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A REVIEW OF THE BITING LICE OF THE GENUS *STURNIDOEUS*  
ELCHLER 1944 (PHILOPTERIDAE : MALLOPHAGA) FOUND ON  
THE BIRD FAMILY STURNIDAE (PASSERIFORMES).

By

PROF. M. ATIQUIR RAHMAN ANSARI,

INTRODUCTION

The genus *Sturnidoeus* was erected by Eichler (1944 : 81) for the *Brueelia*-like Ischnoceran lice found on the bird-order Passeriformes. Eichler's diagnosis "Die Gattung sei aufgestellt für die von Piaget (1880) errichtete Gruppe der Docophori Angustoclypeati" - is too brief to be helpful in splitting this genus from the allied genera. Because of small number of specimens available for study at any one natural history museum, the workers did not attempt a comprehensive review of the genus. Through the kindness of Dr. Theresa Clay of the British Museum (Natural History), London, I have been fortunate in securing a considerable number of specimen of the genus. In this interesting collection, most of the species so far described are represented. In addition, there are specimens of forms which appear to be undescribed. Some of the specimens discussed herein are very distinct and may be easily recognised while excellent likeness in other species makes separation a most difficult job. The best characters for the separation of good species, are the shape and characters of the pre-antennal region of the head, abdominal chaetotaxy, sternal plates and the male genitalia. In the closely allied forms, however, the details of male genitalia constitute an infallible means of identification.

Dr. Clay has most generously put at my disposal an account of the genus. The preliminary description of the genus given in this paper is partly drawn from a study of the specimens available and partly on the remarks furnished by her.

HISTORICAL

*Sturnidoeus* Eichler is a relatively small genus. Hopkins and Clay (1952 : 344) listed 18 valid species out of which 7 species are recognised from Sturnidae alone. During recent years 18 more new names (including one from Sturnidae) are added to this list.

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The first species—*Pediculus sturni*—now referable to the genus *Sturnidoecus* and occurring on the bird family Sturnidae (Passeriformes), of which we have any knowledge was described by Schrank in 1776. Eicher (1944) established the genus *Sturnidoecus* and designated this species—*Docophorus leontodon* Nitzsch 1818 *Nomen Novum* for *Pediculus sturni* Schrank 1776, *sensu* Piaget 1880—as the genotype.

For over three scores of years, no Mallophagan species from the bird family Sturnidae was described which could now be referred to this genus. Denny added one species—*Docophorus pastoris* from *Pastor roseus* (Linnaeus) – to this list in 1842. He was followed by Nitzsch, who contributed another species—*Nirmus quadrilineatus* from *Aegithalos caudatus* (Linnaeus) in 1866, Rudow who added *Docophorus senegalensis* from *Lamprocolius nitens* (Linnaeus) in 1869 and Giebel, who described *Docophorus capensis* from *Sturnus contra* Linnaeus in 1874. Piaget contributed two new species to this group viz., *Docophorus affinis* from *Acridotheres fuscus javanicus* Cabanis and *Docophorus subacutus* from *Lamprotornis australis* (Smith) in 1880.

For about seventy years, no other species which can now be included in this group was described from this bird family until 1955 when Ansari published the description of *Sturnidoecus bannoo* from *Acridotheres ginginianus* (Latham).

I have attempted in this paper to make a complete revision of all the known *Sturnidoecus* species parasitic on Sturnidae. The new forms contained in the collection are fully and completely described in order that there may be no confusion in future. A tentative key to all these species is also given.

All the hosts given herein have been varified by Dr. Clay. The measurements are in millimeters and all the camera lucida drawings were prepared by the author, and inking was however, done by Mr. Saleem Rahman. *Allotypes*, *holotypes* and *paratypes* of all the species discussed have been deposited in the British Museum (Natural History), London.

#### Acknowledgements

My grateful thanks are due to Dr. Theresa Clay for her kind cooperation in making this material available for study to me. Finally I wish to thank Mr. Saleem Rahman, Dr. (Mrs.) Athar Mukhtar Ahmad Chisti and Miss Tasneem Rahman who have assisted me in its preparation for the press. I am specially indebted to Professor M. Afzal Husain for his suggestions and help in many directions. The generosity of the Panjab University, Lahore, for the grant of a research fund is gratefully acknowledged.

Genus *Sturmidacus* Eichler

(Philopteridae : Ischnocera)

1944 Eichler, *Stettin. ent. ztg.*, 1051, 81.

Moderate sized, robust philopterids, feebly well pigmented and sclerotised species.

This genus finds its closest affinity in *philopterus*. The commonest characters of the two are the shape of the head and clypeal signature, general body form and tergal plates, thoracic sternites. Terebrae large, triangular, almost equal to first antennal segment. The male genital armature in the two are modified on very different pattern.

This genus is also allied to *Brueelia* from which it differs in the shape of the head, especially in the characters of the preantennal region. The characters of the clypeal region of *Sturmidacus* species are very much diverse and do not fall within the *Brueelia* range of variation.

#### Description of the genus

Head longer than broad, somewhat pointed anteriorly and expanded at temples. The frontal margin is either rounded or slightly sinuated or medianly indented.

Marginal carina interrupted medianly. At the termination of marginal carina arise well marked, hyaline margin. Dorsal anterior plate present, well developed anterior margin and may or may not be demarcated posteriorly. Dorsal preantennal suture originates at the distal end of the marginal carina and bifid posteriorly. Ventral carina prolonged anteriorly beyond the level of distal end of marginal carina. Ventral anterior plate emarginate anteriorly and almost flat or rounded posteriorly so as to become kidney-shaped. Pharyngeal glands and sclerite well developed and more or less of uniform pattern. Antennae filiform, simple, weakly dimorphic in the two sexes. Clavi small, scarcely projecting beyond the anterior margin of the first antennal segment. Eyes simple, mono cornate, usually prominent with a short seta in the posterior angle, arising from dorsal surface.

Temples convexly rounded. Temporal carina present, joins ocular nodus and preantennary nodus. Occipital plate present, simple. Cephalic chaetotaxy simple and

remarkably constant in number and in the same position throughout the genus. On the dorsum there are : submarginal seta "A", anterior seta "B", preantennal seta "C", post nodal seta "D", ocular seta "E" and one long and 4-5 short marginal temporal setae. On the ventrum there : 3 submarginal setae ; *a, b, c*, 2 anterior setae : *d, g*, and 2 anteroventral setae : *e, f*.

Thoracic sclerites show no special feature and are more or less similar throughout the group. Prothorax short, dorsum with one long seta on each postero-lateral angle. Pterothorax short and wide, with a row of setae along the dorso-posterior margin. Thoracic sternites as in *Bruella* and allied genera. Legs short and stout, femora and tibia about equal in length, claws short and thick.

There also seem to be no characters of the abdomen, which make it possible to separate the *sturnidoecus* species from *Bruella* and other allied genera. Abdomen ovate, with tergal plates II-X in male and II-VIII in female interrupted medially. Dorsal chaetotaxy varies considerably from one group of species to another. Sternal plates II-VI are in the form of median plates, well developed, transverse, in some narrow, while in others considerably reduced to bars, each with a seta in the posterior lateral angle. VII-X in male fused to form an irregular triangular subgenital plate. Females with characteristic sclerotisation of the sub-genital plate, continuous with that round the edge of the vulval giving an anchor-shaped mark, like that found in *Bruella* species and also with a vulval fringe of setae. Ventral sclerite each side of the abdominal segment IX+X in female well developed, each with clamp of setae. Male with ano-genital opening on dorsum.

### KEY TO THE SPECIES OCCURRING ON STURNIDAE

The following key is based entirely on the males *Sturnidoecus* species discussed in the text. Females of several species are identical and it is often most difficult to assign a particular female specimen to the proper species unless there is a male also. The characters of the female are therefore, some times provided in parentheses as additional aids but not as reliable guides to the species.

1. Endomerall plate elongate, reaching as far as the tips of parameres — — — — — 2
- — — Endomerall plate may be elongate or shield-shaped but never reaching the tips of parameres — — — — — 4

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7. Hind-head more than twice as wide as long. IX abdominal segment with not more than 18 setae on each side (two short and one long followed by 5-6 short setae) — — *Sturnidoecus senegalensis* (Rudow)
- — — Hind head always less than twice as wide as long. IX abdominal segment with 18-24 setae on each side — — — — — 8
8. Comparatively more hairy. IV tergite with 2+6+6+2 setae. VIII tergite with 1+4+4+1 setae. IX tergite with 9 setae on each side (one long and one short followed by one long and six or seven short setae). (Female subgenital plate triangular, reduced at tip. Vulva with 10+5+5+10 setae) — — — *Sturnidoecus eichleri* sp. nov.
- — — Comparatively less hairy. IV tergite with 1+5+5+1 setae. VIII tergite with 2+2+2+2 setae. IX tergite with twelve setae on each side (three short and one long followed by eight short setae) — — — *Sturnidoecus distinguendus* sp. nov.
9. Mesosomal plate more or less rectangular with straight posterior margin — — — — — 10
- — — Mesosomal plate with rounded posterior margin — — — — — 12
10. Abdominal tergites II-VIII with a row of 18-21 setae. IX tergite with nine setae on each side (2 long setae followed by seven short setae). (Female subgenital plate narrow at tip. Vulva with 7-9+16-18 setae on each side) — — — *Sturnidoecus afzali* sp. nov.
- — — Abdominal tergites II-VIII with a row of 2-6 setae. IX tergite with nine setae on each side (one short and one long seta followed by seven short setae). — — — — — 11
11. Basal plate, mesosomal plate and parameres at least 1/3 times more as long as in the species given below. Parameres stout, with well developed proximal head. Mesosomal plate as in the figure. (Female subgenital plate considerably drawnout posteriorly, and narrow. Vulva with 5-6+9-11 setae on each side). — — — *Sturnidoecus husaini* sp. nov.
- — — Basal plate, mesosomal plate and parameres considerably shorter than in *Sturnidoecus husaini*. Parameres comparatively narrow. Mesosomal plate as in figure — — — *Sturnidoecus husaini prominens* sp. nov.

12. Proximal-head of the parameres very strongly developed. Sternal plates very narrow, band of bar like — — — — — 13  
 — — — Proximal head of the parameres moderately developed. Sternal plates well developed, transverse stripes — — — — — 14
13. Preantennal region 1.64 times as wide as long. Parameres with slightly-up-turned proximal head - (Female subgenital plate squat, terminating posteriorly. Vulva with 12 - 13 + 5 - 6 setae on each side — — — *Sturnidoecus zahrae* sp. nov.  
 — — — Preantennal region 1.46 times as wide as long. Parameres with almost straight proximal head. (Female subgenital plate moderately developed. Vulva with 14-15+ 7 - 8 setae on each side) — — — *Sturnidoecus zahrae illustris* ssp. nov.
14. Hind-head not more than 1.5 times as wide as long. (Female subgenital plate moderately developed, narrow and elongate posteriorly. Vulva with 12 - 14 + 8 - 9 setae on each side) — — — *Sturnidoecus pastoris* (Denny, 1842)  
 — — — Hind head more than 1.75 - 2.00 times as wide as long — — — 15
15. Mesosomal plate widest in the anterior region, steadily narrowing posteriorly. Proximal parameres with a considerably narrow handle. (Female subgenital plate squat, blunt posteriorly. Vulva with 14 - 16 + 9 setae on each side) — — — *Sturnidoecus sturni* (Schrank, 1776).  
 — — — Mesosomal plate widest in the middle or little beyond and steadily narrowing both anteriorly and posteriorly. Proximal head of the parameres with well-developed squarish handle — — — — — 16
16. Abdominal tergites II - VII with a row of 6 - 14 setae. (Female subgenital plate moderately developed, top-shaped. Vulva with 9 - 12 + 4 - 5 setae on each side) — — — *Sturnidoecus parvifrons* sp. nov.  
 — — — Abdominal tergites II - VII with a row of 14 - 20 setae — — — 17
17. Abdominal tergite II with 10 - 12 setae — — — — — 18  
 — — — Abdominal tergite II with 15 - 20 setae — — — — — 21

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- 8
18. Basal plate and parameres 25 percent smaller than below. Head longer than wide. Preantennal region 1.28 times as wide as long. (Female subgenital plate squat. Vulva with 12-16 + 4-7 setae on each side. ———— *Sturnidoecus acutifrons* sp. nov.
- — — Basal plate and parameres 25 percent as long as in *Sturnidoecus acutifrons*. Head wider than long. Preantennal region 1.42 times as wide as long ————— 19
19. Proximal-head of the parameres well built, hilt at least 1.5 times as long as in the species given below and considerably tilted upwards. (Female subgenital plate well built, spread anteriorly and terminating to a point posteriorly. Vulva with 11-14 + 6-8 setae on each side) ———— *Sturnidoecus zoophilic* sp. nov.
- — — Proximal head of the parameres with a short hilt, more or less quadrangular ————— = ————— 20
20. Proximal head of the parameres with deeper socket. VIII abdominal tergite with 1+4+4+1 setae. (Female subgenital plate well developed, narrow posteriorly. Vulva with 19-20 + 6-7 setae on each side). ———— *Sturnidoecus capensis* (Giebel, 1874)
- — — Proximal head of the parameres with shallow socket. VIII abdominal tergite with 1+6+6+1 setae. (Female subgenital plate squat. Vulva with 16-17 + 7-8 setae on each side) ———— *Sturnidoecus capensis fragilis* ssp. nov.
21. Basal plate 1/5 times as long as parameres. (Female subgenital plate moderately reduced posteriorly, top-shaped. Vulva with 13-14 + 5-6 setae on each side) ———— *Sturnidoecus affinis* (Piaget, 1880).
- — — Basal plate 1/3 times as long as parameres. (Female subgenital plate considerably reduced posteriorly, almost pointed. Vulva with 14-15 + 7-8 setae on each side) ———— *Sturnidoecus bannoo* Ansari, 1955 ————— 22
22. IX abdominal tergite with one long seta on each side (one short seta followed by one long and six or seven short setae). (Female subgenital plate with slight posteriorly drawn out tip. Vulva with

13 — 15 + 6 — 7 setae on each side). — — — *Sturnidoecus bannoo laticephalum* ssp. nov.

— — — IX abdominal tergite with two long setae on each side — — — 23

23. IX abdominal tergite with eleven setae on each side (two short and one long followed by three short, one long and four short setae). Proximal head of the parameres with deep socket. (Female subgenital plate with considerably drawn out tip. Vulva with 12—13 + 6—8 setae on each side) — — — *Sturnidoecus bannoo avinus* ssp. nov.

— — — IX abdominal tergite with ten setae on each side (two short and one long followed by six short and one long seta). Proximal head of the parameres with shallow socket. (Female subgenital plate moderately drawn out tip. Vulva with 14—15 + 7—8 setae on each side) — — — *Sturnidoecus bannoo* Ansari, 1955

TABLE I—Measurements of various parts of the Body in *Sturnideocus* Species Occurring on the Pastors, Starlings and Mynahs : *Sturnidae*

| <i>Sturnideocus</i>          | Body        | Head        | Prothorax   | Pterothorax | Abdomen     |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| <b>Males</b>                 |             |             |             |             |             |
| 1. <i>avivorax</i> ...       | 1.605x0.731 | 0.497x0.487 | 0.096x0.279 | 0.168x0.431 | 0.848x0.731 |
| 2. <i>theresae</i> ...       | 1.208x0.572 | 0.428x0.436 | 0.093x0.237 | 0.171x0.381 | 0.521x0.572 |
| 3. <i>clayae</i> ...         | 1.662x0.728 | 0.513x0.503 | 0.118x0.282 | 0.184x0.441 | 0.852x0.728 |
| 4. <i>meinertzhageni</i> ... | 1.461x0.615 | 0.476x0.462 | 0.118x0.272 | 0.144x0.395 | 0.728x0.615 |
| 5. <i>opeca</i> ...          | 1.286x0.544 | 0.414x0.421 | 0.077x0.215 | 0.144x0.349 | 0.656x0.544 |
| 6. <i>senegalensis</i> ...   | 1.483x0.621 | 0.452x0.493 | 0.133x0.266 | 0.154x0.431 | 0.749x0.621 |
| 7. <i>eichleri</i> ...       | 1.642x0.677 | 0.446x0.456 | 0.103x0.256 | 0.139x0.400 | 0.718x0.677 |
| 8. <i>distinguendus</i> ...  | 1.575x0.703 | 0.483x0.477 | 0.133x0.288 | 0.159x0.446 | 0.805x0.703 |
| 9. <i>afzali</i> ...         | 1.587x0.733 | 0.513x0.533 | 0.114x0.308 | 0.144x0.482 | 0.821x0.733 |
| 10. <i>husaini</i> ...       | 1.872x0.749 | 0.544x0.452 | 0.118x0.292 | 0.189x0.456 | 1.026x0.749 |
| 11. <i>h. prominens</i> ...  | 1.667x0.662 | 0.483x0.451 | 0.123x0.257 | 0.153x0.400 | 0.913x0.662 |
| 12. <i>zahrae</i> ...        | 1.595x0.708 | 0.503x0.508 | 0.118x0.292 | 0.174x0.456 | 0.805x0.708 |

|                                |             |             |             |             |             |
|--------------------------------|-------------|-------------|-------------|-------------|-------------|
| 13. <i>z. illustris</i> ...    | 1.503x0.641 | 0.493x0.477 | 0.123x0.272 | 0.164x0.415 | 0.728x0.641 |
| 14. <i>pastoris</i> ...        | 1.958x0.708 | 0.633x0.497 | 0.115x0.272 | 0.179x0.436 | 1.036x0.708 |
| 15. <i>stural</i> ...          | 1.494x0.646 | 0.524x0.552 | 0.123x0.292 | 0.195x0.451 | 0.657x0.646 |
| 16. <i>parvifrons</i> ...      | 1.540x0.641 | 0.482x0.477 | 0.113x0.279 | 0.149x0.451 | 0.801x0.641 |
| 17. <i>acutifrons</i> ...      | 1.462x0.621 | 0.457x0.435 | 0.118x0.246 | 0.164x0.384 | 0.728x0.621 |
| 18. <i>zoophilic</i> ...       | 1.682x0.773 | 0.503x0.528 | 0.158x0.279 | 0.164x0.482 | 0.862x0.773 |
| 19. <i>capensis</i> ...        | 1.625x0.738 | 0.497x0.523 | 0.153x0.318 | 0.169x0.477 | 0.811x0.738 |
| 20. <i>c. fragilis</i> ...     | 1.525x0.641 | 0.473x0.487 | 0.156x0.262 | 0.158x0.416 | 0.743x0.641 |
| 21. <i>affinis</i> ...         | 1.585x0.713 | 0.503x0.472 | 0.138x0.287 | 0.164x0.446 | 0.785x0.713 |
| 22. <i>bannoo</i> ...          | 1.663x0.728 | 0.508x0.513 | 0.144x0.292 | 0.144x0.451 | 0.872x0.728 |
| 23. <i>b. laticephalum</i> ... | 1.667x0.698 | 0.498x0.482 | 0.158x0.279 | 0.164x0.451 | 0.852x0.698 |
| 24. <i>b. avinus</i> ...       | 1.672x0.771 | 0.518x0.554 | 0.144x0.279 | 0.179x0.421 | 0.836x0.771 |

|                              |             |             |             |             |             |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| <b>Females :</b>             |             |             |             |             |             |
| 1. <i>avivcrax</i> ...       | 1.944x0.838 | 0.533x0.548 | 0.117x0.294 | 0.198x0.462 | 0.096x0.838 |
| 2. <i>theresae</i> ...       | 1.644x0.675 | 0.468x0.505 | 0.118x0.268 | 0.171x0.423 | 0.892x0.675 |
| 3. <i>clayae</i> ...         | 1.922x0.811 | 0.543x0.569 | 0.118x0.318 | 0.215x0.553 | 1.051x0.811 |
| 4. <i>meinertzhageni</i> ... | 1.837x0.693 | 0.528x0.513 | 0.138x0.272 | 0.174x0.431 | 1.001x0.693 |
| 5. <i>opeca</i> ...          | 1.639x0.723 | 0.491x0.482 | 0.092x0.251 | 0.189x0.411 | 0.872x0.723 |

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M. Atique Rahman Amari

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TABLE I Measurements of various part of the Body in *Sturnidoecus* Species Occurring on the Pastors, Starlings and Mynahs : Sturnidae

| <i>Sturnidoecus</i>           | Body        | Head        | Prothorax   | Pterothorax | Abdomen     |
|-------------------------------|-------------|-------------|-------------|-------------|-------------|
| 6. <i>senegalensis</i> ...    | Female      |             | not         | available   |             |
| 7. <i>elchleri</i> ...        | 2.091x0.738 | 0.498x0.508 | 0.131x0.266 | 0.189x0.451 | 1.011x0.738 |
| 8. <i>distinguendus</i> ...   | Female      |             | not         | available   |             |
| 9. <i>afzali</i> ...          | 2.016x0.836 | 0.570x0.595 | 0.138x0.344 | 0.195x0.544 | 1.118x0.836 |
| 10. <i>husalni</i> ...        | 2.395x0.703 | 0.566x0.538 | 0.128x0.318 | 0.205x0.492 | 1.231x0.708 |
| 11. <i>h. prominens</i> ...   | 2.061x0.778 | 0.487x0.503 | 0.123x0.279 | 0.169x0.436 | 1.287x0.778 |
| 12. <i>zahrae</i> ...         | 1.898x0.754 | 0.533x0.544 | 0.144x0.318 | 0.195x0.477 | 1.031x0.754 |
| 13. <i>z. illustris</i> ...   | 1.846x0.687 | 0.513x0.518 | 0.133x0.272 | 0.189x0.451 | 1.016x0.687 |
| 14. <i>pastoris</i> ...       | 2.219x0.836 | 0.666x0.569 | 0.138x0.307 | 0.205x0.503 | 1.215x0.838 |
| 15. <i>sturni</i> ...         | 1.725x0.703 | 0.551x0.589 | 0.123x0.318 | 0.195x0.477 | 0.861x0.703 |
| 16. <i>parvifrons</i> ...     | 1.790x0.662 | 0.492x0.497 | 0.113x0.279 | 0.179x0.452 | 1.011x0.662 |
| 17. <i>acutifrons</i> ...     | 1.801x0.763 | 0.503x0.492 | 0.128x0.279 | 0.144x0.452 | 1.031x0.763 |
| 18. <i>zoophillic</i> ...     | 1.995x0.811 | 0.565x0.594 | 0.128x0.323 | 0.174x0.533 | 1.133x0.811 |
| 19. <i>capensis</i> ...       | 1.969x0.836 | 0.519x0.548 | 0.164x0.359 | 0.169x0.543 | 1.123x0.836 |
| 20. <i>c. fragilis</i> ...    | 2.017x0.758 | 0.571x0.579 | 0.144x0.311 | 0.189x0.503 | 1.113x0.758 |
| 21. <i>affinis</i> ...        | 1.722x0.738 | 0.532x0.523 | 0.128x0.315 | 0.174x0.477 | 0.893x0.738 |
| 22. <i>bannoo</i> ...         | 2.162x0.795 | 0.571x0.553 | 0.144x0.318 | 0.201x0.497 | 1.251x0.795 |
| 23. <i>b. laticepalum</i> ... | 1.943x0.791 | 0.503x0.523 | 0.158x0.297 | 0.169x0.482 | 1.118x0.791 |
| 24. <i>b. avinus</i> ...      | 1.887x0.771 | 0.549x0.553 | 0.138x0.308 | 0.195x0.487 | 1.011x0.771 |

A review of genus *Sturnidoecus*

M. Arifur Rahman Ansari

TABLE II : Measurements of the head in *Sturnidoecus* species (Males) Occurring on Brackets)

| <i>Sturnidoecus</i>        | Head                   | Hyaline region |
|----------------------------|------------------------|----------------|
| 1. <i>avivorax</i>         | 0.497x0.487(1 : 0.98)  | 0.071x0.188    |
| 2. <i>theresae</i>         | 0.428x0.436(1 : 1.019) | 0.067x0.149    |
| 3. <i>clayae</i>           | 0.513x0.503(1 : 0.98)  | 0.072x0.169    |
| 4. <i>meinertzhageni</i>   | 0.476x0.462(1 : 0.98)  | 0.066x0.143    |
| 5. <i>opeca</i>            | 0.414x0.421(1 : 0.95)  | 0.061x0.128    |
| 6. <i>senegalensis</i>     | 0.452x0.493(1 : 1.09)  | 0.077x0.185    |
| 7. <i>eichleri</i>         | 0.446x0.456(1 : 1.02)  | 0.041x0.149    |
| 8. <i>distinguendus</i>    | 0.483x0.477(1 : 0.98)  | 0.062x0.154    |
| 9. <i>afzali</i>           | 0.513x0.533(1 : 1.04)  | 0.067x0.179    |
| 10. <i>husaini</i>         | 0.544x0.482(1 : 0.88)  | 0.062x0.153    |
| 11. <i>h. prominens</i>    | 0.483x0.451(1 : 0.93)  | 0.062x0.138    |
| 12. <i>zahrae</i>          | 0.503x0.508(1 : 1.01)  | 0.056x0.164    |
| 13. <i>z. illustris</i>    | 0.493x0.477(1 : 0.96)  | 0.056x0.144    |
| 14. <i>pastoris</i>        | 0.633x0.497(1 : 0.78)  | 0.056x0.169    |
| 15. <i>sturni</i>          | 0.524x0.552 (1 : 1.05) | 0.076x0.195    |
| 16. <i>parvifrons</i>      | 0.482x0.477(1 : 0.99)  | 0.076x0.179    |
| 17. <i>acutifrons</i>      | 0.457x0.435(1 : 0.95)  | 0.057x0.128    |
| 18. <i>zoophilic</i>       | 0.503x0.528(1 : 1.05)  | 0.062x0.169    |
| 19. <i>capensis</i>        | 0.497x0.523(1 : 1.05)  | 0.066x0.236    |
| 20. <i>c. fragilis</i>     | 0.473x0.487(1 : 1.03)  | 0.067x0.153    |
| 21. <i>affinis</i>         | 0.503x0.472(1 : 0.94)  | 0.056x0.179    |
| 22. <i>hannoo</i>          | 0.508x0.513(1 : 1.01)  | 0.046x0.174    |
| 23. <i>b. laticephalum</i> | 0.498x0.482(1 : 0.96)  | 0.062x0.179    |
| 24. <i>b. avinus</i>       | 0.518x0.554(1 : 1.07)  | 0.056x0.169    |

the Pastors, Starlings and Mynahs : Sturnidae (ratios of length to width is given in

| Preantennal region    | Hind-head             | Dorsal plate | Ventral plate |
|-----------------------|-----------------------|--------------|---------------|
| 0.233x0.341(1 : 1.46) | 0.264x0.487(1 : 1.84) | 0.108x0.135  | 0.078x0.097   |
| 0.222x0.278(1 : 1.25) | 0.206x0.436(1 : 2.12) | 0.140x0.136  | 0.081x0.082   |
| 0.251x0.359(1 : 1.42) | 0.262x0.503(1 : 1.92) | 0.101x0.105  | 0.073x0.067   |
| 0.238x0.315(1 : 1.32) | 0.238x0.462(1 : 1.94) | 0.138x0.107  | 0.108x0.076   |
| 0.193x0.297(1 : 1.53) | 0.221x0.421(1 : 1.91) | 0.088x0.072  | 0.126x0.015   |
| 0.231x0.338(1 : 1.46) | 0.221x0.493(1 : 2.23) | 0.111x0.113  | 0.087x0.076   |
| 0.205x0.303(1 : 1.48) | 0.241x0.456(1 : 1.89) | 0.181x0.114  | 0.081x0.085   |
| 0.221x0.323(1 : 1.46) | 0.262x0.477(1 : 1.82) | 0.140x0.108  | 0.105x0.081   |
| 0.246x0.379(1 : 1.54) | 0.267x0.533(1 : 1.99) | 0.138x0.116  | 0.095x0.072   |
| 0.267x0.369(1 : 1.38) | 0.277x0.482(1 : 1.74) | 0.116x0.108  | 0.087x0.076   |
| 0.221x0.318(1 : 1.44) | 0.262x0.451(1 : 1.71) | 0.116x0.105  | 0.065x0.068   |
| 0.231x0.379(1 : 1.64) | 0.272x0.508(1 : 1.86) | 0.096x0.119  | 0.087x0.087   |
| 0.236x0.344(1 : 1.46) | 0.257x0.477(1 : 1.86) | 0.076x0.114  | 0.089x0.062   |
| 0.279x0.354(1 : 1.27) | 0.354x0.497(1 : 1.41) | 0.149x0.100  | 0.095x0.089   |
| 0.262x0.349(1 : 1.33) | 0.262x0.552(1 : 2.11) | 0.130x0.122  | 0.108x0.095   |
| 0.251x0.369(1 : 1.47) | 0.231x0.477(1 : 2.06) | 0.114x0.271  | 0.073x0.092   |
| 0.246x0.315(1 : 1.28) | 0.211x0.435(1 : 2.06) | 0.119x0.096  | 0.076x0.062   |
| 0.246x0.375(1 : 1.52) | 0.257x0.528(1 : 2.06) | 0.149x0.114  | 0.089x0.096   |
| 0.246x0.349(1 : 1.42) | 0.251x0.523(1 : 2.08) | 0.143x0.105  | 0.089x0.084   |
| 0.211x0.323(1 : 1.53) | 0.262x0.487(1 : 1.86) | 0.146x0.102  | 0.092x0.084   |
| 0.241x0.364(1 : 1.53) | 0.262x0.472(1 : 1.80) | 0.145x0.102  | 0.078x0.071   |
| 0.231x0.369(1 : 1.59) | 0.277x0.513(1 : 1.85) | 0.138x0.112  | 0.095x0.081   |
| 0.241x0.364(1 : 1.51) | 0.257x0.482(1 : 1.88) | 0.127x0.084  | 0.078x0.073   |
| 0.246x0.369(1 : 1.50) | 0.272x0.554(1 : 2.04) | 0.143x0.119  | 0.130x0.099   |

TABLE III Measurements of the head in *Sturnidoecus* Species (Females) Occurring on

| <i>Sturnidoecus</i>        |     | Head                  | Hyaline region |
|----------------------------|-----|-----------------------|----------------|
|                            | ... | 0.533x0.548(1 : 1.03) | 0.076x0.198    |
| 1. <i>avivorax</i>         | ... | 0.468x0.505(1 : 1.08) | 0.072x0.165    |
| 2. <i>theresae</i>         | ... | 0.543x0.569(1 : 1.05) | 0.072x0.169    |
| 3. <i>Clayae</i>           | ... | 0.529x0.513(1 : 0.97) | 0.072x0.143    |
| 4. <i>meinertzhageni</i>   | ... | 0.491x0.482(1 : 0.98) | 0.067x0.154    |
| 5. <i>opeca</i>            | ... | —                     | —              |
| 6. <i>senegalensis</i>     | ... | 0.498x0.508(1 : 1.02) | 0.046x0.159    |
| 7. <i>elchleri</i>         | ... | —                     | —              |
| 8. <i>distinguendus</i>    | ... | 0.570x0.595(1 : 1.05) | 0.067x0.179    |
| 9. <i>afzali</i>           | ... | 0.566x0.538(1 : 0.95) | 0.062x0.164    |
| 10. <i>husaini</i>         | ... | 0.487x0.503(1 : 1.04) | 0.067x0.138    |
| 11. <i>h. prominens</i>    | ... | 0.533x0.554(1 : 1.44) | 0.056x0.164    |
| 12. <i>zahrae</i>          | ... | 0.513x0.518(1 : 1.01) | 0.062x0.144    |
| 13. <i>z. illustris</i>    | ... | 0.666x0.569(1 : 0.85) | 0.056x0.169    |
| 14. <i>pastoris</i>        | ... | 0.551x0.589(1 : 1.07) | 0.076x0.215    |
| 15. <i>sturni</i>          | ... | 0.492x0.497(1 : 1.01) | 0.076x0.179    |
| 16. <i>parvifrons</i>      | ... | 0.503x0.492(1 : 0.97) | 0.067x0.158    |
| 17. <i>acutifrons</i>      | ... | 0.565x0.594(1 : 1.05) | 0.067x0.169    |
| 18. <i>zoophilic</i>       | ... | 0.519x0.548(1 : 1.05) | 0.066x0.236    |
| 19. <i>capensis</i>        | ... | 0.571x0.579(1 : 1.01) | 0.076x0.169    |
| 20. <i>c. fragilis</i>     | ... | 0.532x0.523(1 : 0.98) | 0.067x0.179    |
| 21. <i>affinis</i>         | ... | 0.571x0.553(1 : 0.97) | 0.062x0.189    |
| 22. <i>bannoo</i>          | ... | 0.503x0.523(1 : 1.04) | 0.062x0.189    |
| 23. <i>b. laticephalum</i> | ... | 0.549x0.553(1 : 1.01) | 0.072x0.169    |
| 24. <i>b. avinus</i>       | ... |                       |                |

the Pastors, Starlings and Mynahs : Sturnidae (ratio of length to width given in brackets)

| Preantennal region    | Hind-head             | Dorsal plate | Ventral plate |
|-----------------------|-----------------------|--------------|---------------|
| 0.244x0.301(1 : 1.24) | 0.289x0.548(1 : 1.89) | 0.130x0.168  | 0.073x0.098   |
| 0.226x0.309(1 : 1.36) | 0.242x0.505(1 : 2.09) | 0.015x0.017  | 0.011x0.011   |
| 0.251x0.334(1 : 1.53) | 0.292x0.569(1 : 1.95) | 0.108x0.122  | 0.073x0.067   |
| 0.273x0.348(1 : 1.29) | 0.256x0.513(1 : 2.01) | 0.138x0.107  | 0.108x0.076   |
| 0.235x0.318(1 : 1.36) | 0.256x0.482(1 : 1.85) | 0.088x0.082  | 0.013x0.015   |
| —                     | —                     | —            | —             |
| 0.231x0.354(1 : 1.53) | 0.267x0.508(1 : 1.91) | 0.127x0.114  | 0.106x0.084   |
| —                     | —                     | —            | —             |
| 0.267x0.415(1 : 1.55) | 0.303x0.595(1 : 1.96) | 0.138x0.116  | 0.095x0.072   |
| 0.287x0.389(1 : 1.35) | 0.279x0.538(1 : 1.92) | —            | 0.071x0.081   |
| 0.215x0.379(1 : 1.76) | 0.272x0.503(1 : 1.85) | 0.127x0.119  | 0.076x0.076   |
| 0.246x0.405(1 : 1.65) | 0.287x0.554(1 : 1.93) | 0.092x0.136  | 0.087x0.087   |
| 0.236x0.369(1 : 1.56) | 0.277x0.518(1 : 1.86) | 0.119x0.124  | 0.089x0.078   |
| 0.287x0.379(1 : 1.32) | 0.379x0.569(1 : 1.76) | 0.190x0.119  | 0.095x0.089   |
| 0.272x0.384(1 : 1.41) | 0.279x0.589(1 : 2.11) | 0.149x0.122  | 0.119x0.095   |
| 0.251x0.395(1 : 1.58) | 0.241x0.497(1 : 2.07) | 0.114x0.127  | 0.073x0.092   |
| 0.262x0.354(1 : 1.35) | 0.241x0.492(1 : 2.04) | 0.119x0.096  | 0.076x0.062   |
| 0.262x0.415(1 : 1.58) | 0.303x0.594(1 : 1.96) | 0.157x0.130  | 0.105x0.122   |
| 0.257x0.431(1 : 1.67) | 0.262x0.548(1 : 2.09) | 0.143x0.125  | 0.099x0.084   |
| 0.292x0.411(1 : 1.41) | 0.279x0.579(1 : 2.07) | 0.146x0.102  | 0.114x0.095   |
| 0.266x0.389(1 : 1.45) | 0.266x0.523(1 : 1.97) | 0.141x0.018  | 0.095x0.071   |
| 0.279x0.411(1 : 1.47) | 0.292x0.553(1 : 1.89) | 0.149x0.130  | 0.111x0.092   |
| 0.241x0.379(1 : 1.57) | 0.262x0.523(1 : 1.98) | 0.127x0.084  | 0.089x0.073   |
| 0.272x0.389(1 : 1.43) | 0.277x0.533(1 : 1.98) | 0.168x0.119  | 0.130x0.099   |

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TABLE IV : Measurements of Male Genital of Armature in *Sturnidoecus* Species

| <i>Sturnidoecus</i>              | Length | Basal Plate |                |
|----------------------------------|--------|-------------|----------------|
|                                  |        | Basal Width | Anterior Width |
| 1. <i>avivorax</i> ...           | 0.200  | 0.1297      | 0.1486         |
| 2. <i>theresae</i> ...           | 0.183  | 0.0951      | 0.127          |
| 3. <i>clayae</i> ...             | 0.265  | 0.101       | 0.121          |
| 4. <i>meinertzhageni</i> ...     | 0.1881 | 0.1324      | 0.1031         |
| 5. <i>opeca</i> ...              | 0.0160 | 0.0081      | 0.0111         |
| 6. <i>senegalensis</i> ...       | 0.2027 | 0.1378      | 0.1703         |
| 7. <i>eichleri</i> ...           | 0.2081 | 0.1271      | 0.1649         |
| 8. <i>distinguendus</i> ...      | 0.2162 | 0.1405      | 0.1703         |
| 9. <i>afzali</i> ...             | 0.2108 | 0.1108      | 0.1216         |
| 10. <i>husaini husaini</i> ...   | 0.2892 | 0.1641      | 0.1902         |
| 11. <i>husaini prominens</i> ... | 0.2081 | 0.1108      | 0.1216         |
| 12. <i>zohrae zohrae</i> ...     | 0.2162 | 0.1324      | 0.1729         |

## on the Pastors, Starlings and Mynahs (Sturnidae)

| Mesosomal Plate |        | Parameres | Ratio of Parameres<br>to basal plate. |
|-----------------|--------|-----------|---------------------------------------|
| Length          | Width  |           |                                       |
| 0.222           | 0.0729 | 0.222     | 1 : 0.901                             |
| 0.136           | 0.0551 | 0.139     | 1 : 1.316                             |
| 0.181           | 0.057  | 0.157     | 1 : 1.633                             |
| 0.1216          | 0.100  | 0.200     | 1 : 0.945                             |
| 0.0134          | 0.0054 | 0.0172    | 1 : 0.931                             |
| 0.1946          | 0.0865 | 0.2162    | 1 : 0.938                             |
| 0.1973          | 0.0781 | 0.2108    | 1 : 0.987                             |
| 0.2054          | 0.0946 | 0.1919    | 1 : 1.126                             |
| 0.1216          | 0.0703 | 0.1487    | 1 : 1.417                             |
| 0.1676          | 0.1107 | 0.1837    | 1 : 1.574                             |
| 0.1081          | 0.0892 | 0.1324    | 1 : 1.572                             |
| 0.1189          | 0.0811 | 1.1676    | 1 : 1.289                             |

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TABLE IV : Measurements of Male Genital Armature in *Sturnidoecus* Species

| <i>Sturnidoecus</i>                 | Length | Basal Plate | Anterior Width |
|-------------------------------------|--------|-------------|----------------|
|                                     |        | Basal Width |                |
| 13. <i>zahrae illustris</i> ...     | 0.2162 | 0.1189      | 0.1405         |
| 14. <i>pastoris</i> ...             | 0.2189 | 0.1054      | 0.1298         |
| 15. <i>sturni</i> ..                | 0.1946 | 0.1108      | 0.1108         |
| 16. <i>parvifrons</i> ...           | 0.2027 | 0.1018      | 0.1405         |
| 17. <i>acutifrons</i> ...           | 0.1676 | 0.0838      | 0.1162         |
| 18. <i>zoophilic</i> ...            | 0.2351 | 0.1081      | 0.1378         |
| 19. <i>capensis capensis</i> ...    | 0.2216 | 0.0963      | 0.1595         |
| 20. <i>capensis fragilis</i> ...    | 0.2162 | 0.1018      | 0.1459         |
| 21. <i>affinis</i> ...              | 0.2189 | 0.1216      | 0.1568         |
| 22. <i>bannoo bannoo</i> ...        | 0.2351 | 0.1081      | 0.1568         |
| 23. <i>bannoo laticephala m</i> ... | 0.2081 | 0.1018      | 0.1512         |
| 24. <i>bannoo avinus</i> ..         | 0.2162 | 0.1108      | 0.1351         |

## on the Pastors Starlings and Mynahs (Sturnidae)

| Mesosomal Plate |        | Parameres | Ratio of Parameres<br>to basal plate. |
|-----------------|--------|-----------|---------------------------------------|
| Length          | Width  |           |                                       |
| 0.1189          | 0.0865 | 0.1567    | 1 : 1.379                             |
| 0.1162          | 0.0703 | 0.1595    | 1 : 1.379                             |
| 0.1298          | 0.0595 | 0.1513    | 1 : 1.286                             |
| 0.1108          | 0.0621 | 0.1459    | 1 : 1.389                             |
| 0.1135          | 0.0568 | 0.1405    | 1 : 1.193                             |
| 0.1351          | 0.0676 | 0.1837    | 1 : 1.274                             |
| 0.1405          | 0.0731 | 0.1703    | 1 : 1.301                             |
| 0.1298          | 0.0703 | 0.1809    | 1 : 1.195                             |
| 0.1405          | 0.0731 | 0.1809    | 1 : 1.210                             |
| 0.1298          | 0.0676 | 0.1676    | 1 : 1.403                             |
| 0.1298          | 0.0648 | 0.1539    | 1 : 1.352                             |
| 0.1216          | 0.0703 | 0.1676    | 1 : 1.289                             |

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| <i>Sturnidococcus</i>        | Pterothorax | II      | III       | IV        |
|------------------------------|-------------|---------|-----------|-----------|
| 1. <i>auratus</i>            | 10+10       | 7+7     | 1+6+6+1   | 2+5-6+6+2 |
| 2. <i>theresia</i>           | 10+10       | 3+4     | 1+4+3-4+1 | 2+4+4+2   |
| 3. <i>clayae</i>             | 11+11       | 4+4     | 1+4+4+1   | 2+4+4+2   |
| 4. <i>meinershageni</i>      | 8+8         | 4+4     | 4+4       | 5+5       |
| 5. <i>opaco</i>              | 9+9         | 3+4     | 4+4       | 2+3+3+2   |
| 6. <i>senegalensis</i>       | 10+10-11    | 4+4     | 4+5       | 2+4+4+2   |
| 7. <i>eichleri</i>           | 11+11       | 4-6+4   | 5+5       | 2+6+6+2   |
| 8. <i>distingueus</i>        | 11-14+11    | 5+5     | 1+6+4+1   | 1+5+5+1   |
| 9. <i>afzali</i>             | 13+12-13    | 8-9+9   | 9-10+10   | 10-11+12  |
| 10. <i>huraini huraini</i>   | 9+9         | -1+1-   | 1+1+1+1   | 2+1+1+2   |
| 11. <i>huraini prominens</i> | 9+8-9       | -1+1-   | 1+1+1+1   | 2+1+1+2   |
| 12. <i>zohrae zohrae</i>     | 10=10       | 1+3+3+1 | 1+3+3+1   | 1-2+3+3+2 |

| V           | VI        | VII       | VIII        | IX           | X<br>+<br>XI |
|-------------|-----------|-----------|-------------|--------------|--------------|
| 2+5-6+6+2   | 2+4-5+5+2 | 2+3+3+2   | 1+2+3+1     | 1+1+3+1----  | 5+3          |
| 2+4+4+2     | 2+4+4+2   | 2+3+3+2   | 1+3+3+1     | 1+1+3+1+2--  | 3+3          |
| 2+4+4+2     | 2+4+4+2   | 2+4+4+2   | 1+3+3+1+1   | 1+1+4-----   | 3+3          |
| 2+4+4+2     | 2+4+4+2   | 2+4+4+2   | 1+4+4+1     | 1+1+6-----   | 3+3          |
| 2+4+4+2     | 2+3+3+2   | 1+3+3+1   | 1+2+2+1     | 2+1+5-----   | 3+3          |
| 2+4-5+4+2   | 2+4+4+2   | 2+3-4+4+2 | 1+1+4+4+1+1 | 2+1+5-6----- | 3+3          |
| 1-2+4-5+4+2 | 2+4+4+2   | 2+3-4+3+2 | 1+4+4+1     | 1+1+1+6----- | 3+3          |
| 2+4+4+2     | 2-3+3-4   | 3+4+3+2   | 2+2+2+2     | 3+1+8-----   | 3+3          |
| 10-11+11    | 10-11+12  | 8-9+9-10  | 1+8+8+1     | 6+5+5+6----- | 2+2          |
| 2+1+1+2     | 2+1+1+2   | 2+1+1+2   | 1+1+1+1     | 1+1+7-----   | 3+3          |
| 2+1+1+2     | 2+1+1+2   | 2+1+1+2   | 1+1+1+1     | 1+1+1+6----- | 3+3          |
| 2+4+3+2     | 2+2-3+3+2 | 2+3+3+2   | 2+2+2+2     | 1+1+5-7----- | 3+3          |

| <i>Sturnidocerus</i>           | Pterothorax | II        | III         | IV        |
|--------------------------------|-------------|-----------|-------------|-----------|
| 13. <i>zahrae illustris</i>    | 8+8         | 1+3+3+1   | 1+5+5+1     | 1+4+4+1   |
| 14. <i>postoris</i>            | 12+12       | 7+7       | 2+7+7+2     | 2+7+7+2   |
| 15. <i>sturni</i>              | 14+14       | 10+9-10   | 12-13+12-13 | 12+12-13  |
| 16. <i>parifrons</i>           | 10+9-10     | 4+4       | 1+3+3+1     | 2+4+4+2   |
| 17. <i>acurifrons</i>          | 10-11+11    | 5+5       | 2+5+6+2     | 2+6+5+2   |
| 18. <i>coophylic</i>           | 11-12+12    | 6+6       | 7-8+7-8     | 7-8+7-8   |
| 19. <i>capensis capensis</i>   | 12+12       | 2+5+5+2   | 2+6+6+2     | 2+6+6+2   |
| 20. <i>capensis fragilis</i>   | 10-12+12    | 5-6+6     | 2+5-6+6+2   | 2+6-7+7+2 |
| 21. <i>affinis</i>             | 10-12+12-13 | 10+10-11  | 2+6+6-7+2   | 2+8+7-8+2 |
| 22. <i>bannoo bannoo</i>       | 12-13+13    | 7-8+8     | 9+9-10      | 9-10+10   |
| 23. <i>bannoo laticephalum</i> | 11+11       | 7-8+8     | 8 9+8       | 2+6+6-7+2 |
| 24. <i>bannoo arimus</i>       | 12+13       | 2+5-6+6+2 | 2+6-7+8+2   | 2+6-7+8   |

In Males of *Sturnidocerus* Species  
and Mynahs (*Sturnidae*)

| V         | VI        | VII       | VIII      | IX           | X<br>+<br>IX |
|-----------|-----------|-----------|-----------|--------------|--------------|
| 2+4+4+2   | 2+4+4+2   | 2+3+3+2   | 2+3+3+2   | 2+1+7-----   | 3+3          |
| 2+7+7+2   | 2+7+7+2   | 2+7+7+2   | 1+5+5+1   | 2+1+4-----   | 3+3          |
| 11-12+12  | 12+11-12  | 9+8-9     | 5-6+5     | 1+1+3+1+2--  | 3+3          |
| 2+4+4+2   | 2+4+4+2   | 2+3+3+2   | 1+2+2+1   | 1+1+6-----   | 3+3          |
| 2+6+7+2   | 2+4-5+5+2 | 2+5+5+2   | 1+3+3+1   | 1+1+5-----   | 3+3          |
| 8+8-9     | 7+7       | 8 9+8     | 6+6       | 1+5+1+1----- | 3+3          |
| 2+6+6+2   | 2+6+5+2   | 2+5+6+2   | 1+4+4+1   | 1+1+7-9----- | 3+3          |
| 2+6+7+2   | 2+5-6+6+2 | 2+6+6+2   | 1+6+6+1   | 1+1+9+1----- | 3+           |
| 2+6-7+6+2 | 2+6-7+6+2 | 2+5+6+2   | 1+5+6+1   | 1+1+2+1+3--  | 3+           |
| 9-10+10   | 8-9+8     | 8-9+8     | 5-6+6-7   | 2+1+6+1----- | 3            |
| 2+6-7+7+2 | 2+6-7+7+2 | 2+6-7+7+2 | 1+3-4+4+1 | 1+1+6-7----- |              |
| 2+7+8+2   | 2+7+6+2   | 2+6-7+7+2 | 1+5-6+6+1 | 2+1+3+1+4--  |              |

| <i>Sturnidoceros</i>             | Thorax   | II      | III        | IV       | V        |
|----------------------------------|----------|---------|------------|----------|----------|
| 1. <i>anthracis</i> ...          | 10+10    | 5+5     | 1+4+6+1    | 2+6+6+2  | 2+5+5+2  |
| 2. <i>rhynchus</i> ...           | 10+10    | 4+4     | 1+4+4+1    | 2+4+4+2  | 2+4+4+2  |
| 3. <i>clayae</i> ...             | 10+11    | 5+6     | 1+4+4+1    | 2+4+4+2  | 2+4+4+2  |
| 4. <i>memorabilis</i> ...        | 9+9      | 4+4     | 4+4        | 5+5      | 2+4+4+2  |
| 5. <i>oprea</i> ...              | 10+10    | 5+4     | 4+4        | 1+4+4+1  | 2+4+4+2  |
| 6. <i>senegalensis</i> ...       | —        | —       | —          | —        | —        |
| 7. <i>elchleri</i> ...           | 9+9      | 4+4     | 6+5        | 6+5      | 2+4+4+2  |
| 8. <i>distinguendus</i> ...      | —        | —       | —          | —        | —        |
| 9. <i>afzali</i> ...             | 14+14    | 8-10+10 | 9-12+10-12 | 10-12+13 | 11-12+13 |
| 10. <i>kusabul kusabul</i> ...   | 8+8      | -1+1-   | -1+1-      | 1+1+1+1  | 1+1+1+1  |
| 11. <i>kusabul prominens</i> ... | 8+8      | -1+1-   | -1+1-      | 1+1+1+1  | 1+1+1+1  |
| 12. <i>zahræ zahræ</i> ...       | 10+10    | 4+4     | 4+4        | 1+3+3+1  | 2+3+3+2  |
| 13. <i>z. illustris</i> ...      | 10+10    | 4+4     | 1+4+4+1    | 2+4+4+2  | 2+4+4+2  |
| 14. <i>pastoris</i> ...          | 12-13+13 | 7+7     | 9+9-10     | 10+10    | 9-10+10  |
| 15. <i>sturni</i> ...            | 15+16    | 12+12   | 16-17+17   | 16-17+17 | 16-17+17 |

Occurring on the Pastures, Starlings and Mynahs (*Sturnidae*)

| VI        | VII      | VIII        | IX             | vulva         |
|-----------|----------|-------------|----------------|---------------|
| 2+3+3+2   | 2+4+4+2  | 1+1+3+3+1+1 | 1+1+1- - - -   | 9+5+5+9       |
| 2+3-4+4+2 | 2+3+3+2  | 4+4         | 1+1+1+1- - - - | 9+5+5+9       |
| 2+4+4+2   | 2+3+3+2  | 1+3+3+1     | 1+1+1- - - -   | 13+4+4+13     |
| 2+4+4+2   | 2+4+4+2  | 1+5+5+1     | 1+1+1+1- - - - | —             |
| 2+4+4+2   | 2+4+4+2  | 1+3+3+1     | 1+1+1- - - -   | 10+5+5+10     |
| —         | —        | —           | —              | —             |
| 1+5+5+1   | 2+3+3+2  | 1+3+3+1     | 1+1+1- - - -   | 10+5+5+10     |
| —         | —        | —           | —              | —             |
| 11-12+12  | 10-13+13 | 1+6-7+7+1   | 1+3+3+1        | 8-9+16 18+7-8 |
| 1+1+1+1   | 1+1+1+1  | 1+1+1+1     | 1+4+4+1        | 5+9+9+5       |
| 1+1+1+1   | 1+1+1+1  | 1+1+1+1     | 1+2+2+1        | 5+6           |
| 2+3+3+2   | 1+3+3+1  | 1+1+2+2+1+1 | 1+1+1- - - -   | —             |
| 2+4+4+2   | 2+3+3+2  | 1+1+3+3+1+1 | 2+1+2+1- - - - | —             |
| 9+9       | 9+9      | 7+7         | 4+4            | 5+12+8- - -   |
| 14-15+15  | 14-15+15 | 7+7         | 5+5            | 9+16+15+      |

TABLE VI : Dorsal Abdominal Chortotaxy in Females of *Sturnidocerus* Species

| <i>Sturnidocerus</i>             | Pterothorax | II    | III       | IV       | V        |
|----------------------------------|-------------|-------|-----------|----------|----------|
| 16. <i>parvifrons</i> ...        | 10+8 9      | 4+4   | 4+5       | 2+4+4+2  | 2+4+5+2  |
| 17. <i>ovatifrons</i> ...        | 10+10       | 5+5   | 2+5+5+2   | 2-5+5+2  | 2+7+7+2  |
| 18. <i>zophidic</i> ...          | 11-12+12    | 7+7   | 8+8       | 8+8      | 8-9+9    |
| 19. <i>capensis capensis</i> ... | 12+12       | 7-8+7 | 2+6+6+2   | 2+7+8+2  | 2+7+7+2  |
| 20. <i>fragilis</i> ...          | 12+13       | —     | —         | —        | —        |
| 21. <i>offinis</i> ...           | 11-12+12    | 8+8   | 9-10+8-10 | 8+8-9    | 9-10+9   |
| 22. <i>bannoo bannoo</i> ...     | 12+13       | 8+8   | 13+13     | 12+12    | 13+13    |
| 23. <i>bannoo laticephalum</i>   | 10+10       | 6+6   | 7+8       | 9+8      | 9+8      |
| 24. <i>bannoo vitinus</i> ...    | 11+13       | 7+7   | 8-9+8     | 8-9+9-10 | 8-9+9-10 |

Occurring on the Pastors, Starlings and Mynahs (*Sturnidae*)

| VI       | VII     | VIII      | IX             | vulva       |
|----------|---------|-----------|----------------|-------------|
| 2+4+4+2  | 2+3+3+2 | 1-2+2+2+1 | +1+2+1- - - -  | 9+9+5       |
| 2-7+7+2  | 2+7+7+2 | 1+5+5+1   | 3+3            | 10+16+7     |
| 8-9+9    | 7-8+8   | 6-7+6     | 2+1+1+1- - -   | 8+14        |
| 2+6+7+2  | 2+6+6+2 | 1+5+5+1   | 1-2+1+3- - - - | 7+20+9      |
| 8+8      | 6+7     | 5+5       | 4+5            | 16+8        |
| 7-8+8    | 8-9+7-8 | 1+6+6+1   | 1+3+4+1        | 6+13+14+5-6 |
| 9+8      | 9+8     | 1+7+6+1   | 4+5            | 8+15+7-8    |
| 8+8      | 7+8     | 6+6       | 3+3            | 9+14+6-7    |
| 8-9+9-10 | 7-8+8-9 | 1+6+7+1   | 1+1+1+1- - - - | 6+12-13+7-8 |

Table VII : The *Sturnidoecus* Species and their Sturnid Hosts—Pastors, Starlings and Mynahs Sturnidae

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A review of genus *Sturnidoecus*

| <i>Sturnidoecus</i>                     | Sturnidae                                                                                    | Locality<br>(Collection, *Type material)                                                                                                                                                                                                                          |
|-----------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <i>acutifrons</i> sp. nov.           | <i>Sturnia malabarica malabarica</i> (Gmelin)                                                | Nepal *9327 : III. 1937 (male)<br>—————*10614 : III 1937 (male, female)<br>Mysore : 14280-14282 : XI. 1938 (5 males, 5 females, 2 immature females)                                                                                                               |
| 2. <i>affinis</i> (Piaget, 1880)        | <i>Aethiopsar fuscus fuscus</i> (Wagler)<br><br><i>Aethiopsar fuscus javanicus</i> (Cabanis) | Nepal : *3858 : VI. 1935 (male)<br>—————*3858 : VI. 1935 (2 males, 4 females)<br>—————3857 : VI. 1935 (male, 2 female)<br>Hopkins & Clay (1952) : 344                                                                                                             |
| 3. <i>afzali</i> sp. nov.               | <i>Creatophora carunculata</i> (Gmelin)                                                      | Kenya (Isiolo) : *20469 : I. 1956 (male)<br>—————*20469 : I. 1956 (male, female)<br>—————20469 : I. 1956 (male, female)<br>Kenya : 6957 : III. 1936 (male)<br>—————6953-6957 : III. 1936 (6 males, 6 females)<br>—————6953-6957 : III. 1936 (2 males, 11 females) |
| 4. <i>avivorax</i> sp. nov.             | <i>Onychognathus tristamii hadramauticus</i> (Lor & Hellm.)                                  | Aden : *17785 : XI. 1949 (4 males, 5 females)                                                                                                                                                                                                                     |
| 5. <i>bannoo bannoo</i> Ansari, 1955    | <i>Acridotheres ginginianus</i> (Latham)                                                     | Rajputana : *9024 : III 1937 (male)<br>—————9024 : III. 1937 (7 females, 11 females)<br>Lyallpur (Pakistan) : (male, female, numerous immature specimens.)                                                                                                        |
| 6. <i>bannoo avinus</i> ssp. nov.       | <i>Acridotheres tristis tristis</i> (Linn.)                                                  | Nepal *4953 : VII. 1936 (male, female)<br>Rajputana : 8275 : III. 1937 (male)<br>—————8975 : III. 1937 (5 males, 13 females)<br>—————8975 : III. 1937 (7 males, 10 females)<br>also amblyceran females.<br>Lyallpur (Pakistan) : several males and females.       |
| 7. <i>bannoo laticephalum</i> ssp. nov. | <i>Aethiopsar albaeinctus</i> Godwin-Aust & Walden                                           | Moraing (Manipur) *19827 : 2.I.1952 (male, female)                                                                                                                                                                                                                |

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TABLE VII : The *Sturnidoecus* Species and their Sturnid Hosts—Pastors, Starlings and Mynahs (Sturnidae)

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| <i>Sturnidoecus</i>                    | Sturnidae                                                                                         | Locality<br>(Collection : *Type material)                                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8. <i>capensis</i> (Giebel, 1947)      | <i>Sturnus contra superciliaris</i> Blyth<br><i>Sturnus contra contra</i> Linn.                   | Assam : *19894 : 2. II. 1952 (2 males, female)<br>——— 19894 : II. 1952 (4 males, 4 females)<br>Hopkins & Clay (1952) : 344                                                                |
| 9. <i>capensis fragilis</i> ssp. nov.  | <i>Acridotheres tritis melanosternus</i> Legge.                                                   | Ceylon : *3460 : III. 1935 (male)<br>——— 3460 : III. 1935 (2 male, 4 females)<br>——— 3511, IV. 1935 (2 males, female)                                                                     |
| 10. <i>clayae</i> sp. nov.             | <i>Onychognathus moria blythi</i> (Harlaub)                                                       | Somaliland : *18239 : I. 1949 (male, female)<br>——— 18239 : I. 1949 (male, female)<br>——— 18239 : I. 1949 (male, female)<br>——— 18240 : I. 1949 (4 males, 4 female, also amblyceran male) |
| 11. <i>distinguendus</i> sp. nov.      | <i>Lamprotornis purpuropterus</i> Ruppel                                                          | Uganda : *7754 : IV 1936 (male)<br>——— 7754 : IV. 1936 (female)                                                                                                                           |
| 12. <i>eichleri</i> sp. nov.           | <i>Lamprocolius chalybaeus chalybaeus</i> (Hamp & Ehr.)                                           | Kenya : *6668 : III. 1936 (male)<br>——— 6660-6668 : III. 1936 (5 males, 3 females)                                                                                                        |
| 13. <i>husaini husaini</i> sp. nov.    | <i>Buphagus africanus africanus</i> Linn.                                                         | Isiolo (Kenya) : *20442 : I. 1956 (male)<br>——— *20442 : I. 1956 (male, female)<br>——— 20442 : I. 1956 (male, female)<br>Kenya : 18902 : IV. 1949 (male, 2 females)                       |
| 14. <i>husaini prominens</i> ssp. nov. | <i>Buphagus erythrorhynchus erythrorhynchus</i> (Stenley)                                         | Kenya : *6646-6930 : II. 1936 (male, 4 females)<br>Somaliland : 18524 : II. 1949 (6 males, 6 females)                                                                                     |
| 15. <i>meinertzhageni</i> sp. nov.     | <i>Lamprocolius splendidus splendidus</i> (Vielot)<br><i>Lamprocolius s. ballundensis</i> Neumann | Ndikinimeki (Cameron) : *V. Aellen No. 486 : 12. IV. 1947 (male, female)<br>Uganda : 7644 : IV. 1936 (male)<br>N.W. Rhodesia : 13331 : 1939 (male, female)<br>13331 : 1939 (female)       |
| 16. <i>opeca</i> sp. nov.              | <i>Speculipaster bicolor</i>                                                                      | Kenya : *6925 : III 1936 (male)<br>*6925 : III. 1936 (male, 6 females)                                                                                                                    |

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Table VII : The *Sturnidoecus* Species and Their Sturnid Hosts—Pastors  
Starlings and Mynahs (Sturnidae)

| <i>Sturnidoecus</i>                    | Sturnidae                                                                                                                      | Locality (Collection : *Type material)                                                                                                                                                                                                                                            |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17. <i>parvifrons</i> sp. nov.         | <i>Lamprotornis meuesii</i> Vahlberg                                                                                           | *Gotomwe, SR(H.E. Peterson) :<br>Brit. Mus. 1955-660 : 18. VII 1954<br>(male, female)<br>Bechuanaland (Debeete) : 26. VII. 1956<br>(77) (male,<br>headless female)<br>—————(male) 30 XII. 1954 (2 males,<br>female)<br>Bechuanaland (Maun) F. Zumpt Coll<br>(Brit. Mus. 1955-457) |
| 18. <i>pastoris</i> (Denny, 1842)      | <i>Pastor roseus</i> (Linn.)                                                                                                   | Deccan : 8832 : II. 1937 (male)<br>.....8828-8832 : II 1937 (male, female)<br>.....8828-8832 : II 1937 (2 males,<br>2 females)<br>———8828-8832 : II 1937 (9 males,<br>10 females)<br>Lyallpur (Pakistan) : numerous males,<br>females, immature<br>specimens.                     |
| 19. <i>quadrilineatus</i> Nitzsch 1886 | <i>Aegithalos caudatus</i> (Linn.)                                                                                             | Hopkins & Clay (1952) : 345 (Generic<br>position<br>doubtful)                                                                                                                                                                                                                     |
| 20. <i>senegalensis</i> (Rudow, 1869)  | <i>Lamprocolius nitens nitens</i> Linn.<br><i>Lamprocolius nitens potchefstroom</i>                                            | Hopkins & Clay (1952) : 345<br>W. Transvaal : 1954-474 : 27.XII.1952<br>(male)<br>————— 1954-474 : 27.XII, 1952<br>(male)                                                                                                                                                         |
| 21. <i>sturni</i> (Schränk, 1776)      | <i>Sturnus vulgaris vulgaris</i> Linn.<br><i>Sturnus vulgaris humii</i> Brooks<br><br><i>Sturnus vulgaris zetlandi</i> Hartert | Lines : *8149 : XII. 1936 (2 males) :<br>Neoparatype<br>Norfolk : 764 : IV. 1934 (10 males,<br>16 females)<br>Lyallpur (Pakistan) : numerous specimens<br>Shetland : 13573-6 : VIII. 1939 (6 males,<br>10 females)                                                                |
| 22. <i>subacutus</i> (Piaget, 1880).   | <i>Lamprotornis</i> sp. [? <i>australis</i><br>(Smith)]                                                                        | Hopkins & Clay (1952) 345.                                                                                                                                                                                                                                                        |
| 23. <i>theresae</i> sp. nov.           | <i>Spreo superbus</i> (Ruppel)                                                                                                 | Somaliland : *18671 : II. 1949 (5 males,<br>7 females)                                                                                                                                                                                                                            |

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Table VII : The *Sturnidoecus* Species and Their Sturnid Hosts—Pastors  
Starlings and Mynahs (Sturnidae)

| <i>Sturnidoecus</i>                   | Sturnidae                                                      | Locality (Collection : *Type material)                                                                                                              |
|---------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 24. <i>zahrae zahrae</i> sp. nov.     | <i>Onychognathus moria shelleyi</i><br>(Hartert)               | Kenya : *7443 : III. 1936 (male)<br>*7443 : III. 1936 (2 males,<br>4 females)                                                                       |
| 25. <i>zahrae illustris</i> ssp. nov. | <i>Onychognathus tenuirostris ray-<br/>mondi</i> Meinertzhagen | Kenya : *6577 : II. 1936 (male)<br>.....*6577 : II. 1936 (3 males,<br>4 females)<br>.....7510-7515 : III. 1936 (2 males<br>12 females)              |
| 26. <i>zoophilic</i> sp. nov.         | <i>Sturnopastor sinensis sinensis</i><br>(Gmelin)              | Nepal : *9253 : III. 1937 (2 males)<br>Bihar (India) : 9253 : III. 1937 (9 males,<br>13 females)<br>..... 9253 : III. 1937 (7 males,<br>11 females) |

TABLE VIII

The List of Hosts (Sturnidae) with the *Sturnidoecus* Species Occurring on them

| Host (Sturnidae)                                                     | Locality                       | <i>Sturnidoecus</i>                   |
|----------------------------------------------------------------------|--------------------------------|---------------------------------------|
| 1. <i>Acridotheres tristis melanosternus</i> Legge                   | Ceylon                         | <i>capensis fragilis</i> ssp. nov.    |
| 2. <i>Acridotheres tristis tristis</i> (Linn.)                       | Rajputana, Nepal,<br>Lyallpur. | <i>bannoo avinus</i> ssp. nov.        |
| 3. <i>Acridotheres ginginianus</i> (Latham)                          | Rajputana, Lyallpur            | <i>bannoo bannoo</i> Ansari.          |
| 4. <i>Aethiopsar albacinctus</i> Godwin-Aust. & Walden               | Manipur                        | <i>bannoo laticephalus</i> ssp. nov.  |
| 5. <i>Aethiopsar fuscus fuscus</i> (Wagler) ( <i>Acridotheres</i> )  | Nepal                          | <i>affinis</i> (Piaget, 1880)         |
| 6. <i>Aethiopsar fuscus javanicus</i> Cabins ( <i>Acridotheres</i> ) | ...                            | <i>affinis</i> (Piaget, 1880)         |
| 7. <i>Aegithalos caudatus</i>                                        | ...                            | <i>quadrilineatus</i> (Nitzsch, 1866) |

|                                                              |     |                   |     |                                    |
|--------------------------------------------------------------|-----|-------------------|-----|------------------------------------|
| 8. <i>Buphagus africanus africanus</i> Linn                  | ... | Kenya             | ... | <i>husaini</i> sp. nov.            |
| 9. <i>Buphagus erythrorhynchus erythrorhynchus</i> (Stanley) | ... | Somaliland, Kenya | ... | <i>husaini prominens</i> ssp. nov. |
| 10. <i>Creatophora carunculata</i> (Gmelin)                  | ... | Kenya             | ... | <i>afzali</i> sp. nov.             |
| 11. <i>Lamprocolius chalybaeus chalybaeus</i> (Hemp. & Ehr.) | ... | Kenya             | ... | <i>eichleri</i> sp. nov.           |
| 12. <i>Lamprocolius nitens</i> (Linn.)                       | ... | W. Transvaal      | ... | <i>senegalensis</i> (Rudow, 1869)  |
| 13. <i>Lamprocolius splendidus bailundensis</i> Neumann...   | ... | N. W. Rhodesia    | ... | <i>meinertzhageni</i> sp. nov.     |
| 14. <i>Lamprocolius splendidus splendidus</i> (Vicillot)     | ... | Uganda            | ... | <i>meinertzhageni</i> sp. nov.     |
| 15. <i>Lamprotornis meuesii</i> Vahlberg                     | ... | Bechuanaland      | ... | <i>parvifrons</i> sp. nov.         |
| 16. <i>Lamprotornis purpuropterus</i> Ruppell                | ... | Uganda            | ... | <i>distinguendus</i> sp. nov.      |

TABLE VIII

The List of Hosts (Sturnidae) with the *Sturnidoecus* Species Occurring on them

| Host (Sturnidae)                                                | Locality         | <i>Sturnidoecus</i>               |
|-----------------------------------------------------------------|------------------|-----------------------------------|
| 17. <i>Lamprotornis</i> sp. [ ? <i>australis</i> (Smith)]       | ...              | <i>subacutus</i> (Piaget, 1880).  |
| 18. <i>Onychognathus tenuirostris raymondi</i> Meinertzhagen.   | Kenya            | <i>zahrae illustris</i> ssp. nov. |
| 19. <i>Onychognathus moria blythi</i> (Harlaub)                 | Somaliland       | <i>clayae</i> sp. nov.            |
| 20. <i>Onychognathus moria shelleyi</i> (Hartart)               | Kenya            | <i>zahrae</i> sp. nov.            |
| 21. <i>Onychognathus tristamii hadramauticus</i> (Lor. & Hellm) | Aden             | <i>avorax</i> sp. nov.            |
| 22. <i>Pastor roseus</i> (Linn.)                                | Deccan, Lyallpur | <i>pastoris</i> (Denny, 1842)     |
| 23. <i>Speculipaster bicolor</i>                                | Kenya            | <i>opeca</i> sp. nov.             |

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|                                                     |     |                  |     |                                 |
|-----------------------------------------------------|-----|------------------|-----|---------------------------------|
| 24. <i>Spreo superbus</i> (Ruppell)                 | ... | Somaliland       | ... | <i>theresae</i> sp. nov.        |
| 25. <i>Sturnia malabarica malabarica</i> (Gmellin)  | ... | Nepal, Mysore    | ... | <i>acutifrons</i> sp. nov.      |
| 26. <i>Sturnus contra contra</i> (Linn.)            | ... | ...              | ... | <i>capensis</i> (Giebel, 1874). |
| 27. <i>Sturnus contra superciliaris</i> Blyth       | ... | Assam            | ... | <i>capensis</i> (Giebel, 1874). |
| 28. <i>Sturnus vulgaris humii</i> Brooks            | ... | Lyallpur, Lahore | ... | <i>sturni</i> (Schrank, 1776).  |
| 29. <i>Sturnus vulgaris vulgaris</i> (Linn)         | ... | Norfolk          | ... | <i>sturni</i> (Schrank, 1776).  |
| 30. <i>Sturnus vulgaris zetlandi</i> Hartert        | ... | Shetland         | ... | <i>sturni</i> (Schrank, 1776).  |
| 31. <i>Sturnopastor sinensis sinensis</i> (Gmelin), | ... | Nepal            | ... | <i>zoophilic</i> sp. nov.       |

# PROMISCUITY AND VENEREAL DISEASE

BY

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## INTRODUCTION

Despite the availability of many potent therapeutic agents, Venereal Disease has somehow resisted every sorts of available control measures and thus till now constitutes a challenge to the social and medical administrations. The number of new cases, most particularly of gonorrhoea, after some decline has remained either static or has increased substantially throughout the globe. It has been noted that in the American, Asian and European countries though there was a steady decline in the reported incidence of syphilis, the incidence of gonorrhoea has never declined; and in the African countries there was a steepening rise of gonorrhoea and no decline of syphilis (Guthe, 1961). In as far as Venereal Disease has ranked first to third among reported notifiable diseases, being exceeded only by largely childhood diseases, even though due to introduction of modern public health measures many infectious diseases can be controlled in a consistent way, having many of them virtually been eliminated from sophisticated communities. It should be appreciated that the statistical picture of venereal disease is full of inaccuracies, and thus well biased. The reported number of cases is highly incomplete though it shows the trend but may represents as low as one-hundredth of the true incidence. Moreover, as for gonorrhoea, there lies large undetectable 'reservoir' of infection which might have been possible due to disappearance of traumatic treatment or perhaps due to less virulent strains or organism which render many a people relatively symptomless, particularly the women, coupled with our complete failure for improving the diagnostic techniques. Nevertheless, it is apparent that there has been a global failure to control the infection, and venereal disease as a live problem of the people has, in fact, never been reduced. Many factors have been shown for such failure though nothing is conclusive to our present state of knowledge. Apart from numerous technical drawbacks thus elucidated, it is, however, almost universally accepted that the increasing trend of promiscuity is in some way mainly responsible for such failure; and in this communication I have tried to emphasise the factors responsible for this problem, its association

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with venereal disease, and probable sociological hints which might be of some value in limiting the extent of promiscuity.

Although the references to the venereal disease are scarce in classical literatures, evidently the infection existed during antiquity and the prevalence of the disease was always perhaps at highest peak due to infectious nature of the disease, absence of adequate therapy and as anthropologists revealed, complete freedom of random sexual activities. It is, however, surprising that after all these milestones of human civilisation and sociological evolutions, we are perhaps no way better of than the people of antiquity, particularly as regard to the sex. People were promiscuous then due to the primitive social and religious customs, whereas the world now experiencing perhaps similar extent of promiscuity encouraged by the leniency of both society and state. It has been noted that the level of promiscuity, which is the main factor of sexual infection is highly correlated with the incidence of venereal disease and, therefore, lat has been claimed to be a problem of the former than the prostitution (British Social Biology Group, 1955) though it is traditional to blame them for the spread of the infection. Since both of these can act as index for one another Simmons et al. (1944) expected to find a very high rate of venereal disease among the native women of Australia as the aborigines there were promiscuous or in other words, the spread of venereal infection invariably depends upon the extent of promiscuity (O. H. E., 1963).

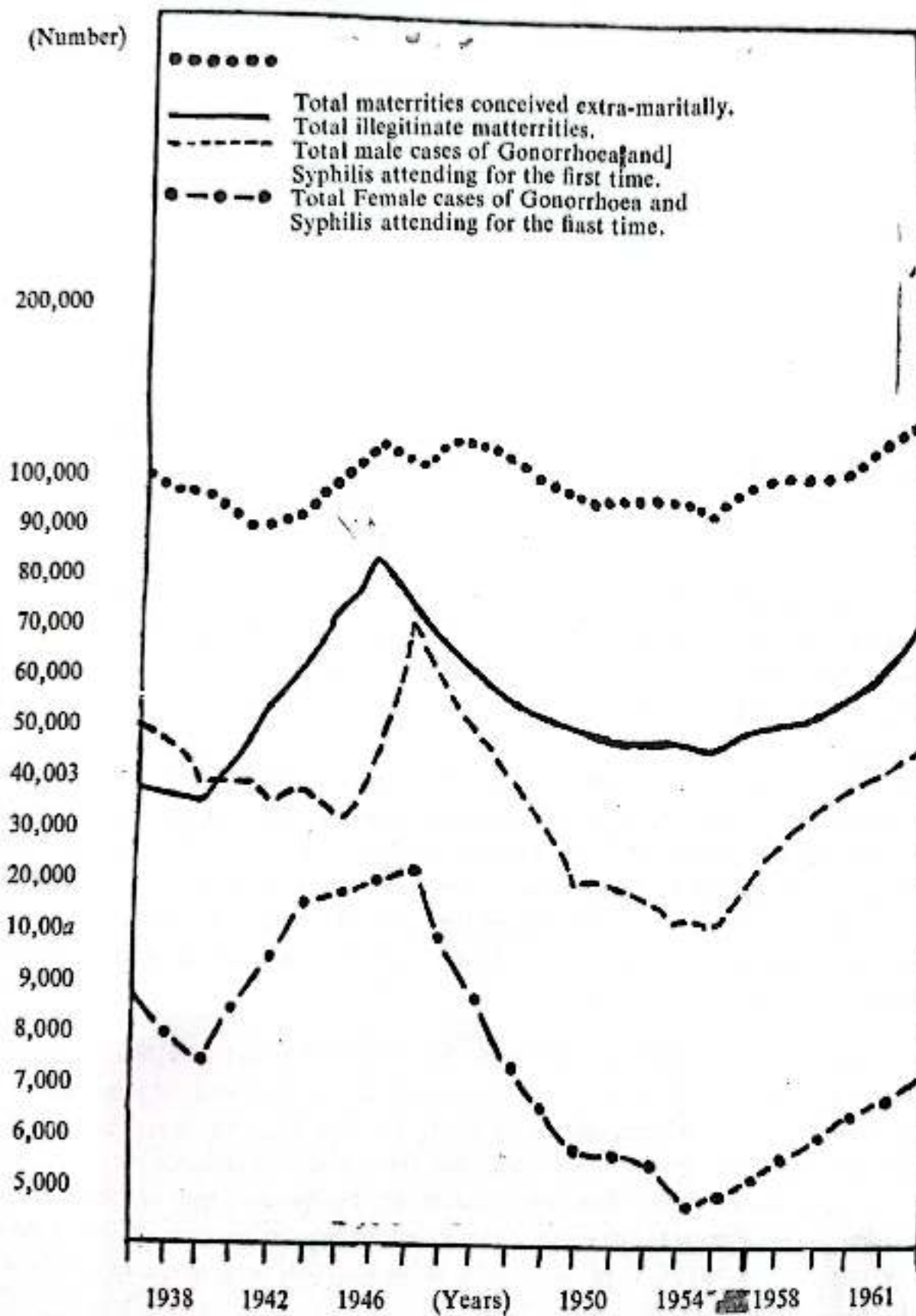
The reference to promiscuity in terms of indiscriminate sexual activities is not infrequent from the past, considering its modern evolution and aggressive nature various definitions (King, 1963; Wittkower & Cowan, 1944) recently have been successfully been tried to fit in loosely to limit the extent of it. Whatever definitions, however, may be used it can simply be said that promiscuity is a pattern, whereas prostitution is an institution. Thus it is a catastrophe both from social and medical point of views.

#### **Problems with Statistics.**

Despite the availability of techniques for mechanically processing data there lies enormous problems and snags as for the statistics coupled with over or under-reporting.

Figure 1 shows a remarkable association between the trends of maternities conceived extra-maritally, illegitimate maternities, and total number of reported male and female gonorrhoea and syphilis cases of England & Wales (Ministry of

**FIGURE 1** Total Attendances of Cases for Gonorrhoea and Syphilis, by age, and total Maternities Conceived extra-maritally, and total Illegitimate Maternities England and Wales, 1951—1961.



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Health, 1951 & 1964; Registrar General, 1959 & 1964). These are, however, far from perfect measures of the extent of sexual activity and full of serious limitations; or in other words, there is no real means of judging the extent of promiscuity which has necessitated to fall back on such indirect indices as illegitimate, extra-maritally and pre-maritally conceived maternities though each has its own limitations and pitfalls. All these indices can only show the trend of conceptions but by no way the frequency of sexual activities. Moreover, all these maternities depend upon numerous factors including that of fertility, knowledge of contraceptive techniques, abortion and false statement and registration the extent of which is not at all known to anybody. If we consider abortion alone other than therapeutic and natural, it has recently been estimated from England & Wales that there occur about 50,000 criminal abortions every year (British Medical Association Report, 1964). It can, therefore, be appreciated that any of these measures or all are far from accuracies. Nevertheless, as they are the manifestations of promiscuity, they provide a useful indication of the trend, which further acts as an index for venereal infection (King, 1963).

#### **Magnitude of problem**

Despite the availability of any data in terms of accuracies, it is generally accepted that promiscuity has become commoner and widespread. It has been noted from Jamaica (Goldberg & Southerland, 1963) that of 155 or 59.2 per cent of a series of 262 gonorrhoeal cases had sexual relationships with but only one female during a period of four weeks. It has also been noted that during the previous six months period the mean number of sexual partners were 2.97 and the younger group had more sexual partners than the older group. Similarly as quoted in the British Medical Journal (leading article, 1967) in a series of young people, Schofield found that 34 per cent of the boys and 17 per cent of the girls were sexually experienced by the age of 18, the number of partners as admitted were 6.2 and 2.3, respectively. Their such findings are sufficient to warrant the magnitude of the problem.

In 1954, the Registrar General's Report for England and Wales showed that there was one illegitimate birth in every 20 of all births, the incidence of which since 1955 has been shown in Table I. But when we compare the same with the legitimate births, it is seen that the number of illegitimate births has risen much more rapidly than the number of legitimate. And in Table II an attempt has been made to show the comparative change in number of illegitimate live births. Behind all these increasing incidences only one reason can be shown of increasing promiscuity (Platts, 1964).

TABLE 1

Illegitimate Live Births as a Per centage of Total Live Births, England and Wales, and London, 1955—1962.\*

| Year | England & Wales | Administrative County of London |
|------|-----------------|---------------------------------|
| 1955 | 4.6 per cent    | 7.7 per cent                    |
| 1956 | 4.8 „ „         | 8.5 „ „                         |
| 1957 | 4.8 „ „         | 8.9 „ „                         |
| 1958 | 4.9 „ „         | 9.9 „ „                         |
| 1959 | 5.1 „ „         | 10.4 „ „                        |
| 1960 | 5.4 „ „         | 11.4 „ „                        |
| 1961 | 5.3 „ „         | 12.7 „ „                        |
| 1962 | 6.6 „ „         | 14.1 „ „                        |

\*Reproduced from British Medical Association Report, 1964.

I must stress here that this is, however, not the situation of England & Wales alone though as for the availability of data and more particularly, for convenience I am quoting England & Wales as for example exclusively merely to illustrate the situation. In other parts of the world, similar ever increasing trends will be noted in greater or lesser extent.

That's why Newsholme (B. S. H., 1926) commented: 'If the teaching of history to have weight, it must be accepted that promiscuity in the sense of casual sexual congress is the chief enemy of the social disorder, as well as the main source of great scourage of humanity, syphilis and gonorrhoea.'

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TABLE II

Change in Number of Illegitimate Live Births, England and Wales, 1951-1962.\*

| Year | Illegitimate live births | Per cent change since previous year | Ratio to 1955 (1955 = 1,000) |
|------|--------------------------|-------------------------------------|------------------------------|
| 1951 | 32,771                   | - 7.0                               | 1052                         |
| 1952 | 32,549                   | - 0.7                               | 1045                         |
| 1953 | 32,503                   | - 0.1                               | 1044                         |
| 1954 | 31,609                   | - 2.8                               | 1015                         |
| 1955 | 31,145                   | - 1.5                               | 1000                         |
| 1956 | 33,534                   | + 7.7                               | 1077                         |
| 1957 | 34,562                   | + 3.1                               | 1110                         |
| 1958 | 36,174                   | + 4.7                               | 1161                         |
| 1959 | 38,161                   | + 5.5                               | 1225                         |
| 1960 | 42,707                   | + 11.9                              | 1371                         |
| 1961 | 48,490                   | + 13.5                              | 1557                         |
| 1962 | 55,376                   | + 14.2                              | 1778                         |

\*Reproduced from Registrar General, 1965.

**Responsible factors for Promiscuity and Venereal Disease.**

The promiscuity may be habitual or occasional but the potentiality of it later is hard to assess as a disseminating factor for the spread of infection. It, however, depends upon their frequency of activities and on the group and their consort, though it is a common belief that they often escape venereal infection. Habitual promiscuous group, on the other hand, is most dangerous and a potential source of spreading the infection very rapidly throughout the community. Habitual promiscuity being a reactive phenomenon related to frustration early in life is a compulsive repetitive of their demands. Promiscuity also follows due to some psychological factors, certain type of glamour, for

certain amount of over-familiarity of treating sex and sexual relation as an easy-come easy-go basis like any other function of the body (B. S. H., 1926). Moreover, prolong separation from one reason or other, or absence of fixed or permanent partners have some diverse influence on many people, which is, however, more marked among the single who also fail to enter the home-making group which has profound sexual implications. Numerous studies (Beveridge, 1964; Haro & Patiala, 1957; King & Wisdom, 1960) have shown that the incidence of venereal disease is many times higher among the single than those who have fixed or permanent partners. In a series of Gonorrhoea cases, Goldberg & Sutherland (1963) found that single group (252) has greatly outnumbered the married group (19); and Goldsteir (1957) from the United States found that of 155 teenaged girls suffering from gonorrhoea 135 (87 per cent) were unmarried. In England, of 100 cases (series consist of married group and all other group having no permanent or fixed consort) MacFarlane & Johns (1958) found that gonorrhoea was present only in 3 cases in the married group with marital contact and 9 cases in all other group with regular consort. But there were 27 cases in married group with extra-marital contact and 61 in all other group with casual contact.

This, however, does not establish that married people are less promiscuous. Various factors may involve there too including the presence of habitual promiscuity, reluctant attitude of the society, sexual antagonism in terms of physiological demand of one, slakening of marriage bonds; or the promiscuity may follow seeing the infidelity of another partner. Thus, the incidence of venereal disease is not so limited among them, rather in some countries, for example, Finland (Haro & Patiala, 1961), it is considerably causing another problem. In Army Wittkower & Cowan (1914) found the percentage for their V. D. patients as 52.5 for married and 47.5 for single. How far marital infidelity concern, of 105 married soldiers they found that there were 52 persons who were engaged in promiscuous acts before the act which led them to V. D. and 53 acquired the infection during their first promiscuous act. And for the influence of army life, they also found that of 200 V. D. patients 38.5 per cent were habitually promiscuous, 29.5 per cent were occasionally promiscuous before joining the army and 32 per cent were promiscuous since joining the army. The observations on seafarers also show that they are equally promiscuous, particularly the married, due to prolong separation from their regular 'consorts. The behaviour of the immigrants and migrants similarly follow the same pattern.

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It is evident that habitual promiscuity has become more widespread than before, particularly among the present young generation who lack the discipline, care, sympathy and fellow-feelings in the diverse circumstances of their daily life often due to broken or disabled background of home and independent parental guidance coupled with lack of constructive leisure. How far the delinquency among them is concern, it is uncertain whether this is due to ignorance or recklessness. This group of people, particularly of aged 13 to 15, is increasingly becoming a problem in many countries presenting a substantial quota to the total reported number of venereal disease cases and should be regarded as a pattern of social disorder which includes increasing illegitimacy, parenthood at relatively young age, increasing juvenile offences, etc.

TABLE III

**Illegitimate Maternities, 11 to 16 Years Old, England & Wales,  
1956-1961\***

| Year | Female Population<br>aged 11-16 years<br>(in thousands) | Age of Mothers at Maternity in Years |     |    |     |     |       |       |
|------|---------------------------------------------------------|--------------------------------------|-----|----|-----|-----|-------|-------|
|      |                                                         | 11                                   | 12  | 13 | 14  | 15  | 16    | Total |
| 1956 | 1,768                                                   | ...                                  | ... | 5  | 55  | 204 | 623   | 887   |
| 1957 | 1,817                                                   | ...                                  | 2   | 9  | 45  | 241 | 627   | 924   |
| 1958 | 1,975                                                   | 1                                    | 1   | 10 | 62  | 305 | 753   | 1,132 |
| 1959 | 2,069                                                   | ...                                  | 4   | 10 | 79  | 392 | 953   | 1,438 |
| 1960 | 2,111                                                   | ...                                  | ... | 15 | 96  | 593 | 1,211 | 1,922 |
| 1961 | 2,117                                                   | ...                                  | ... | 25 | 133 | 728 | 1,650 | 2,534 |

\*Reproduced from British Medical Association Report, 1964.

Through the nutritional improvements and public health developments, the revolution in child health is illustrated by the earlier maturity of young people today which is advancing steadily by about five months per decade. The teenagers are now mature at an earlier age and develop adult instinct without

the maturity of mind and character (King, 1963). About the sexual socialisation it has been seen from Jamaica (Goldberg and Sutherland, 1963) that the mean age of first coitus was 14 years which vary from 6 to 21 years, and thus reflects how sexually active all these young people are. The girls are not only contributing substantially to the total number of illegitimate births but a good proportion of them are now already pregnant at the time of marriage. Briggs et al. (1962) from Los Angeles found that during the period of 1951 to 1960 there were 954 females delivered at home of which 204 (21%) unmarried mothers were 16 years old and younger; again of which 88 girls of 16 years, 77 of 15, 26 of 14, 7 of 13, and 3 of 12 years old were primiparous. Table III shows similar sexually active teenagers in England & Wales (illegitimate maternities only) which show a persistent increase. In England & Wales, there were 33,088

TABLE IV

Comparative Change In Illegitimate Live Births, By Age-Group, Per 1,000  
At All Ages, England & Wales, 1952 & 1961\*

| Year | Age of Mothers at birth |          |      |      |      |      |      |             |
|------|-------------------------|----------|------|------|------|------|------|-------------|
|      | All ages                | Under 20 | 20 - | 25 - | 30 - | 35 - | 40 - | 45 and over |
| 1952 | 1,000                   | 157      | 294  | 227  | 171  | 107  | 40   | 3           |
| 1961 | 1,000                   | 245      | 319  | 192  | 128  | 82   | 31   | 2           |

\*Adapted from Registrar General, 1964.

illegitimate maternities in 1952 which jumped to 48,490 in 1961. Table IV shows this comparison with age distribution and illustrate that though the incidence has decreased among the mothers 25 years old and over, the incidence has almost doubled particularly among the mothers under 20 years old. Whereas if we measure the illegitimate maternity rates since 1952 to 1961 (Table V), not only there will be noted enormous increasing rate among all the age-groups, the increase is almost double in all ages under 35 years to the corresponding rate for 1952.

In 1961, over half of the illegitimate maternities in England & Wales were of young women under 25 years of age, nearly a quarter being under 20 years; and of all maternities one birth in five was illegitimate to mothers under twenty.

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TABLE V  
Ratio of Illegitimate Maternity Rate To That Of 1952 Taken As 1,000,  
England & Wales, 1952 to 1961.

| Year | Age of Maternity |       |       |       |       |       | All ages<br>under<br>45 |
|------|------------------|-------|-------|-------|-------|-------|-------------------------|
|      | Under 20         | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 |                         |
| 1952 | 1,000            | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000                   |
| 1953 | 1,032            | 1,053 | 1,005 | 1,065 | 1,008 | 1,027 | 1,024                   |
| 1954 | 1,035            | 1,093 | 998   | 1,031 | 1,027 | 1,045 | 1,017                   |
| 1955 | 1,060            | 1,101 | 1,066 | 1,044 | 1,051 | 1,081 | 1,028                   |
| 1956 | 1,222            | 1,236 | 1,202 | 1,194 | 1,173 | 1,151 | 1,146                   |
| 1957 | 1,317            | 1,316 | 1,295 | 1,277 | 1,259 | 1,164 | 1,211                   |
| 1958 | 1,394            | 1,446 | 1,427 | 1,375 | 1,275 | 1,273 | 1,288                   |
| 1959 | 1,481            | 1,549 | 1,591 | 1,436 | 1,286 | 1,331 | 1,358                   |
| 1960 | 1,733            | 1,750 | 1,794 | 1,388 | 1,388 | 1,581 | 1,511                   |
| 1961 | 2,045            | 2,054 | 2,105 | 1,971 | 1,617 | 1,662 | 1,716                   |

\* Adapted from Registrar General, 1964.

In many prosperous societies now late marriage is in practice even when the people are maturing at a comparatively earlier age, and such delays intervening between marriage and sexual maturity may bring some more curiosity and experimentation of sex in many people. This in turn may lead themselves to what the moralists call, 'moral degradation'.

The association of such sexual activities can easily be illustrated from numerous investigations. In the United States (Joint Statement), one of every 250 teenage population was infected with gonorrhoea in 1966 which alone creates another major social problem as the actual incidence of the disease may be at least four times than the number reported. The incidence of infectious syphilis among them continued to increase at a faster rate and has increased by 12.4

per cent although the national figure remained almost constant in 1964 and 1965. Table VI shows the reported incidence of primary and secondary syphilis and gonorrhoea by age-group.

In England & Wales, British Co-operative Clinical Group (1960) undertook an investigation and noted that there has been an increasing number of gonorrhoea cases among teenagers, (Table VII). They also found similar increasing trend during the later surveys in 1960, 1961 and 1962 (British Co-operative Clinical Group, 1962, 1963).

TABLE VI.

In fectionous Venereal Disease By Disease And Age,  
United States, 1956 to 1965.\*

| Diagnosis         | Year | Age-Group in years. |       |        |         |         |
|-------------------|------|---------------------|-------|--------|---------|---------|
|                   |      | 0-9                 | 10-14 | 15-19  | 20-24   | Over 24 |
| <i>Gonorrhoea</i> | 1956 | 1,222               | 2,425 | 44,264 | 74,755  | 102,017 |
|                   | 1957 | 1,628               | 2,363 | 43,705 | 70,777  | 96,399  |
|                   | 1958 | 1,164               | 2,706 | 48,723 | 76,964  | 103,261 |
|                   | 1959 | 1,328               | 2,600 | 50,324 | 81,076  | 104,926 |
|                   | 1960 | 1,619               | 3,261 | 53,649 | 87,823  | 112,581 |
|                   | 1961 | 1,615               | 2,567 | 52,131 | 90,686  | 117,159 |
|                   | 1962 | 1,459               | 2,422 | 51,679 | 91,588  | 116,566 |
|                   | 1963 | 1,634               | 2,414 | 54,509 | 98,541  | 121,191 |
|                   | 1964 | 1,913               | 2,691 | 61,066 | 105,807 | 129,477 |
|                   | 1965 | 1,724               | 2,801 | 66,947 | 114,945 | 138,508 |

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| Diagnosis                        | Year | Age-Group in years |       |       |       |         |
|----------------------------------|------|--------------------|-------|-------|-------|---------|
|                                  |      | 0-9                | 10-14 | 15-19 | 20-24 | Over 24 |
| Primary<br>Secondary<br>Syphilis | 1965 | 36                 | 245   | 4,039 | 6,575 | 12,443  |
|                                  | 1964 | 43                 | 249   | 3,595 | 6,455 | 12,622  |
|                                  | 1963 | 40                 | 233   | 3,438 | 6,332 | 12,203  |
|                                  | 1962 | 40                 | 225   | 3,587 | 6,063 | 11,155  |
|                                  | 1961 | 35                 | 210   | 3,215 | 5,575 | 10,810  |
|                                  | 1960 | 20                 | 139   | 2,577 | 4,692 | 8,711   |
|                                  | 1959 | 39                 | 109   | 1,668 | 2,779 | 5,205   |
|                                  | 1958 | 23                 | 90    | 1,228 | 2,005 | 3,833   |
|                                  | 1957 | 33                 | 80    | 1,192 | 1,857 | 3,422   |
|                                  | 1956 | 11                 | 75    | 1,093 | 1,778 | 3,433   |

\*Adapted from Joint Statement, January, 1967.

In Copenhagen, 16.1 per cent of all females infected with gonorrhoea were teenagers in 1943 which has been increased to 37.9 per cent in 1962, and in 1963 there were 713 teenagers infected with gonorrhoea alone. That's why Ekstrøm (1966) made a socio-psychiatric study on the teenagers, average aged 18 years and found that most of them had a poor social background and many were of poor intellect with a history of behaviour disturbance. It is also equally wonder to note that of such very small sample of 63 females and 37 males, Ekstrøm found 24 females were prostitutes, 15 were semi-prostitute, 27 had been pregnant, and 2 females and 6 males were homosexuals.

TABLE VII

Number of Cases of Gonorrhoea by Age and Sex,  
England & Wales, 1957 & 1958.

| Sex          |              | Male |       | Female |       |
|--------------|--------------|------|-------|--------|-------|
| year         |              | 1957 | 1958  | 1957   | 1958  |
| Age in years | 12 and under | ...  | 5     | 22     | 41    |
|              | 13           | ...  | ...   | ...    | 2     |
|              | 14           | ...  | 4     | 6      | 6     |
|              | 15           | 10   | 8     | 30     | 24    |
|              | 16           | 36   | 44    | 86     | 98    |
|              | 17           | 131  | 119   | 184    | 179   |
|              | 18           | 260  | 342   | 308    | 361   |
|              | 19           | 391  | 545   | 331    | 456   |
| Total        |              | 828  | 1,067 | 967    | 1,167 |

It is also equally disappointing to note an increasing trend both of promiscuity and venereal disease among the students even of university status, and it has been observed that the sexual promiscuity and venereal disease have increased sharply among the undergraduates of British universities (Leading article, 1967) over the past five years. In one English university it has been seen that the number of known pregnancies among the unmarried female students has increased nearly by five times from 1962-63 to 1964-65 and thus almost

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one woman in 10 became pregnant before completing her studies. So there was a parallel increase in venereal disease including that of genito-urinary complaints and other gynaecological disorders. Similar increase has been noted from another English university too, and it has been seen that in many cases there was evidence of a neurotic wish to be pregnant and in some a compulsive desire to be pregnant for pregnancies sake. From Sheffield, Morton (1966) has also experienced a double fold increase of the number of students attending a special clinic there from 1961 to 1965. For such increased promiscuity and venereal disease cases among the students he has postulated the reason might be due to the result as in recent years the universities and colleges are drawing students from an increasingly sexually experienced teenage population.

#### Pre-marital and Extra-marital Conceptions And Affairs

Pre- and extra-marital conceptions can also be used as indices to measure the extent of promiscuity though such measures also have the usual limitations, drawbacks and inaccuracies, mentioned before.

TABLE VIII.

Extra-maritally Conceived Maternities per 1,000 Unmarried Women at Risk, England & Wales, 1938 and 1952--1961.\*

| Age of Mother (Yrs.) | Year |                   |      |      |      |      |      |      |
|----------------------|------|-------------------|------|------|------|------|------|------|
|                      | 1938 | 1952—1955 Average | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 |
| 15—                  | 11.8 | 15.7              | 19.0 | 20.2 | 21.2 | 21.7 | 24.0 | 27.0 |
| 20—                  | 32.6 | 42.8              | 48.3 | 50.2 | 52.1 | 54.1 | 58.0 | 63.0 |
| 25—                  | 24.5 | 37.8              | 43.3 | 47.0 | 49.4 | 53.2 | 59.2 | 66.0 |
| 30—                  | 15.1 | 30.8              | 34.2 | 36.7 | 37.8 | 40.8 | 46.0 | 52.0 |
| 35—                  | 10.4 | 18.2              | 20.4 | 21.9 | 21.9 | 22.1 | 24.1 | 26.0 |
| 40—                  | 4.3  | 6.2               | 6.8  | 7.1  | 7.4  | 8.0  | 9.6  | 10.0 |
| 15—44                | 18.6 | 25.5              | 28.9 | 30.4 | 31.5 | 32.7 | 35.5 | 39.0 |
| Ratio to 1938        |      |                   |      |      |      |      |      |      |
| Crude                | 1.00 | 1.37              | 1.55 | 1.63 | 1.69 | 1.76 | 1.91 | 2.10 |
| Standardised by age. | 1.00 | 1.42              | 1.63 | 1.72 | 1.79 | 1.85 | 2.03 | 2.23 |

\*Reproduced from Registrar General, 1964.

About the American males Kinsey Report (Ernst & Loth, 1949) mentioned that married men under 20 years old derive 10.8 per cent of their extra-marital intercourse from the prostitution. The percentage rises to 17.6 between the ages of 30 and 35, to 22.3 after the age of 55. In England & Wales (British Medical Association Report, 1964), 2 out of every 3 babies born to girls under 20 years old during 1948 to 1961 were conceived out of Wedlock, and the Chesser Report (Chesser, 1958) described that in Great Britain approximately 2 out of 5 women before marriage and one of every four single women had sexual intercourse. Some of them may find more satisfaction in an 'illicit' relationship for which there exist the risk of aggressive promiscuousness in some proportion of them even after marriage. Another smaller survey in 1951 about the sexual behaviour of the British working classes showed that about 50 per cent of the women and 64 per cent of the men had had 'affairs' prior to marriage (Walker & Fletcher, 1955). The risk of conceiving maternities extra-maritally in England & Wales has been shown in Table VIII, which, is increasing progressively among all age-group.

Illegitimacy, however, does not cause any nuisance to the society and the societies too show an equal reluctant attitude. In as far as the state also looks with a kindly eye on the unmarried mothers as for the social security presenting them adequate financial aids for maintenance as charity (Platts, 1964). In other words, the state as well as the societies do patronise the illegitimacy with enthusiasm. Thus in many prosperous societies, in fact, pregnancy bears no terrors and people enjoy a greater freedom from the absence of fear of public opinion, of venereal disease, and of everything and anything.

#### **Other Factors for Promiscuity.**

Many other factors may be responsible for the causation of promiscuity including that of increased population mobility with consequent weaker family ties and greater social instability. Of the other factors low forms of amusements, influence of erotic literatures and the abuse of alcohol are noteworthy. Polygamy (Bennett, 1964) also brings about similar promiscuity since it is logical that the deprived or unsatisfied wives may seek some sorts of sexual pleasure from outside, which is more marked when the husband is incapacitated either physically or due to age. Moreover, certain restrictions over intercourse between husband and wife, for example, during lactation may predispose the husband, if not polygamous, to seek extra-marital relationship.

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**Addendum.**

A news has recently been published in the weekly 'News of the World' (London) of September 11, 1966 that two doctors of Sheffield have opened a clinic, the 408 Young People's Consultation Centre, to the young boys and girls who will be able to buy contraceptives and get advice on sex problems (similar facility also exists there at the University Student Health Service for the married or unmarried students). As for the purpose of such clinic one of the doctors remarked: "There are many career women who never intend to get married but who desire sexual intimacy."

**Conclusion.**

It is no wonder that promiscuity in terms of casual, frequent and demoralised sexual relations and Venereal Disease are significantly correlated. There is no means of judging the extent of promiscuity which has necessitated to fall back on indirect indices though any of such measures has its own limitations coupled with inaccuracies, under or over-reporting, and depends upon numerous factors. Whatever indices may, however, be used for the measurement of the frequency of sexual activities, it would be appreciated that the promiscuity is increasing and the sexual behaviour is becoming more casual than ever among the people and singularly is an extremely potential source for the spreading of venereal infection (Ministry of Health, 1963), and it is thus inevitable that venereal disease will always cause threat wherever promiscuity is widespread.

It is a fact that promiscuity can perhaps never be eliminated but it can be minimised at a far lesser extent through education and modern psychology. It is also possible to eliminate such emotional and instinctive factors and the circumstances which predispose them to the unwanted promiscuity. There is necessity to promote leisure activities and recreational facilities. As for the polygamous societies the most practical form of prophylaxis, however, would undoubtedly be the faithful mongamy.

In short, to oppose the extent of promiscuity we need an ever increasing educational and cultural levels. Further, much better would result if the society as well as the state take some discouraging attitude for many a things mentioned here; and from a dynamic social approach.

The bewildering promiscuity among the young people has made the picture completely obliterated from many countries, and the sex education and

the description of the disease symptoms could have a limited effect. It can, however, only be hoped that proper but intensified education may throw some light on them, and much better perhaps could be done in sociological research and sensible publicity.

The influence of late marriage and early maturity have been appreciated, which require further studies and special consideration. Nevertheless, societies where such is evident, introduction of marriage when people are adult perhaps may reverse the pattern of promiscuity, though it is highly disappointing to note that while the number, for example, in Scotland, of teenaged boys and girls of 16-17 years has doubled in 1965 compared with 10 years ago, instead of decrease there has been a parallel increase both of sexual promiscuity and venereal disease.

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# SOCIO-ECONOMIC STATUS IN THE EPIDEMIOLOGY OF PULMONARY TUBERCULOSIS

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*And*

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## I. INTRODUCTION

McDoughal (1949) has stated that in Indo-Pakistan subcontinent most of the writers agree that every year 250 people die of tuberculosis out of every 100,000 of population. Awan (1955) investigated 1,341 employees of the Mela Ram Cotton Mills, Lahore, and reported that 6.9 per cent of them were suffering from active pulmonary tuberculosis. The Government of Pakistan, with the assistance of WHO and UNICEF, conducted a tuberculosis sample prevalence survey and reported a morbidity rate of 6.7 per cent in three Divisions in West Pakistan (Directorate of Tuberculosis Control of Pakistan, 1962). Tuberculosis is estimated to claim about 125 to 150 thousand lives annually and poses a major health problem in Pakistan (Government of Pakistan, 1964).

Pulmonary tuberculosis is due to multiple causes and many factors in the host-agent-environment triad interact to disturb the balance of health and thus produce the disease. Though the specific cause is infection with virulent tubercle bacillus (*Mycobacterium tuberculosis*), conditions which favour transmission of the infection, and conditions which lower human host resistance to infection also play not an insignificant role in the causation of pulmonary tuberculosis. Extreme poverty in the community not only makes people highly susceptible to this disease but also retards their recovery once they have succumbed to this disease (Government of Pakistan, 1964). Further, pulmonary tuberculosis runs a chronic course, and produces invalidism and unproductiveness for a long period. On the top of it, the treatment of this disease requires prolonged use of costly drugs and attention by specialists. Due to the heavy economic burden of this disease, economic and social difficulties are frequently produced.

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Chadwick and Pope (1946) have stated that "evidence suggests that poverty is the predisposing cause of tuberculosis". Sartwell (1951) explains the downward trend of tuberculosis in the USA in large part due to improvements in socio-economic conditions. Wolfe (1940) has stated that in nations and people, having higher standards of living, tuberculosis mortality and morbidity were low. Terris (1948) from Buffalo (New York) showed that economic status was related with tuberculosis morbidity specially in males over 30 years of age. Awan (1954) while reporting the incidence of tuberculosis amongst 402 contact family members of tubercular patients showed that when income per capita was less than rupees 10 per month the tuberculosis attack rate was 8.0 per cent; when income per capita per month was 11-20 rupees, the attack rate was 7.5 per cent; while with an income of 21 rupees or more per capita per month, the attack rate amongst contacts fell to 2.8 per cent. Awan (1959) while reporting a community survey on 5,080 persons in Sargodha showed that income was related with the prevalence of tuberculosis and that the disease was more common amongst poorer classes of the population.

## II. THE STUDY

For the purpose of this study patients detected on a community survey should have been selected but financial limitations came in the way. Therefore, it was decided to select one clinic in Lahore and investigate the patients who are registered at the clinic, during a period of three months. The clinic was not necessarily random sample of such institutions but was purposely chosen for administrative convenience. The Public Chest Clinic at Nisbet Road, Lahore, is being maintained and administered by the District Tuberculosis Association, Lahore, for the last eleven years. It was, therefore, easy to enlist the cooperation and interest of the staff and patients. This clinic caters exclusively for the patients residing in Gawalmandi Police Station area of Lahore. It is well staffed and is equipped with x-ray and laboratory facilities.

The tool used for data collection was an interview schedule, i.e. a set of questions which were answered by the patients when face to face with the interviewer. The questions were formed in English but translated into Urdu. The actual interview was carried out in Punjabi, Urdu, or Pushto as needed by the patient concerned. Two lady interviewers possessing Master's Degree in Social Sciences were utilized. A few experimental interviews were conducted collectively for understanding and maintaining uniformity. Actual interviewing was started on the 18th May, 1962, and completed on 15th August, 1962. In all 320 clinic patients were interviewed. Diagnosis of tuberculosis was made on radiological appearance and on either the presence of positive sputum (smear test), or the presence of undisputed clinical features.

Only such cases were interviewed who had been visiting the clinic for more than 15 days. Wherever, subsequently, if the person interviewed was not found to be definitely suffering from pulmonary tuberculosis, the case was dropped.

As the Public Chest Clinic is located at Nisbet Road, Lahore, and exclusively caters to the tuberculosis patients residing in Gowalmandi area of Lahore, it was considered worthwhile to compare the social status of the patients attending the clinic with a representative sample of the population living in Gowalmandi Police Station area. Two hundred and fifty three households of four randomly selected blocks of this area (being 10 per cent of the blocks comprising the area) were surveyed. This control sample consisted of 1,579 persons.

The association of disease frequency with socio-economic status, as with other descriptive variables, is measured by stratification of the population according to arbitrary levels of the variable and derivation of the disease frequency rates in the several sub-groups to be formed. The difficulty in this case is that socio-economic status is a theoretical concept still awaiting clear specification of meaning (MacMahon, Pugh and Ipsen, 1960). So many variables, such as occupation, family income, living conditions, social prestige and so on, are encompassed that, in practice, one variable which can be objectively defined is commonly used as an indirect indicator for epidemiologic and social research purposes.

Various measures of income have been used. These include total family income, average family income per person (i. e. income per capita), and more complicated measures such as average family income "per adult unit", children being counted as certain percentages of an adult unit. Actually all these measures are highly correlated and the choice of one instead of another is usually not critical; the measure of disease frequently being not so precise as to be affected by minor variations caused by the application of different methods of computation of income (MacMahon, Pugh and Ipsen, 1960).

Education constitutes another indication of social status and reflects not only economic status but also possible cultural climate of the family. Education and income of a person are associated with a large number of variable social and physical factors. Different combinations of these factors constitute the soci-physical environment of a person.

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Income per capita and education status are the two correlates which have been utilized in this study for studying the relationship of economic and social status with pulmonary tuberculosis.

Income :— Income per capita has been calculated on the basis of the following formula :—

$$\text{Income per capita per month} = \frac{\text{total family income received in rupees during the year}}{12 \times \text{number of members (including children) constituting the household}}$$

Following scales of income were created :—

1. Poor income group : when income was less than Rs.21/per capita per month.
2. Modest income : when income was Rs.21—40 per capita per month, and
3. Better income group : when income per capita per month as Rs.41/—more.

(ii) Educational Status :—Following scales were used :

- (a) Illiterate :—when the client was neither able to read nor write
- (b) Below Matric :—When the client was able to read or write or had formal schooling but had not passed Matriculation examination.
- (c) Matric and Post—Matric :—Matric or equivalent or higher examination of a University or of a Secondary Board of Education.

### III. The Sample And Its Characteristics.

Table 1, gives the frequency distribution of various income groups amongst the clinic patients.

TABLE I

Distribution of the clinic patients according to income per capita per month

| Income per capita per month<br>in rupees | No. | Clinic Patients |
|------------------------------------------|-----|-----------------|
|                                          |     | Percentage      |
| Less than 1                              | 13  | 4.1             |
| 1-10                                     | 84  | 26.3            |
| 11-20                                    | 132 | 41.3            |
| 21-30                                    | 54  | 16.9            |
| 31-40                                    | 21  | 6.6             |
| 41-50                                    | 9   | 2.8             |
| 51-60                                    | 2   | 0.6             |
| 61- and more                             | 5   | 1.6             |
| Total                                    | 320 | 100.2           |

Perusal of table 1 shows that the largest group (41.3 per cent) in the clinic patients had an income per capita per month of Rs.11-20. The second largest group (26.2 per cent) had an income per capita per month of Rs.1-10. The third largest group (16.9 per cent) had per capita per month income of Rs. 21-30. It will be observed that 4 per cent of the clinic patients had either no income or their income per capita per month was less than one rupee.

Table II, gives the distribution of the households of the clinic neighbourhood population as related to economic status.

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TABLE II

Proportionate distribution of the households of the 'Clinic neighbourhood  
Population according to income per capita per month.

| Monthly income per capita<br>in rupees | No. | Households in the<br>Clinic neighbourhood |
|----------------------------------------|-----|-------------------------------------------|
|                                        |     | Percentage                                |
| Less than 1                            | 0   | 0.0                                       |
| 1 - 10                                 | 36  | 14.2                                      |
| 11 - 20                                | 106 | 41.9                                      |
| 21 - 30                                | 56  | 22.1                                      |
| 31 - 40                                | 20  | 7.9                                       |
| 41 - 50                                | 11  | 4.3                                       |
| 51 - 60                                | 1   | 0.4                                       |
| 61 and more                            | 16  | 6.3                                       |
| Not known                              | 7   | 2.8                                       |
| Total                                  | 253 | 99.9                                      |

Perusal of Table II shows that the largest proportion of households in the community (i. e. 41.9 per cent) had a per capita per month income of Rs. 11-20. Next largest group (of 22.2 per cent) had an income per capita per month of Rs. 21-30. About 19 per cent households had income per capita per month of thirty one rupees or more, and only 14.2 per cent households had income per capita per month of less than eleven rupees.

#### IV. ANALYSIS AND INTERPRETATION.

Table III compares the distribution of 'Clinic neighbourhood households' and 'clinic patients households' with reference to economic groups.

TABLE III

Comparative distribution of the households of the clinic patients and of the households of the clinic neighbourhood, by the economic groups.

| Economic group      | Income per capita per month | Households of Clinic patients |            | Households of Clinic neighbourhood |            |
|---------------------|-----------------------------|-------------------------------|------------|------------------------------------|------------|
|                     |                             | No.                           | Percentage | No.                                | Percentage |
| Poor income group   | Rs. 0-20                    | 229                           | 71.6       | 142                                | 57.7       |
| Modest income group | Rs. 21-40                   | 75                            | 23.4       | 76                                 | 30.9       |
| Better income group | Rs. 41 and more             | 16                            | 5.0        | 28                                 | 11.4       |
| All groups          | All Income groups           | 320                           | 100%       | 246*                               | 100%       |

\*Note : In the clinic neighbourhood group, 7 households with unknown income have been excluded.

Perusal of Table III shows that there is a greater proportion of poor income group and smaller proportions of modest income group and better income group in the 'clinic households' as compared to the 'households in the neighbourhood'. Applying null hypothesis we find that  $X^2 = 14.3$  to 3 degrees of freedom, giving a probability of less than 1 per cent of occurrence of these differences due to chance. Hence these differences are real and highly significant. In other words tubercular patients of the clinic are more frequently poor (i. e. have an income per capita per month of less than Rs.21/—) as compared to the universe (the clinic neighbourhood) from which they are drawn. Similarly we can say that clinic patients suffering from pulmonary tuberculosis less frequently belong to "modest income and "better income" groups as compared to population in clinic neighbourhood.

Table IV gives the distribution of the clinic patients and of the population of the clinic neighbourhood in relation to the education status.

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TABLE IV

Comparison of the educational level of the clinic patients and of the population of the clinic neighbourhood.

| Educational Level | Clinic patients |            | Clinic neighbourhood |            |
|-------------------|-----------------|------------|----------------------|------------|
|                   | No.             | Percentage | No.                  | Percentage |
| Illiterate        | 222             | 69.4       | 994                  | 62.95      |
| Below Matric      | 87              | 27.2       | 474                  | 30.02      |
| Matric and above  | 11              | 3.4        | 111                  | 7.03       |
| Total             | 320             | 100%       | 1579                 | 100%       |

Perusal of Table IV shows that though illiterates constituted 62.95% of the clinic neighbourhood population, they formed 69.4% of the clinic patients. Further there were 27.2% and 3.4% Clinic Patients respectively in the "below Matric" and "Matric and above" groups, as compared to the Clinic neighbourhood which had 30.02 and 7.03 per cent persons respectively in these groups. Applying null hypothesis we find that  $X^2 = 7.78$  to two degrees of freedom, giving a probability of about 2% for the occurrence of the above mentioned differences as due to chance. Hence, differences recorded are highly significant. It therefore appears that illiteracy is more frequent amongst the patients attending a tuberculosis clinic as compared to the universe (i.e. the community) from which patients are drawn. Table V, given below, gives the distribution of clinic tubercular patients according to the stage of disease and according to income groups :—

TABLE V

Distribution of the clinic patients by stage of disease and by economic groups.

| Economic group               | Income per capita per month. |     | No. & Percentage of patients by* stage of Disease and Income. |      |      | Patients in all Stage |
|------------------------------|------------------------------|-----|---------------------------------------------------------------|------|------|-----------------------|
|                              |                              |     | I                                                             | II   | III  |                       |
| Poor Income group.           | Rs. 0-20                     | No. | 85                                                            | 82   | 62   | 229                   |
|                              |                              | %   | 37.1                                                          | 35.8 | 27.1 | 100%                  |
| Modest & better Income group | Rs. 21 and more              | No. | 28                                                            | 36   | 27   | 91                    |
|                              |                              | %   | 30.8                                                          | 39.6 | 29.7 | 100%                  |
| All groups                   | Total                        | No. | 113                                                           | 118  | 89   | 320                   |
|                              |                              | %   | 35.3                                                          | 36.9 | 27.8 | 100%                  |

\*Note :—Classification of the stage of disease was done according to the method laid down in 1940 by the National Tuberculosis Association (U.S.A.) and the American Trudeau Society (Heaf, 1957).

Perusal of Table V apparently shows that less advanced disease (i. e. stage I), is slightly more prevalent in the poor income group, and more advanced disease (i. e. stages II and III) is somewhat more frequent in modest and better income groups. But by applying null hypothesis to Table V we find that  $X^2 = 1.13$  to two degrees of freedom, giving a probability of 50—70 per cent, for the occurrence of differences as due to chance. The differences seen are therefore highly insignificant. The distribution of stages of disease in the two economic groups is probably similar and hence in come appears to have no relationship with the extent of the disease in tubercular patients.

Table VI shows the relationship of the educational status with the extent of pulmonary tuberculosis.

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TABLE VI

Distribution of the clinic patients by educational status and stage of disease.

| Educational level                  | Number of patients    |                                   | (Stage - wise)               |               |
|------------------------------------|-----------------------|-----------------------------------|------------------------------|---------------|
|                                    | I<br>Minimal<br>stage | II<br>Moderately<br>advance stage | III<br>Far advanced<br>stage | All groups    |
| Illiterate                         | 77<br>(34.7%)         | 82<br>(36.9%)                     | 63<br>(28.4%)                | 222<br>(100%) |
| Below matric, Matric and<br>above. | 36<br>(36.7%)         | 36<br>(36.7%)                     | 26<br>(26.5%)                | 98<br>(99.9%) |
| Total                              | 113                   | 118                               | 89                           | 320           |

Perusal of Table VI shows that moderately advanced and far advanced disease is slightly more common in the illiterate group, minimal stage group is slightly more common in the educated group. But applying nul hypothesis we find that  $X^2 = 0.11$  to two degrees of freedom, giving a probability of occurrence of observed differences as due to chance, as 90—95%. Hence observed differences are highly insignificant. It appears that literacy too has no relationship with the stage of the disease.

## V. IMPLICATIONS OF THE FINDINGS AND COMMENTS

1. In this study it has been shown that majority of the tubercular patients in the community under study were poor and were in no position to even meet their basic needs, e. g. food, shelter, education, clothing etc. Such patients were medically indigent as they were in no position to pay for the cost of medical care needed. Medical administrators and planners, therefore, must provide socio-economic relief to this category of tubercular patients, e. g. sickness grants to the family and support for providing domestic help to the housewife (if she herself is the patient), etc., besides offering free medical coverage. Moreover, it may be remembered that tuberculosis is a very chronic disease and its economic burden is great. It is likely that even the members of the modest and better income groups would soon start feeling the economic burden of illness. It appears that 95 per cent of the patients attending the tuberculosis clinic require full scale provision of socialized medical care. The proper

tion of non-needy patients is so small that it will be useless to apply "means tests" in the management and care of pulmonary tuberculosis patients.

2. Every effort for improving the living standards of poor people would therefore be helpful in lowering the incidence of pulmonary tuberculosis. Spacing and family limitation through contraception could be an important weapon in preventing further lowering of social standards.

3. Poor socio-economic status has been found to be more frequent in patients attending the tuberculosis clinic, but appears to have no relation with the extensiveness and seriousness of disease in the lungs. It looks very likely that factor is chiefly helping in the spread of tuberculosis by making transmission of infection easy, but does not specially lower human host resistance, for which other factors, e.g., heredity, nutrition, strain, etc may be more important. Presence of tuberculosis in the lower status group therefore does not necessarily indicate poor prognosis which probably depends more upon the availability of treatment and care facilities for the patients.

4. Since prevalence of tuberculosis has inverse relationship with educational status and income status, and since the adverse effect is mostly through helping in transmission of disease, proper health education focussed on illiterate or semi-literate part of our population, and on poor people, is likely to help in the prevention of pulmonary tuberculosis. Official and voluntary agencies, therefore, should develop methods and techniques which can be utilized for reaching such groups. Such programmes need to be given priority by the agencies engaged in the fight against tuberculosis. Present health educational efforts through mostly written material and thus exclusively directed on literate and better class population need evaluation and replanning, because illiterate and poor persons who are in greater need of this kind of assistance are mostly unaffected by such efforts.

5. Present emphasis on economic development and the evolution of the concept of social welfare state in Pakistan, is also likely to help in lowering tubercu-

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losis morbidity and mortality. Added emphasis on mass education will be helpful in controlling tuberculosis problem in Pakistan.

### SUMMARY

1. A study has been conducted on 320 pulmonary tuberculosis patients attending the Nisbet Road Chest Clinic, Lahore. These constituted the total number of patients under care of the institution during a period of three months, i. e., the duration of field operations of the study.

2. For providing a control population, the Gowalmandi Police Station area of Lahore was selected and surveyed. The clinic is located in this area and exclusively serves its population. It was, therefore, presumed that this population would be the universe for the sample population attending the clinic. Two hundred and fifty three households of four randomly selected blocks of this area (being 10 per cent of the blocks comprising this area) were surveyed.

3. It was found that 71.5 per cent of the clinic patient's households and 57.7 per cent of the control population households had an income per capita per month of less than 21 rupees. 23.5 per cent of the clinic households and 30.9 per cent of the clinic neighbourhood households had a monthly per capita income of 21—40 rupees. Only 5.0 per cent of the clinic households and 11.4 per cent of the clinic neighbourhood households had a per capita per month income of 41 or more rupees.

4. Since 95 per cent of the clinic patients had a per capita income of less than 11 rupees (poor income group and modest income group), it has been suggested that no "means test" should be applied in the treatment of pulmonary tuberculosis in tuberculosis clinics, and full requirements of the socialized medical care programme for all such patients should be provided.

5. It has been demonstrated that tubercular patients attending clinics are more frequently poor.

6. No relationship has been found between income and extensiveness of pulmonary tuberculosis. It has been suggested the poverty is related with pulmonary tuberculosis because it is associated with social conditions which help in the transmission of infection.

7. It was found that illiteracy is more common amongst pulmonary tuberculosis patients attending the Public Chest Clinic at Nisbet Road, Lahore, as compared to the general population from which this clinic draws its patients.

8. No relationship has been established between the extent of disease in lungs and literacy.

9. It has therefore been inferred that though illiteracy is associated with higher prevalence of pulmonary tuberculosis, it has no relationship with the resistance of the patient to the disease as gauged by the extent of disease in the lungs.

10. Organization of specially designed health education programmes for the illiterate and poor part of our population, and institution of economic uplift and relief programmes have been suggested for the control of tuberculosis in the country.

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DETERMINATION OF MALARIA TRANSMISSION IN CENTRAL PART  
OF KARACHI CITY AND INCREMINATION OF *A. STEPHENSI*  
AS THE VECTOR :

By

DR. MAHBOOBER RAHMAN

And

MR. A. MUTTALIB

HISTORICAL

Hicks and Dewanchand (1935) carried out dissections on Anophelines around Karachi. They dissected very small number of Anopheline mosquitoes and their results were also negative. According to Hicks and Dewanchand "Malaria in 1935 was negligible, though there was evidence of moderate malaria to recent years", and they suspected that *A. culicifacies* and *A. stephensi* responsible for malaria in the area.

Husain and Talibi (1956) have conducted a detailed investigation to determine the Vectorial capacity of *A. stephensi* for a period of about five years (1947-1951) during which period they have dissected 23,233 *A. stephensi* without positive results. According to them "It may be noted that upto November, 1949 more concentrated efforts were made in the catches and dissections of *A. stephensi*, the presumed Vector, with which we were constantly getting negative results (see table IV) in which the results of dissections of *A. stephensi* both for gut and gland infection done from November, 1947 to May, 1961 have been summarised. These figures are monthly total of the dissection done during this period and it may be pointed out that no positive gut or gland was found at any time".

Below is table IV of Hussain and Talibi 1956 for ready reference.

TABLE IV  
*Anopheles stephensi*.

| Months         | Years     | No. of<br>guts<br>dissected | No.<br>posi-<br>tive | Rate | No. of<br>glands<br>dissected | No. + | Sporozo-<br>Rate |
|----------------|-----------|-----------------------------|----------------------|------|-------------------------------|-------|------------------|
|                |           |                             |                      |      | 1992                          | 0     | ...              |
| January,       | 1948-1951 | 436                         | 0                    | 0    | 2781                          | 0     | ...              |
| February,      | 1948-1951 | 708                         | 0                    | ...  | 3400                          | 0     | ...              |
| March,         | 1948-1951 | 1215                        | 0                    | ...  | 3435                          | 0     | ...              |
| April,         | 1948-1951 | 1817                        | 0                    | ...  | 2461                          | 0     | ...              |
| May,           | 1948-1951 | 1834                        | 0                    | ...  | 2507                          | 0     | ...              |
| June,          | 1948-1950 | 1501                        | 0                    | ...  | 2844                          | 0     | ...              |
| July,          | 1948-1950 | 1397                        | 0                    | ...  | 1833                          | 0     | ...              |
| August,        | 1948-1950 | 87                          | 0                    | ...  | 492                           | 0     | ...              |
| September,     | 1948-1950 | 359                         | 0                    | ...  | 32                            | 0     | ...              |
| October,       | 1948-1950 | 3                           | 0                    | ...  | 443                           | 0     | ...              |
| November,      | 1948-1950 | 9                           | 0                    | ...  | 998                           | 0     | ...              |
| December,      | 1947-1950 | 251                         | 0                    | ...  |                               |       |                  |
| Grand total... |           | 9617                        | 0                    | ...  | 23223                         | 0     | ...              |

Husain and Talibi, however correlated malaria with *A. culicifacies* in their work (from November 1949 upto May, 1951) during which period 9869 *A. culicifacies* were dissected, out of which 80 were found with infected glands, in two small now extinct villages of Chotekhan and Barekhan which was situated some where in Pakistan Employees Cooperative Housing Society (PECHS). The work of Husain and Talibi came out to be in favour of *A. culicifacies* as the only Vector in Karachi. The probable flaw, in their massive dissection of *A. stephensi* for such a long period, was that the workers had little knowledge of the actual malaria situation in the city (after Hussain and Talibi) and as such a right place and time was not selected on sound epidemiological grounds. Though they have dissected 23,223 *A. stephensi* in four years (1947-1951) but only 492 and 32 in the months of September and October respectively.

It also appears that Husain and Talibi were influenced by their another concurrent work with Afridi and Rashid which revealed that *A. stephensi mysorensis* is prevalent in Karachi which they did not consider as a vector as "repeated attempts to establish a laboratory colony of *A. stephensi* at Karachi ended in failure and that in spite of the large number of dissections no infected specimen of the species could be found in Karachi quoted from their paper titled "Identification of races of *A. stephensi* prevalent in Federal Karachi Area "by Afridi, Talibi, Rashid and Husain (1958)".

Kureshi, Lari and Bukhari also studied the Vectorial capacity of *A. stephensi* and gave a report of their studies for a period of 6 years (1954-1959) on the eve of launching Malaria Eradication Programme in the country i. e. 1960. If we study their survey report, it becomes clearly evident that these workers were fully biased phased by the findings of Husain and Talibi (1956) and Afridi et al (1958). They have not mentioned the extent and period of dissection of *A. stephensi* around the positive cases. Instead of making detailed epidemiological investigation (by contact survey to determine the presence of secondary cases) and solve the problem on the spot (Karachi Metropolis) they preferred to consider the four *falciparum* cases as stray cases to have been acquired from outside the city. Though their survey period was about five years (1954-1959) but they surveyed only six areas in the city on the basis of which they have given their verdict as "The city area has very low is more or less free from the disease and one or two cases detected may be considered to be of outside origin." Although Karachi was known to have moderate malaria in recent years (after Hicks and Diwan chand 1936) and after the partition lots of people flocked to the city from all parts of Indo-Pakistan sub-continent along with malaria. These workers were so much biased that malaria in Karachi was only associated with *A. culicifacies*, that though only *A. stephensi* and *A. subpictus* was available around their positive *falciparum* cases of the city they went 12 miles away from Karachi to Pathan Colony in the search of *A. culicifacies* and associate malaria with it. They further observed "incidence and transmission of the disease is associated with the presence of *A. culicifacies* in the locality". Moreover they said "only the localities outside the city area are malarious provided breeding grounds of vector anopheline are available."

Based upon the findings of all these eminent workers and malariologists that no transmission takes place in the urban areas, Malaria Eradication Programme did not include all urban areas having 20,000 or more population in their plan of operation for West Pakistan which was prepared under the auspices of WHO. The arbitrary verdict that malaria transmission does not occur in (central part of) urban areas with

20,000 or more population because the known vector species do not normally breed in the towns, seemed to be very strange to one of the workers Dr. Mahboobur Rahman. Since his joining at the National Headquarters, Malaria Eradication Programme, Karachi, he was looking forward for an opportunity to work on the problem of malaria in urban areas, particularly the central part of Karachi city. During his investigation Dr. Mahboobur Rahman came in contact with 5 cases of malaria (case No. 1, 2, 3, 4 and 5) from Jinnah Postgraduate Medical Centre, one infant case from his neighbour, another infant case from his maid servant all belonging to the Central Part of the city. On a preliminary epidemiological investigation in March, 1966 of the two positive cases (case No. 1 and 2) of Bizarta Lines both brothers aged 4 years and 8 years appeared to be locally incriminated as they were born and brought up in this very house and there was no history of movement outside the city. The services of the second author was immediately availed of for detailed entomological survey during the period from 6.4.66 to 12.4.66 in Bazerta Lines, Just Land Lines, Police Lines, Headquarters, Garden Road, which revealed presence of only *A. stephensi* and *A. subpictus* in all the places. A thorough search for *A. culicifacies* the known vector was made in Bizarta Lines and all areas surrounding it but not a single adult or larvae could be found.

The contact survey dated 7.4.1966 of the first two cases (case No. 1 and 2) revealed two more *Plasmodium vivax* cases (case No. 6 and 7) out of 34 blood smears examined. Case No. 6 was the two years old brother of case No. 1 and 2 who also was born in that house and never spent a night outside the house.

Case No. 3 was living within the compound of Jinnah Postgraduate Medical Centre. In a contact survey of this case three more cases were revealed (case No. 8, 9 and 10) after the examination of 86 blood smears (2p. v. and 1. p. f.). Case No. 3 gave history of overnight stay in the Police Lines Quarters, Garden Road, where a contact survey in the quarters and primary school revealed two more cases (case No. 11 and 12 (1 pf. and 1 pv) one of which seemed to be indigenous. On the contact survey of case No. 10 at Landhi three more cases (No. 141, 142 and 143) were detected on examination of 60 slides (2 pv. and 1 pf.). These sporadic distribution of locally contracted cases further strengthened the view of Dr. Rahman that transmission was going on within the city.

A spleen survey was conducted in Bizarta Line Primary School on 7.4.66 which showed 25% spleen rate. Blood survey could not be done at this stage. However, permission for the blood and spleen survey was procured from the education authorities and malariometric survey was conducted from 20.4.66 to 22.4.66 which revealed

spleen rate to be 34% and parasite rate to be 10.9%. 26 *P. vivax* cases (case No. 24—49) were conducted from 20.4.66 to

Case No. 4 was located at Jutland Lines. This case was epidemiologically investigated and found to have been infected at Rawalpindi. However a contact survey around this case also revealed two positive *vivax* cases (case No. 13 and 14).

A malariometric (blood and spleen) survey was conducted in a Primary School of Jutland Lines which revealed 10% spleen rate and 2.2% parasite rate after the examination of 405 children between the ages of 4 to 10 years. A total of 9 cases, Pv. 7 and Pf. 4, Mixed 2 (case No. 15—23) were detected.

On 25.4.66 a children and infant survey was conducted in Bizarta Lines. The result of the survey which was received towards the end of May, 1966 revealed 14 positive *vivax* cases (case No. 50—63) out of which only 3 were below the age of one year. One of these three positive case was the infant sister of case No. 1 and 2. In a contact survey of another infant (case No. 51) 10 blood smears of infants were collected on 7.7.66 which were examined and three of them were found to be positive. One of these three was born in the month of February, 1966.

The presence of these three infant cases made the first worker to believe that actual transmission in this very area was going on at that particular time and requested the second author to immediately establish the fact entomologically. An entomological survey conducted by the second author in the same area again failed to reveal any species other than *A. stephensi* and *A. subpictus*. Again a thorough search for *A. culicifacies* including night observation was made without a positive result. Dissections for salivary gland was *A. stephensi* was started on 8.7.66. After dissection 106 mosquitoes one gland was found infected with sporozoites. Dissection was continued upto August, 1966 during which period a total of 204 dissections were made but without any further positive glands (summary of the dissections are shown in table 1). Further dissections to determine the sporozoite rate could not be continued at that time due to the preoccupation of the second author and the work was left for continuation in the month of September, 1966.

Contact survey in Bizarta line around all the 14 positive cases (detected in the children and infant survey of 25th April) was conducted during the period from 4.7.66 to 25.7.66 and in the examination of 267 slides 74 (Pv. 73 Pf. 3 and mixed 2)

came out to be positive. Routine entomological surveys were also conducted in the month of July and August, 1966 with a view to have a check on the anopheline fauna.

Summary of Malariometric and Entomological activity done so far is shown in table II and III :—

### CONCLUSIONS

1. Active transmission of malaria is going on in the heart of Karachi city.
2. *A. stephensi* is the vector, responsible for the transmission of malaria in Karachi city.
3. Quite a good number of malaria cases exist in the city. A thorough malaria survey is under progress which will come in a separate paper.
4. There is epidemiological suggestion of spring transmission in Karachi city for the establishment of which these workers hope to conduct a study during the next year.
5. Breeding places of *A. stephensi* are available through out the city almost the whole year round.
6. It is presumed that *A. stephensi* is not only a vector in Karachi but also in other parts of West Pakistan which have similar situation.
7. Karachi city will be a good place to study the vectorial capacity of *A. subpictus*.

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TABLE I

Results of Dissection of *A. stephensi* during the month of July and August, 1966 collected from Bizartalines, Karachi.

| Month        | No. salivary gland dissected | No. of gland positive | Sporozoite Rate | Remarks                                              |
|--------------|------------------------------|-----------------------|-----------------|------------------------------------------------------|
| July, 1966   | 158                          | 1                     | 0.63            | +ve glands was detected on 14.7.66                   |
| August, 1966 | 46                           | 0                     | 0.00            | As part of training to the entomological technician. |

TABLE II (a)

Consolidated record of Entomological survey for adult Anopheline Mosquitoes  
of Karachi during April to August, 1966

| Area of survey. | Month of survey 1966 | No. of rooms exam. | A. stephensi |     | A. subpictus |     |
|-----------------|----------------------|--------------------|--------------|-----|--------------|-----|
|                 |                      |                    | F.           | M.  | F.           | M.  |
| Bizartalines.   | April,               | 10                 | 1            | 8   | 1            | 0   |
|                 | July,                | 60                 | 281          | 278 | 808          | 686 |
|                 | August,              | 31                 | 241          | 338 | 647          | 576 |
| Kalapul         | April,               | 5                  | 8            | 2   | 8            | 6   |
|                 | July,                | 8                  | 65           | 38  | 78           | 51  |
|                 | August,              | 8                  | 43           | 37  | 88           | 87  |
| Golf Ground     | April,               | 4                  | 3            | 0   | 0            | 0   |
| Police Lines    | April,               | 4                  | 5            | 10  | 6            | 5   |
| Jutland Lines   | April,               | 5                  | 3            | 1   | 4            | 1   |

TABLE II (b)

Consolidated record of Anopheline Larval survey conducted in April, and July 1966 in Karachi

| Area         | Months | No. of larvae collective | Species      |              |
|--------------|--------|--------------------------|--------------|--------------|
|              |        |                          | A. stephensi | A. subpictus |
| Bizarta Line | April, | 239                      | 111          | 128          |
|              | July,  | 139                      | 46           | 93           |

Table III : Consolidated result of Malarionetric survey in Karachi during April to August, 1966

| Dates  | Name of Area                                                               | Nature of survey                 | No. Exam. | Spleen |   |   |   | Total +ve | S.R. | No. Exam. | P.V. | P.F. | P.M. | Missed Total +ve | P.R. | Case No. | Remarks |
|--------|----------------------------------------------------------------------------|----------------------------------|-----------|--------|---|---|---|-----------|------|-----------|------|------|------|------------------|------|----------|---------|
|        |                                                                            |                                  |           | 1      | 2 | 3 | 4 |           |      |           |      |      |      |                  |      |          |         |
| 6.4.66 | Bizarta Lines                                                              | Contact survey of case No. 1 & 2 | 5         | 1      | 2 |   |   | 3         | 60.0 | 34        | 2    |      |      | 2                |      | 6-7      |         |
| 6.4.66 | Bizartalines                                                               | Spleen survey.                   | 117       |        |   |   |   | 30        | 25.6 |           |      |      |      |                  |      |          |         |
| 7.4.66 | Compound of Jinnah Post graduate Medical Centre, adjacent to Bizartalines. | Contact survey case No. 3        | 15        | 1      | 2 |   |   | 3         | 20.6 | 86        | 1    | 1    |      | 3                |      | 8-10     |         |
| 8.4.66 | Police Lines Garden Road.                                                  | School survey                    | 85        | 1      | 4 |   |   | 5         | 6.0  | 20        | 1    | 1    |      | 2                | 8    | 11-12    |         |

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|                              |                     |                                  |     |    |    |  |  |   |    |      |    |    |  |      |      |        |           |
|------------------------------|---------------------|----------------------------------|-----|----|----|--|--|---|----|------|----|----|--|------|------|--------|-----------|
| 8.4.66                       | Police line Quarter | Contact survey of case No. 3     |     |    |    |  |  |   |    | 16   |    |    |  | 0    |      |        |           |
|                              |                     |                                  |     |    |    |  |  |   |    | 95   | 2  |    |  | 2    |      | 13-14  |           |
| 15.4.66                      | Jutland Lines       | Contact survey of case No. 4     |     |    |    |  |  |   |    | 405  | 7  | 4  |  | 2.9  | 2.2  | 15-23  |           |
| 16.4.66 }<br>to<br>18.4.66 } | Jutland Lines       | School survey                    | 405 | 19 | 21 |  |  | 2 | 42 | 10.3 |    |    |  | 26   | 10.8 | 24-49  |           |
|                              |                     |                                  |     |    |    |  |  |   |    | 239  | 37 | 42 |  | 3    | 82   | 34.3   | 239       |
| 20.4.66 }<br>to<br>22.4.65 } | Bizarta Lines,      | School survey                    |     |    |    |  |  |   |    |      |    |    |  |      |      |        |           |
|                              |                     |                                  |     |    |    |  |  |   |    | 90   | 14 |    |  | 14   | 15.5 | 50-63  | 3 infants |
| 25.4.66                      | Bizartalines        | Infant and children survey       |     |    |    |  |  |   |    | 10   | 3  |    |  | 3    |      | 64-66  | -do-      |
|                              |                     |                                  |     |    |    |  |  |   |    |      |    |    |  |      |      |        |           |
| 7.7.66                       | Bizartalines        | Contact infant survey            |     |    |    |  |  |   |    | 267  | 73 | 3  |  | 2.74 |      | 67-140 | 2 infants |
| 9 to 18.7.66                 | Bizartalines        | Contact survey of case No. 50-63 |     |    |    |  |  |   |    |      |    |    |  |      |      |        |           |

Determination of Malaria Transmission in Karachi

Table III : Consolidated result of Malaria metric survey in Karachi during April to August, 1966

| Dates        | Name of Area      | Nature of survey              | No. Exam. | Spleen |   |   |   | Total +ve | S.R. No. | Exam. No. | P.V. P.F. P.M. |   |   | Mix Total +ve | P.R. | Case No. Remarks |
|--------------|-------------------|-------------------------------|-----------|--------|---|---|---|-----------|----------|-----------|----------------|---|---|---------------|------|------------------|
|              |                   |                               |           | 1      | 2 | 3 | 4 |           |          |           | 1              | 2 | 3 |               |      |                  |
| 16.7.66      | Landi             | Contact survey of case No. 10 |           |        |   |   |   |           |          |           |                |   |   |               |      | 141-143          |
| August, 1966 | PECHS             | Fever case                    |           |        |   |   |   |           |          |           | 1              | 1 |   |               | 1    | 144              |
|              | Clifton Road      | Fever case                    |           |        |   |   |   |           |          |           | 1              | 1 |   |               | 1    | 145              |
|              | Pakistan quarters | Fever case                    |           |        |   |   |   |           |          |           | 1              | 1 |   |               | 1    | 146 on infants   |
|              | Clifton Road      | Fever case                    |           |        |   |   |   |           |          |           | 1              | 1 |   |               | 1    | 147              |

# A DETAILED STUDY OF MALARIA SITUATION IN KARACHI DURING SEPTEMBER AND OCTOBER 1966

By

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Mr. S. A. Talibi<sup>4</sup> and Mr. A. A. Majahid<sup>5</sup>

## INTRODUCTION

After the finding of Mahboob and Muttalib in July 1966 that active transmission of malaria was going on in Bizerta Line, in the central part of Karachi City and detecting *A. stephensi* as the vector, the work was continued during the month of September and October 1966 with a view to investigate in detail the malaria situation in Karachi. The following studies were conducted :—

1. Malaria survey at different parts of the city.
2. Large scale dissections to find out the sporozoite rate.
3. Extent of transmission in different parts of the city.
4. Find out the vectorial capacity of *A. subpictus* in an area where *A. stephensi* is found to be a vector.
5. Determine the race of prevalent *A. stephensi* by measurement of their ova.
6. Find out the susceptibility level of *A. stephensi* and *A. subpictus* to DDT.
7. Find out the human blood index of *A. stephensi* and *A. subpictus*.
8. Study all mosquitoes in relation to their distribution, breeding places and prevalence in Karachi.

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Hicks and Dewanchand (1936) carried out mosquito survey in Karachi with a view to ascertain the possibility of introduction and dispersion of yellow fever. They also carried out dissections of anopheline mosquitoes for observation of sporozoites in the salivary glands but their findings were negative. They observed "Malaria was negligible in 1935 though there was evidence of a moderate incidence of malaria in recent years". However, considering the habits of *A. culicifacies* and *A. stephensi* they suggested that these species were probably transmitting malaria.

2. Husain and Talibi (1956) made extensive studies of the anophelines in Karachi from November 1947 to May 1951. During this period dissections were carried out of 6 different species of *Anopheles* and sporozoites were only detected in *A. culicifacies*. A total of 9869 *A. culicifacies* were dissected with 80 positive glands while 23223 *A. stephensi*, 364 *A. subpictus*, 87 *A. pulcherrimus*, 6 *A. fluviatilis* and 3 *A. hyrcanus* gave negative results. In spite of their negative findings based on large scale dissections of *A. stephensi*, these workers did not exclude the possibility of *A. stephensi* as a vector.

3. Afridi and Talibi et al (1958) found *A. stephensi mysorensis* to be the prevalent *stephensi* race in Karachi. They also indicated the behaviour of the variety with respect to its colonization and vectorial capacity which was in conformity with the previous observations.

4. Kuraishy, Lari and Bokhari (1960) also studied the vectorial capacity of *A. stephensi*. These workers though did not mention the number of *A. stephensi* dissected but their work also ended in negative findings. However, they also confirmed *A. culicifacies* to be a vector in Pathan Colony (Karachi).

5. Mahboob and Muttalib found evidence of active transmission in Bizerta Lines and detected in July 1966 that *A. stephensi* was the vector responsible for this transmission. They found one salivary gland of *A. stephensi* positive out of 158 dissections. (In press).

### EPIDEMIOLOGICAL OBSERVATION.

A Malaria Survey (Malariometric and Entomological) was conducted in different widely separated areas of the city between 22nd September to 30th

October 1966. The results of the Malariometric Survey are summarised in Table I.

It is evident from the finding of the Malariometric Survey that malaria is prevalent throughout the whole city with different degrees of endemicity. The spleen rate will be a better index to show the prevalence of malaria in this city. In no locality spleen rate is found to be negative. Spleen rate varies between 2.5% to 52% in different localities giving a gross spleen rate of 13.1% for the whole city.

#### **Parasite rate.**

Parasite rate varies from 0% to 66% in different areas of Karachi city. The gross parasite rate for the city was calculated as 12.4%.

The non-correlation between spleen rate and parasite rate in some areas particularly in P.E.C.H. Society is mainly due to the fact that people in these areas are rich, have easy medical facilities and antimalarial drugs are very easily available.

#### **Selection of area.**

From the study of the map and table it is seen that malaria incidence is comparatively less towards the midwestern part of the city. This has correlation with finding of very negligible number of *A. stephensi* in that area.

The contact survey in Bizerta Lines conducted in the month of July around 14 positive cases detected in the infants and children. Survey in April 1966 revealed 77 more cases (Pv. 76, Pf. 3 mixed 2) including 5 infants (Mahboob and Muttalib 1966). This area is situated in and around the Jinnah Post Graduate Medical Centre. The houses in this area are mostly composed of Jhuggies, Quarters, Barracks for employees of Jinnah Post Graduate Medical Centre and other Government employees. This area was selected for study and was labelled as 'A' area.

The infant which was detected positive on 22nd September 1966 (Table I) was born in the month of February 1966 and had no history of overnight stay anywhere other than his own house. A contact survey around this case

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and subsequently detected cases in this area on the 2nd, 4th, 8th, 12th, 14th October 1966 revealed 83 more positive cases (Pv. 57 Pf. 32 and mixed) including 12 infants while 208 blood smears were examined. This area was thus selected for entomological studies and was named as 'B' area. This area is situated on the northern part of the Pakistan Quarters and on southern bank of Lyari River mostly composed of mud brick walled houses with tin roof. This is a bustee area but Government quarters are also situated adjacent to it.

The results of the malariometric survey of Pathan Colony showed spleen rate as 52% and parasite rate as 21.7%. Thus confirming findings of Kuraisi Lari, and Bokhari (1960) about malaria prevalence in this area.

A contact survey was conducted around the available detected positive cases of Pathan Colony on 6th October, 1966 which revealed 4 more positive cases (Pv. 4) including 2 infants. This area was thus selected for entomological study and was termed as 'C' area.

### Entomological Observation

The Entomological studies conducted during the period from 1st October to 15 October were mainly concentrated in carrying out dissections of salivary glands of *A. stephensi* and *A. subpictus*. Susceptibility test, collection of blood smear for precipitin testing and measurement of ova, of *A. stephensi*. Mosquitoes for these studies were collected by space spray total catch method and hand catch by aspiration from the houses of the patients and neighbouring houses.

### RESULTS AND DISCUSSIONS.

#### Salivary gland dissection.

Results of dissection of salivary glands for *A. stephensi* and *A. subpictus* from the three areas namely Bizerta Lines ('A' area) Dhobighat behind Pakistan Quarters ('B' area) and Pathan Colony ('C' area) are shown in the following table:—

| Date and place         | A. stephensi  |              | A. subpictus  |              |
|------------------------|---------------|--------------|---------------|--------------|
|                        | No. dissected | No. positive | No. dissected | No. positive |
| <b>Bizerta Line</b>    |               |              |               |              |
| ('A' area)             |               |              |               |              |
| 1.10.66                | 143           | 1            | 0             | —            |
| 2.10.66                | 73            | 2            | 13            | 0            |
| 3.10.66                | 73            | 1            | 2             | 0            |
| 5.10.66                | 53            | 0            | 81            | 0            |
| <b>Total</b>           | 342           | 4            | 96            | 0            |
| <b>Sporozoite rate</b> | —             | 1.1%         | —             | 0%           |
| <b>Pathan Colony</b>   |               |              |               |              |
| ('C' area)             |               |              |               |              |
| 6.10.66                | 40            | 0            | 0             | —            |
| 7.10.66                | 13            | 1            | 12            | 0            |
| <b>Total</b>           | 3             | 1            | 12            | 0            |
| <b>Sporozoite rate</b> | —             | 1.8%         | —             | 0%           |
| <b>Dhobighate</b>      |               |              |               |              |
| ('B' area)             |               |              |               |              |
| 4.10.66                | 69            | 0            | 108           | 0            |
| 7.10.66                | 0             | —            | 145           | 0            |
| 8.10.66                | 41            | 1            | 67            | 0            |
| 9.10.66                | —             |              | 140           | 0            |

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| Date and place             | <i>A. stephensi</i> |              | <i>A. subpictus</i> |              |
|----------------------------|---------------------|--------------|---------------------|--------------|
|                            | No. dissected       | No. positive | No. dissected       | No. positive |
| 10.10.66                   | —                   | —            | 255                 | 0            |
| 11.10.66                   | —                   | —            | 340                 | 0            |
| 12.10.66                   | —                   | —            | 425                 | 0            |
| 13.10.66                   | —                   | —            | 391                 | 0            |
| 14.10.66                   | —                   | —            | 36                  | 0            |
| Total                      | 110                 | 1<br>0.9%    | 1907                | 0            |
| Sporozoite rate ('B' area) | —                   | —            | —                   | 0%           |
| Grand Total                | 505                 | 6            | 2015                | 0            |
| Sporozoite rate all areas  | —                   | 1.18%        | —                   | 0%           |

A total of 505 *A. stephensi* and 2015 *A. subpictus* were dissected during the period of observation and 6 *A. stephensi* were found to be positive for sporozoites giving overall sporozoite rate of 1.18%.

*A. subpictus* was the only other species available in the localities from where *A. stephensi* was found to be the vector. The spleen and parasite rate were also high. It was, therefore, considered a very ideal place and time to study the vectorial capacity of *A. subpictus* of this area. *A. subpictus* were collected from the malaria patients houses and a total of 2015 dissection, however, revealed negative results. The above findings indicate that *A. stephensi* is responsible for transmission of malaria in 3 different areas in the city. Two in the central part and one at the periphery.

#### Measurement of eggs of *A. stephensi*.

A sample of *A. stephensi* eggs were measured. Figures for the length and breadth of the eggs, the length of the float and the number of ridges were recorded. The result is shown in the following table :—

|                                                          | Range         | Mean  |
|----------------------------------------------------------|---------------|-------|
| Length                                                   | 475.8 - 524.6 | 495.3 |
| Breadth                                                  | 158.6 - 195.2 | 174.7 |
| Length of float                                          | 268.4 - 292.3 | 241.2 |
| No. of Ridges                                            | 12 - 15       | 13    |
| Proportion of<br>Length of float<br>total length of eggs |               | 0.47  |

Remarks: Length and Breadth is given in microns. Afridi and Talibi, 1958 made extensive work on measurement of eggs. of *A. stephensi* prevailing in Karachi and found variety *mysorensis* present in this area. In the present observation, mean figures of length, breadth, length of float, number of ridges and proportion of L. of float fall under figures for the variety *mysorensis*.

**Susceptibility test.** Susceptibility tests were conducted on *A. stephensi* and *A. subpictus* to DDT and results are tabulated as follows:—

Place: Bizerta Lines: Date 4-7-10.66.

Species *A. stephensi*, Temperature 85-88°F, RH. 69%

| DDT Concentration | No. tested | No. dead | % Mortality |
|-------------------|------------|----------|-------------|
| 2% ...            | 11         | 1        | 9.0%        |
| 4% ...            | 36         | 18       | 50%         |
| Control ...       | 5          | 1        | 20%         |

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Place Dhobighat behind Pakistan Quarters : Date 11.10.66

| Species |     | <i>A. stephensi</i> | Temperature<br>83-92°F | RH 39% |
|---------|-----|---------------------|------------------------|--------|
| 4%      | ... | 16                  | 11                     | 68.3%  |
| Control | ... | 2                   | 0                      | 0.0%   |
| Species |     | <i>A. stephensi</i> | Temperature<br>83-92°F | RH 39% |
| 4%      | ... | 12                  | 7                      | 58.3%  |
| Control | ... | 11                  | 0                      | 0.0%   |

Although tests were small, *A. stephensi* and *A. subpictus* were found to be moderately tolerant to DDT.

It may be noted that in case DDT pressure is increased by unjudicious spraying it may result in stepping up the resistance level. However, DDT residual spraying can be applied in certain area where operationally feasible.

#### Blood smears collection for precipitin test.

A total of 45 *A. stephensi* and 112 *A. subpictus* blood samples were collected from human dwellings in Dhobighat area. These samples will be sent to London for further examination.

It can be mentioned here that number of domestic animals such as buffaloes, cows, sheep and goat etc. are very little in number in the place from where blood samples have been collected. It is therefore presumed that *A. stephensi* and *A. subpictus* may show higher anthropophilic tendency though usually they showed high zoophilic tendency in rural areas of West Pakistan.

#### Mosquitoes in relation to their distribution, breeding places and prevalence in Karachi.

Entomological surveys were carried out on considerable scale in order to indicate the breeding places of vector as well as other mosquitoes prevalent in Karachi at this time of the year so that planning for eradication of malaria in Karachi and mosquito nuisance of the city can be effectively dealt with.

Twenty six areas in the city were surveyed for both adult and larvae. The results are shown in Tables 2 and 3. Results of previous surveys conducted in the

#### Adult survey.

It can be seen from Table No. 2 that *A. stephensi* and *A. subpictus* are found to be widely distributed throughout the city.

*Culex spp.* and *Aedes spp.* are also found all over the city. It is interesting to note that *Aedes aegypti* was found in Clifton, Landhi and Baghdadi Line areas.

#### Larval survey.

Fifteen areas were surveyed and *A. stephensi* was found in seven areas while *A. subpictus* was detected from all the places surveyed (Table 3). Breeding of *Culex spp.* and *Aedes spp.* was detected from almost all the areas since the surveys made from middle of October, where as *Aedes aegypti* was found from three place as already mentioned.

Species recorded in relation to the types of breeding places are noted in Table 4. Breeding places of mosquitoes existing in Karachi can be classified under two heads—out-door and indoor breeding places as shown under :—

#### Outdoor breeding places.

1. Ponds and pools.
2. Canals and drains.
3. Fountains and garden pits.
4. Swamps.
5. Seepage water.
6. Irrigation channels.
7. Wells.
8. Cisterns (over head and underground)
9. Water collections along the running streams.
10. Foot-prints, hoof-marks and cart-tracks.
11. Artificial containers (open cement tanks meant for construction purposes).

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12. Burrow pits.
13. Water reservoirs,
14. Tidal pools.
15. Cesspools and manholes (not covered properly).
16. Leakages and over flow from pipes and gutters.

**Indoor breeding places.**

1. Water closets.
2. Flushing cisterns.
3. Water tanks inside houses.
4. Flower vases.
5. Ornamental tanks.
6. Underground tanks.
7. Artificial containers.

A study of the breeding places shows that most of the breeding places that are present in Karachi are man made or exist due to improper drainage and sewerage system and the general public is ignorant about the danger of such man made breeding places.

**SUGGESTIONS.**

1. To establish a Mosquito Control Body to enlist cooperation from all quarters and execution of the Scheme.
2. To arrange Health Education campaign to control mosquito nuisance through all available media of communication.
3. To improve the drainage and sewerage system of the area.
4. To eliminate temporary breeding places from the area by appropriate means.
5. To treat the permanent breeding places under effective supervision.
6. To spray all areas of high endemicity with suitable insecticides.
7. To organise Active and Passive Case Detection and radical treatment of the cases.

**CONCLUSION.**

Active transmission of malaria has been detected in three different parts of Karachi city.

*A. stephensi* has been found to be responsible for transmission of malaria. Since *A. stephensi* has been detected with wide distribution throughout the whole city, it is expected that active transmission is going on through out the whole city.

2. Measurement of Ova of *A. stephensi* revealed the prevalence of the variety *myzorensis* in Karachi.

3. It appears that *A. subpictus* does not play any role in the transmission of malaria in Karachi.

4. *A. stephensi* and *A. subpictus* has been found to be moderately tolerant to DDT.

5. *A. stephensi*, *A. subpictus*, *Culex* spp. and *Aedes* spp., are widely distributed in the city and their different types of breeding places have been indicated.

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TABLE  
Consolidated Results of

| Date      | Name of Area                                               | Total Spleen Examined | SPLLEN |     |     |     | Total +ve | S. R. |
|-----------|------------------------------------------------------------|-----------------------|--------|-----|-----|-----|-----------|-------|
|           |                                                            |                       | 1      | 2   | 3   | 4   |           |       |
|           |                                                            |                       | 10     | 10  | 2   | 1   | 23        | 19.3  |
| 22-9-1966 | Sher Shah village<br>Dhobighat behind<br>Pakistan Quarters | 139                   | 7      | 9   | ... | ... | 16        | 17.9  |
| 23-9-1966 | Sher Shah Colony...                                        | 83                    | ...    | 1   | ... | ... | 1         | 2.3   |
| 24-9-1966 | (i) New Khumbar-<br>wara                                   | 39                    | 2      | 1   | ... | ... | 3         | 2.7   |
|           | (ii) Kala Kot                                              | 109                   | 3      | 3   | ... | ... | 6         | 4.4   |
|           | (iii) Chakrawa                                             | 140                   | ...    | ... | ... | ... | ...       | ...   |
| 25-9-1966 | DHOBIGHAT<br>Behind Pakistan<br>Quarters                   | ...                   | 9      | 5   | ... | ... | 14        | 28.00 |
| 26-9-1966 | (i) P. E. C. H.<br>Society                                 | 50                    | 7      | 2   | ... | ... | 9         | 15.5  |
|           | (ii) Martin Road                                           | 53                    | 11     | 2   | ... | ... | 13        | 26.0  |
|           | (iii) Behar Colony                                         | 50                    | 21     | 12  | 3   | ... | 36        | 52.1  |
| 27-9-1966 | (i) Phutan Colony                                          | 69                    | 8      | 5   | ... | ... | 13        | 26.0  |
|           | (ii) Jacob Lines                                           | 50                    | 5      | 4   | 1   | ... | 10        | 20.4  |
|           | (iii) Soldier Bazar                                        | 49                    | 12     | 2   | 1   | ... | 15        | 23.8  |
|           | (iv) Hyderabad<br>Colony                                   | 63                    | 8      | 8   | ... | ... | 16        | 37.2  |
| 28-9-1966 | (i) Intelligence<br>School                                 | 43                    | 12     | 2   | ... | ... | 14        | 12.1  |
|           | (ii) Kharadar                                              | 115                   | 7      | 1   | ... | ... | 8         | 9.0   |
|           | (iii) Ramswamy<br>Quar.                                    | 88                    | 5      | 1   | ... | ... | 6         | 8.3   |
|           | (iv) Aram Bagh                                             | 72                    | ...    | ... | ... | ... | ...       | ...   |

No. 1.  
Malaria Survey in Karachi.

| No. Examined | PARASITE |     |      |           |       | Remarks |
|--------------|----------|-----|------|-----------|-------|---------|
|              | Pv.      | Pf. | Mix. | Total +ve | P. R. |         |
| 38<br>1      | 19<br>1  | 1   | ...  | 20<br>1   | 52.6  | Infant  |
| 19           | ...      | 1   | ...  | 1         | 5.4   |         |
| 11           | 3        | 1   | ...  | 4         | 36.3  |         |
| 24           | 9        | ... | ...  | 9         | 37.5  |         |
| 36           | ...      | ... | ...  | ...       | 0.0   |         |
| 3            | 1        | 1   | ...  | 2         | 66.6  |         |
| 50           | ...      | ... | ...  | ...       | 0.0   |         |
| 58           | 3        | 3   | ...  | 6         | 10.3  |         |
| 50           | 5        | 0   | 0    | 5         | 10.00 |         |
| 69           | 7        | 8   | 0    | 15        | 21.7  |         |
| 50           | 4        | 0   | 0    | 4         | 8.0   |         |
| 49           | 3        | 0   | 0    | 3         | 6.12  |         |
| 63           | 7        | 0   | 0    | 7         | 11.1  |         |
| 43           | 6        | 0   | 0    | 6         | 13.6  |         |
| 115          | 3        | 1   | 0    | 4         | 3.4   |         |
| 88           | 3        | 0   | 0    | 3         | 3.4   |         |
| 72           | 1        | 0   | 0    | 1         | 1.4   |         |

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TABLE  
Consolidated Result of

| Date                    | Name of Area                       | Total Spleen Examined | SPLEEN |     |     |     | Total +ve | S. R. |
|-------------------------|------------------------------------|-----------------------|--------|-----|-----|-----|-----------|-------|
|                         |                                    |                       | 1      | 2   | 3   | 4   |           |       |
| 29-9-1966               | (i) Gollan, Wahidabad              | 73                    | 10     | 13  | ... | ... | 23        | 31.5  |
|                         | (ii) Nazimabad                     | 100                   | 20     | 5   | 1   | 1   | 27        | 27.0  |
|                         | (iii) Nazimabad (South)            | 58                    | 9      | 1   | 2   | ... | 12        | 20.6  |
| 2-10-1966 to 14-10-1966 | Dhobighat behind Pakistan Quarters | ...                   | ...    | ... | ... | ... | ...       | ...   |
| 6-10-1966               | Parkian Colony                     | ...                   | ...    | ... | ... | ... | ...       | ...   |
| 13-10-1966              | Kutchary Road                      | ...                   | ...    | ... | ... | ... | ...       | ...   |
| 15-10-1966              | LANDHI                             | ...                   | ...    | ... | ... | ... | ...       | ...   |
| 29-10-1966              | CLIFTON                            | 43                    | 3      | 4   | 2   | 1   | 10        | 12.00 |
| 30-10-1966              | Hub-Chowki                         | ...                   | ...    | ... | ... | ... | ...       | ...   |
| Total                   |                                    | 1517                  | 169    | 91  | 12  | 3   | 275       | 18.1  |

No. 1.  
Malarometre Survey in Karachi.

| PARASITE     |     |     |      |           |       |
|--------------|-----|-----|------|-----------|-------|
| Examined No. | Pv. | Pf. | Mix. | Total +ve | P. R. |
| 73           | 5   | 1   | 0    | 6         | 8.1   |
| 100          | 3   | 1   | 0    | 4         | 4.0   |
| 58           | 5   | 0   | 0    | 5         | 8.6   |
| 241          | 57  | 32  | 6    | 83        | 34.4  |
| 62           | 15  | 0   | 0    | 15        | 24.1  |
| 11           | 1   | 1   | 1    | 1         | 9.1   |
| 249          | 11  | 0   | 0    | 1         | 0.04  |
| 144          | 10  | 0   | 1    | 18        | 12.5  |
| 50           | 2   | 1   | 0    | 3         | 6.00  |
| 1627         | 181 | 54  | 8    | 227       | 12.4  |

Table 2. Entomological Survey for Adult Mosquito Consolidated Record of Karachi Area

| Entomological Survey for Adult Mosquito Consolidated Record of Karachi Area |                   |                           |                |     |               |      |                       |  |         |
|-----------------------------------------------------------------------------|-------------------|---------------------------|----------------|-----|---------------|------|-----------------------|--|---------|
| Area                                                                        | Month of surveyed | Total Number house Exam : | A. Step-hensi. |     | A. Sub-pictus |      | Culex & Aedes species |  | Remarks |
|                                                                             |                   |                           | F-M            |     | F-M           |      | F-M                   |  |         |
| Bazaria Line                                                                | April - 1966      | 10                        | 1              | 3   | 1             | 0    | Not recorded          |  |         |
|                                                                             | July - 1966       | 12                        | 57             | 45  | 95            | 55   | do                    |  |         |
|                                                                             | July - 1966       | 48                        | 217            | 230 | 647           | 615  | do                    |  |         |
|                                                                             | August - 1966     | 31                        | 241            | 238 | 647           | 576  | do                    |  |         |
| Kalapul                                                                     | Sep. - 1966       | 2                         | 85             | 94  | 16            | 8    | do                    |  |         |
|                                                                             | April - 1966      | 5                         | 8              | 2   | 8             | 6    | do                    |  |         |
|                                                                             | July - 1966       | 8                         | 65             | 38  | 76            | 51   | do                    |  |         |
| Golf Ground                                                                 | August 1966       | 8                         | 43             | 37  | 88            | 87   | do                    |  |         |
|                                                                             | April - 1966      | 4                         | 3              | 0   | 0             | 0    | do                    |  |         |
| Police Line                                                                 | April             | 4                         | 5              | 10  | 6             | 5    | do                    |  |         |
| Jutland Line                                                                | April             | 5                         | 3              | 1   | 4             | 1    | do                    |  |         |
| P.E.C.H. Society                                                            | August            | 3                         | 8              | 6   | 15            | 13   | do                    |  |         |
| Dhobighat behind Pakistan Qnarters                                          | September         | 9                         | 14             | 5   | 5             | 3    | do                    |  |         |
|                                                                             |                   | 55                        | 688            | 441 | 2199          | 1848 | do                    |  |         |
| Hyderabad Colony                                                            | September         | 9                         | 2              | 0   | 0             | 1    | do                    |  |         |
| Martin Road                                                                 | September         | 6                         | 0              | 1   | 1             | 1    | do                    |  |         |
| Kuchery Road                                                                | October           | 1                         | 6              | 0   | 3             | 2    | do                    |  |         |

|                   |           |    |    |    |     |     |              |     |                  |
|-------------------|-----------|----|----|----|-----|-----|--------------|-----|------------------|
| P.I.B. Colony     |           | 3  | 3  | 0  | 24  | 11  | 174          | 36  |                  |
| Drigh Road Colony | October   | 3  | 6  | 4  | 108 | 111 | 60           | 51  |                  |
| Chakiwara         | September | 6  | 1  | 0  | 7   | 2   | Not recorded |     |                  |
| Nazimabad         | September | 10 | 17 | 7  | 141 | 166 | do           |     |                  |
| Clifton Area      | October   | 12 | 64 | 29 | 43  | 30  | 214          | 258 |                  |
| Goltmar           | October   | 1  | 24 | 23 | 49  | 71  | Not recorded |     |                  |
| Baghdadi Line     | October   | 2  | 0  | 0  | 5   | 0   | do           |     |                  |
| Sher Shah Village | October   | 5  | 36 | 2  | 657 | 160 | do           |     |                  |
| Delhi Colony      | September | 4  | 43 | 34 | 52  | 16  | 208          | 119 |                  |
| Nazimabad (North) | October   | 3  | 0  | 0  | 3   | 1   | 63           | 52  |                  |
| Air Port, Karachi | October   | 3  | 0  | 0  | 3   | 0   | 3            | 12  |                  |
| Malir Colony      | October   | 2  | 0  | 0  | 3   | 5   | 830          | 607 |                  |
| University Campus | October   | 3  | 2  | 1  | 53  | 4   | 38           | 29  |                  |
| Korangi           | October   | 3  | 2  | 2  | 9   | 15  | 862          | 790 |                  |
| Laadi 37/B        | October   | 3  | 4  | 2  | 25  | 8   | 335          | 302 |                  |
| Phatan Colony     | October   | 7  | 0  | 0  | 45  | 14  | Not recorded |     |                  |
| Pipri             | October   | 8  | 57 | 2  | 44  | 73  | do           |     | A. culci. facies |
| Maeh              | October   | 6  | 64 | 27 | 109 | 0   | do           |     | F-M              |
| Hub. Chowki Area  | August    | 1  | 0  | 0  | 1   | 3   | 209          | 148 | 52 13            |
|                   | October   | 7  | 64 | 8  | 19  |     |              |     |                  |

Note :- Hub Chowki area is situated approximately 14-16 miles away from the Karachi city having rural type of conditions breeding of *A. culicifacies* was recorded in the Bank of Hub-Nadi having the clear rain water collection from the hills.

Table : 3 Consolidated Record of Larval Survey of Karachi City

| Area                                 | Month       | Species Recorded    |                     |                     |                                 | Remarks |
|--------------------------------------|-------------|---------------------|---------------------|---------------------|---------------------------------|---------|
|                                      |             | No-Larvae Collected | <i>A. stephensi</i> | <i>A. subpictus</i> | <i>Culex</i> & <i>Aedes</i> Sp. |         |
| Bazarta Line                         | April, 1966 | 239                 | 151                 | 128                 | Not recorded                    |         |
|                                      | July,       | 139                 | 46                  | 93                  |                                 |         |
|                                      | October     | 35                  | 0                   | 35                  | do                              |         |
| P.E.C.H. Society                     | September   | 258                 | 167                 | 91                  | do                              |         |
| Dhobighat (behind Pakistan Quarters) | September   | 50                  | 0                   | 50                  | o                               |         |
| P.I.B. Colony                        | October     | 86                  | 0                   | 22                  | 64                              |         |
| Drigh Road Colony                    | October     | 260                 | 20                  | 240                 | ...                             |         |
| Nazimabad                            | September   | 110                 | 0                   | 110                 | ...                             |         |

|                              |         |     |    |     |     |  |
|------------------------------|---------|-----|----|-----|-----|--|
| Clifton Area                 | October | 272 | 37 | 75  | 160 |  |
| All Basti (Gollmar)          | October | 55  | 0  | 55  | ... |  |
| Bughdadi Lines               | October | 160 | 0  | 40  | 120 |  |
| Delhi Colony                 | October | 92  | 49 | 43  | ... |  |
| North Nazimabad              | October | 32  | 0  | 12  | 20  |  |
| Landi                        | October | 155 | 0  | 20  | 135 |  |
| Pathan, Banarash Colony      | October | 320 | 31 | 289 | ... |  |
| Maeh                         | October | 38  | 0  | 38  | ... |  |
| Hub. Nadi Area Umar Jo. Goth | October | 67  | 26 | 41  | ... |  |
| Hub Nadi                     | October | 101 | 0  | 43  | 49  |  |

*A. culicifacies* (9 Larvae) also recorded for the Loc. 15 miles away from Karachi.

TABLE 4  
Species recorded in relation to type of breeding places

| Species                        | Type of breeding places                                                                                                                                              |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>A. stephensi</i> ;          | Ponds, Pools, ditchess, seepage and swamp water, borrow pits, leakage from tanks and pipes, ornamental water tanks, garden cisterns, wells and fountains.            |
| <i>A. subpictus</i> :          | Ponds, Pools, Ditchess, Swamps, Seepage water, hoofs marks, cart tracks, borrow pits, water reservoirs, Wells, water tanks, garden cisterns.                         |
| <i>Culex sp. and Aedes sp.</i> | Ponds, Pools, Drains, Ditches, Swamp, Seepage water, Wells cisterns, Footprints, water reservoirs, leakage from tanks, taps, garden cisterns, artificial containers. |
| <i>Aedes aegypti</i> :         | Water tanks, earthenpots, artificial containers.                                                                                                                     |

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## PREMATURITY.

By

Dr. (Miss.) H.M. Saeeda, M.B.,B.S., M.P.H. (U.S.A.)\*

A premature, in the strict sense of the word, is an infant born before he has reached full maturity. As a rule, he is smaller, weighs less and presents signs of poor adaptation to extra uterine life. For practical purposes a birth weight of 2500 gm. is internationally accepted as the limit below which a newborn is considered to be premature and to require special care and attention.

### Definition.

Various criteria that have been used to define premature birth include, length of gestation, birth length, and birth weight. Birth weight has come to be accepted as the most reliable and best index of prematurity although it has some limitations, but the other *indices* also have advantages. Reasons for not using length of gestation as the chief criterion, include the difficulty in obtaining an accurate date of the last menstrual period and the fact that a considerable percentage of women continue to have some bleeding at the time of expected menstrual flow for one or more months after conception.

The accepted international definition of a premature baby is based on weight *i.e.* 2640 G (5½ pound) or less—regardless of the estimated period of gestation. Because of immaturity, these babies need special care in regard to environments and feeding.

The 2500 gms., as a criterion for prematurity, is challenged in Western part of the world on the grounds that the average birth weight is lower in the east than in the west, due no doubt to maternal malnutrition in particular.

### Incidence.

The percentage of newborns, weighing less than 2500 gm., varies very considerably in the eastern countries. The incidence ranges from 5.5% in Sweden to about 50% in Thailand,

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Incidence in other countries has been estimated to be 30% in Ceylon, 30% in India, 10% in Japan, 7.6% in U.S.A., 6.5% in England and 5.5% in Sweden, while it is 28% in Lahore (Pakistan : 1961-62).

When weight and gestation period are combined and used as criterion to determine prematurity, the proportion of premature infants so classified, differs widely from the proportion found by using one of these criterion separately.

#### Factors influencing incidence.

Since a birth weight of 2500 gm or less is the generally accepted definition of prematurity, it is obvious that the incidence of prematurity is influenced by most of the factors that influence the birth weight of these infants.

#### Race, sex and plurality of birth.

A children's Bureau study showed that in a series of approximately 3000 live births, the percentage of infants with a birth weight less than 2500 gm, varied with race and sex, viz., 6% average white male and female infants, 8% average negro male infants and 14% average negro female infants. Incidence of prematurity among single-born and plural-born infants by sex and race in Newyork is as follows:—

| Single born infants: | Percentage: |
|----------------------|-------------|
| White males.         | 5.4         |
| White females.       | 6.6         |
| Colored males.       | 8.6         |
| Colored females.     | 12.6        |
| Plural-born infants. | Percentage  |
| White males.         | 51.6        |
| White females.       | 61.3        |
| Colored males.       | 62.2        |
| Colored females.     | 52.5        |

**(a) Age and Parity.**

That the mother's age and the orders of birth influence prematurity was pointed out by Woodbury, 8% among mothers under 20, decreasing to 4.1% for mothers from 35-39 and then increasing, to 4.8 for mothers 40 and over.

Anderson et al. also found the highest percentage of premature infants among mothers 15-19 years old and among Primipara.

**(b) Socio-economic factors :—**

Obviously incidence is higher in the lower socio-economic group. In U. S. A. a children's bureau study of infant over a period of several years showed that the incidence of prematurity was higher among ward patients, (6.8%) than among the private and semi-private patients, (4.3%).

**(c) Nutritional factors :—**

The studies that have been made in U. S. A. and Canada in which the mother diet during pregnancy was graded, have shown that the incidence of prematurity is higher among the women with the poor diets.

**(d) Toxaemia of pregnancy.****(e) Ante-partum haemorrhage.****(f) Premature rupture of the membrane.****(g) Non-obstetric conditions are :—**

- (i) Syphilis.
- (ii) Tuberculosis.
- (iii) Acute infectious diseases.
- (iv) Cardiac diseases.
- (v) Diabetes.
- (vi) Abnormalities of the genital tract e. g. vaginitis, pelvic deformation, and tumors.
- (vii) Smoking and alcoholism in women.

**Development :—**

In pre-natal life growth of all parts of the body does not proceed at the same rate, for example, some part may be still in the embryonic stage while others are in

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fetal stage of growth. Moreover, the changes that occur at one stage of development cannot always be sharply separated from those of the next stage, and the fetal development of some parts of the body extends into the neonatal period.

The postnatal growth in weight and length of premature infants has been studied and comparisons have been made with data for growth in the prenatal period and with those for full term infants. In general the conclusion reached is that, after the first few weeks of life, the growth of the premature infant tends to follow a pattern corresponding to the conceptional age of the infant, i.e. the growth tendency in premature infants in the period of infancy is, in general that of fetuses of the same size and age rather than that of full-term infants. (Premature infants, by Ethel C. Dunham PP.—48.)

### PRENATAL DEVELOPMENT

Some of the land marks of the Fetal development is described by arey as follows :—

#### I. During the first two months of intrautrine life.

- i. The face develops.
- ii. The external structures of the eye, ear and nose appear.
- iii. The limb organise as such, with digits demarcated.
- iv. The umbilical cord becomes a definite entity.
- v. The heart, which was the chief ventral prominence in earlier embryo, now shares this distinction with the rapidly growing liver. The two organs determine the shape of the ventral body until the eight week.

#### II. During the third month the fetus definitely resembles a human being, but the head is still proportionately large.

- i. The umbilical herniation is reduced by the return of the intestines into the abdomen.
- ii. The eye lids fuse.
- iii. Nails begin forming.
- iv. Sexes can now be distinguished readily.

#### III. At fourth month, the fetal movements begin to be felt by the mother. The face has a truly human appearance.

IV. At 5th month hair are present on the head and body.

V. During the 6th month the eye brows and lashes grow, the body is lean but in better proportion.

VI. At 7th month the fetus look like a dried up, old person, with wrinkled skin.

VII. In the eight month subcutaneous fat is deposited the testes invading the scrotum.

VIII. In the ninth month the fetus continues to round up due to the progressive accumulation of fat, the provisional downy hair coat begins to shed, and fetus is ready to deliver. The following criteria, observed either alone or in combination, have been more or less generally accepted as indicative or suggesting prematurity.

(Growth and development of children EH by Watson-G.H.Locury.)

1. A birth weight of 2500 (5lbs. 8oz or less).
2. A crown—heel length of 47 cm (18½ in) or less.
3. An occipito—frontal diameter of the head less than 11.5 cm (4½ in).
4. A head circumference less than 33 cm (13 in).
5. A thoracic circumference of less than 30 cm (11½ in).
6. Disproportion between head and thoracic circumference.

#### Clinical picture.

The clinical picture presented by a small premature infant is quite characteristic. The deficit of subcutaneous fat results in marked wrinkling of the skin, which is dull red and transparent, the superficial vessels being readily visible beneath it. The large head appears to be out of proportion to relatively short neck and extremities and elongated trunk. The eyes seem prominent and widely spaced while under development of the nasal bones results in a small, short nose. The ears are nearly devoid of cartilage. The tongue appears relatively large. The abdominal protuberance because of poor muscle tone, and umbilical hernias are frequently seen.

First of all feeding is the priority for the development of premature infant.

(Text Book of pediatrics 309 Nelson.)

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**FEEDING HANDICAP**

The feeding of premature infants is complicated because the various mechanism for ingestion and digestion of food are not fully developed. The more immature the infant the more difficult is the feeding problem. In addition, the needs for rapid growth in an infant born with low stores of minerals and vitamins must be met in the presence of the following handicaps.

1. The sucking and swallowing reflexes may be absent or sluggish.
2. The small capacity of the stomach leads to distention and vomiting.
3. The gastric acidity is low.
4. The absorption of fat is poor.

Keeping these in mind there are variety of techniques for the feeding of premature infants. There is general agreement on the importance of avoiding fatigue and the absorption of food as fed or by regurgitation.

Large premature infants can often be fed by bottle or breast. Since the effort of sucking is usually the limited factor, breast feeding is most likely to be successful.

In bottle feeding effort may be reduced by use of special small, soft nipples with large holes. Smaller and less vigorous premature infants should be fed by savage, soft plastic tube of No. 5 French external and approximately 0.05 cm. Internal diameters with a rounded tip and two holes on alternate sides is preferable. The tube is passed through the nose until approximately one inch of the lower end should be in the stomach. The free end of the tube is then placed under water. If bubbles appear with each expiration the gather is in the trachea, and must be reinserted into the proper position. The free end has an adapter into which the tip of a glass syringe is fitted, and measured amount of feeding is allowed to flow in by gravity. Such tubes may be left in place for three to seven days.

Change to bottle or breast feeding may be instituted gradually as soon as the infant displays general vigor adequate for feeding without fatigue. The smaller and less active infant may be safely allowed at least two days without intake. It is generally agreed that no fluids should be given by mouth for at least 12 to 18 hours after birth and in some instances the period may be as long as 3—4 days.

Milk feeding should follow a period during which 6–10% of glucose water only is given in small amounts at first and with gradual increase depending on the size and vigor of the infant. For small infants initial milk feedings of about 2 to 4 cc are recommended, for large and more vigorous infants 4–5 cc. The amount given at each feeding should be increased very gradually during the first week of life.

#### Caloric requirements.

The caloric requirements are of no concern in the first 2 or 3 days. The basic requirement of 50 calories/kg may be met by the third to fifth day, and calories may then be gradually increased until the infant receives about 90 (80–105) calories/kg, at the end of 10 days or 2 weeks.

### DEATH OF PREMATURE INFANTS

The available statistics dealing with deaths of premature infants are comprehensive for some countries, meagre or unavailable for others.

Deaths of infants due to prematurity in the United States is based on the information obtained from death certificates. It is found that premature birth takes a higher toll of infant life than any other condition, and it is 2nd of the ten leading causes of death among infants.

#### Death rate and trends.

Neonatal mortality attributed to premature birth and to all other causes by race from 1935–1948, has shown a marked decline from 32.4 to 22.2/1000 live births. It is apparent that progress has been made in reducing the mortality rate through the widespread recognition and study of this problem in recent years.

The neonatal mortality rate for live born infants, attributed to premature birth, among negro infants is higher than among white infants.

The neonatal mortality rates from premature birth for the year 1948 in different countries are as follows :—

|        |      |                             |
|--------|------|-----------------------------|
| U.S.A. | 10.8 | death per 1000 live births. |
| Canada | 10.7 | deaths —do—                 |

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|                    |     |      |
|--------------------|-----|------|
| England and Wales. | 8.1 | —do— |
| France.            | 7.2 | —do— |

A number of factors influence the survival of prematurely born infants. These are :—

(a) Birth weight is an important factor since the lower the birth weight, the lesser the chances of survival. It is for this reason that in special community programmes for premature infants should be started and priority is to be given to those infants who are in the lower birth weight groups.

(b) Sexual Race, is another factor influencing the survival of prematurely born infants. The survival among the non-white infants is greater than that among white infants. Female premature infants have better survival rates than do males.

(c) Question of age has a considerable influence on survival among premature infants in the same weight group.

(d) The mother's health during pregnancy also has an effect on survival of premature infants. The premature infants delivered of mothers with a normal pregnancy have better survival rates than do premature infants delivered of mothers with abnormal pregnancies.

Major causes of death in premature infants at autopsy include (i) abnormal pulmonary ventilation, (ii) birth injury, (iii) infection, (iv) malformation (v) anoxia and (vi) blood dyscrasias.

#### Programmes for the prevention of prematurity :-

##### Pre-natal Care.

##### Standards of prenatal care.

In general, the standards point out the importance of visits to the physician for prenatal care early in pregnancy and for continuing the visits at regular intervals throughout pregnancy. At these visits, consideration should be given to the mother's general health and her past pregnancy history as well as to the progress of her present pregnancy.

The standards for prenatal care have been generally accepted but the evaluation of prenatal care as a factor in preventing premature birth is complicated by the pre-

sence of other factors that play a role such as (i) economic status (ii) failure on the part of some women to appreciate the value of prenatal care, (iii) inaccessibility of clinics, and (iv) sometimes the physicians failure to give adequate care.

Another approach to the problem of prevention of premature birth is organized programmes to lower the incidence of puerperal conditions with which premature labor is associated. An example is found in a report from the Women's Hospital, Sydney, (Australia), of the efficiency of intensive antenatal care programmes in reducing the incidence of prematurity. These measures were described by Hamlin under seven steps as follows :—

1. *Stimulation of attendance* at prenatal clinics by nurses, midwives and sisters.
2. *Lectures* :—To explain the need for regular prenatal supervision and dangers on account of failure to attend.
3. Increased supervision of patients in rural areas.
4. *Co-ordination with prenatal clinic* :—The Woman's Hospital sought and obtained good co-ordination with those physicians in the Government prenatal clinics who supervised the hospital's patients living in Sydney's outlying districts.
5. *Blood pressure* :—Any patient who, after the twentieth week, had rise in blood pressure upto 130/85 where the original readings has been less, was seen more frequently.
6. *Edema* :—Digital edema, sufficient to cause a ring, to be uncomfortably tight at the 31st week. Specially in young primiparas, it was considered a warning sign.
7. *Diet* :—increasing control was exercised over the women's rate of weight gain between the 20th to 30th week of pregnancy because a gain of more than 8 pounds during that period was considered as evidence of a pathological condition.

Since a large proportion of the deaths are associated with, low birth weight, early and adequate prenatal care is of primary importance to prevent complications of pregnancy or to prolong pregnancy safely until the infant is sufficiently mature to

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have good chance of survival, for which an expert WHO Group on prematurity wishes to emphasize the importance of giving consideration to two types of programmes...

(a) for lowering the incidence of prematurity.

(b) for the care of the prematurely born infants.

The group considered the pre-requisites and *content* for undertaking each type of programme and recognized that the initiation of a preventive program might precede the initiation of a specialized care program. Either type of program may be initiated in a localized area or on a countrywide basis.

Setting up these requirements does not necessarily tend to *deter* less well developed countries from developing premature infant program but is intended to encourage the establishment of general public health measures and the strengthening of maternal and child health program before embarking on a specialized program aimed specifically at the reduction of premature infant morbidity and mortality.

#### REFERENCES.

1. Public Health Considerations—Death of Premature infants—Page 141  
Premature infants. Ethel C. Dupham.
2. The premature infants Health—Services for mothers and children—by Hale M. Wallace. Mortality among premature infants : page 84.
3. World Health Organisation—Technical Report—Series No. 27 : Expert group on prematurity, page 5.

#### For lowering the incidence of prematurity.

The WHO group was of the opinion that a program to reduce the incidence of prematurity may be introduced in a country even if the pre-requisites for a specialized care program have not yet been met.

#### The group outlines the following pre-requisites.

- (a) An actively working public health organisation with a well developed maternal and child health section, including adequate number of well qualified physicians, nurses and midwives.

- (b) Evidence of a steadily downward trend in infant mortality rates.
- (c) Evidence that a program is being developed to educate the public as well as professional worker with respect to the need for a preventive program.
- (d) Efforts made or in progress to determine the chief causes in a particular area before activating the premature preventive program.
- (e) Attempts to ameliorate unfavourable social, economic and hygienic conditions, including legislation for protection of pregnant women in industry and means for implementation of such legislation.
- (f) Adequate provision for hospitalization of women, with complications of pregnancy.

There is sufficient knowledge to make it clear that a premature infant program will result in lowering the incidence of premature birth for certain known causes and will result in the prolongation of pregnancy, delivery of more mature infants, and thereby, the reduction of premature infant mortality.

The group suggests that a preventive program should include the following :—

**1. Educational programme, stressing the importance of :—**

(a) Early and continuous prenatal care, availability of such care and measures for obtaining these services.

(b) Maintenance during pregnancy of good health, nutrition, physical, mental and emotional well being.

**2. Provision of service :—**

(a) Prenatal clinics providing medical, nursing, public health and social services.

(b) Hospitalization of pregnant women with complications.

(c) A well organized delivery service hospital or home.

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(d) Protection of the pregnant women by means of :—

- (i) Adequate legislation to promote physical rest and freedom from anxiety.
- (ii) Provision of auxilliary services to make possible fulfilment of the legislation.

### **PROGRAMME FOR CARE.**

#### **Pre-requisites for a specialized care programme :**

- (a) Birth registration as complete as possible and date on the birth weight and or gestation period entered on the birth certificate, if possible.

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1. Public Health Considerations—Deaths of premature infants—page 341, premature infants ; Ether C. Dunham.
2. The premature infants—Health Services for mothers and children : by Helen M. Wallace. Mortality among premature infants : page 84.
3. World Health Organisation—Technical Report, series No. 27 : Expert group on Prematurity : Page 5.

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# PRODUCTIVITY AND HUMAN RELATIONS\*

By

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In the present age of Science and Technology, more and more emphasis is being placed on the subject of Productivity and Human Relations, for a better and happier life for this and the succeeding generations. The subject of Productivity and Human Relations, is not to be considered as a form of what has been described as "*Mao-cow Sociology*" the science of keeping the cows happy in order that they will give more milk. If there is the slightest suspicion that this is so then all efforts at improving human relations to achieve better productivity will be still-born. During the last four decades, research in U.S.A. and U.K. have highlighted the need for the administrators and supervisors to use the best human relations techniques in order to obtain increased productivity by satisfying the socio-economic needs of the people in an organization - a social institution.

## Productivity.

Productivity may be defined as that quality of a worker which, if improved will help him to do better and more work and if this quality decreases, the worker's output will diminish. The term productivity is one of the most elusive concepts in Development economics. Productivity ratio can be misleading if due care is not taken to its interpretation. As productivity is simply a ratio between output and input, rising productivity does not necessarily reflect again in the well-being of the people. The productivity indices may show a rise when both output and input increases and when both output and input falls. It is thus imperative that in interpreting productivity data, one must take cognizance of the physical changes in output in juxtaposition with the direction in which such changes appear to be taking place.

## Labour Productivity.

Labour productivity is of considerable interest to economists from Soviet Union and Eastern European countries not only on theoretical grounds but also because of its role in specific planning. The topic is no less significant to economists

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in the United States and Western Europe, for the formulation of economic policies. The meaning and measurement of productivity within a country and among countries, presents a wide variety of methodological and statistical problems of great concern to both groups of economists. Labour productivity has considerable implications for wage setting both at the plant level and for the economy. There are a wide range of factors, technical and organizational which influence labour productivity. Productivity is usually measured by dividing output in physical units by man-hours worked:

$$\text{Productivity} = \frac{\text{Units of output}}{\text{Man-hours worked}}$$

The reasons for selecting labour time as the unit of input are: (1) it is present in all production; (2) because we are a society of men, not machines, we are especially interested in how man's efforts are used and (3) better statistical record exists for employment and hours worked than for the most other factors that serve as inputs. Analysis of productivity changes over long time spans is a useful kind of interpretation of the statistical measures. For long periods it is generally true that increases in productivity can be taken as indications of improvement in the economic situation of the industries involved. Caution must be used in analysing short-period changes in productivity, whether at the level of the plant or for broad sectors of the economy. They are nevertheless of great use as a point of departure for examination of what has actually happened to the process of production.

### Productivity and work Study.

Knowledge of work study is now becoming widespread and its methods are being used with signal success in many branches of industry and the public services. It is a general tool of management but perhaps its most important result is to inculcate an attitude of mind that seeks continuous progress in a systematic manner. The agreed definition of work study issued by the British Standards Institute is that it is a generic term for those techniques, particularly method study and work measurement which are used in the examination of human work in all its contexts and which lead systematically to the investigation of all the factors which affect the efficiency and economy of institutions being reviewed in order to effect improvement. The objective of work study is to assist management to obtain the optimum use of the human and material resources available to an organization for the accomplishment of the work upon which it is engaged. The term work study itself is used to associate two distinct yet completely interdependent groups of techniques. These

groups have been subtitled method study and work measurement respectively as shown in fig. 1 (Currie, 1963). As this diagram suggests, the techniques to which they refer are concerned on the one hand with the way in which work is done i.e. method and on the other with the value of work content.

### **Human Relations - Art And Science.**

The term human relations came to fore as the designation of a trend if not a movement, in the late 1940's although its roots go farther back. It was the cumulative effect of a variety of influences shaping the transformation of human side of industry in the 1920's. The human relations movement came into existence prior to automation, gaining maturity almost simultaneously with the birth of the computer. Human relations is both an art and a science. It relates both to the individual and the group. In the field of administration, both the officials of the personnel office and the line superiors under whom most of the employee work have an important role to play. Most recent researches have pointed out the need for the administrator to use best human relations practices in order to motivate as well as to satisfy the needs of people in the organization. The assumption by classical economists that economic man responds to monetary stimuli only has been proved to be an unreal assumption.

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The field of human relations is not only concerned with the impact of different administrative practices upon groups and the different group reactions to these practices, but also with the individual in business. Understanding and influencing human behaviour requires knowledge of the needs of man. These needs are Biological and Sociological. Biological needs serve some physiological functions while the sociological needs are primarily social in nature. These needs are not inborn in man nor are they related to his survival as an organism except in an indirect way. These needs have their origin in the training he receives from numerous social organizations to which he belongs. The sociological needs are acquired, they develop differently in different cultures. Thus the human reactions of subordinate employees though similar from the point of view of biological needs, will tend to acquire a different colouring and form depending on the variations and difference in cultural background and conditions.

### **Culture.**

Culture refers to man-made environment, the influences that the individual unconsciously absorbs and those govern his behaviour. Culture in this broad sense consists of knowledge, beliefs, traditions, customs, art and law. Culture consists not only of action and behaviour, but also of objects and things that express and maintain conventional understandings, such as clothing, utensils, houses, means of transportation, weapons and places of worships. While culture is common to mankind, it varies in its manifestations. People in different cultures seem to respond favourably to their sense of personal worth and importance. Personality is moulded by institutions, individual experiences and philosophical principles, all of which are culture in nature.

### **Human Nature.**

Human nature can be changed in at least four ways, two of which are in the realm of biological science. The first method of changing human nature is in the area of social reform. The second is entering the management realm through the new departments of industrial medicine. The third and fourth approaches are directly available to management and these are (3) cultural change, or changing the environment of the work place, and (4) changing behaviour through education and learning. The most obvious means of bringing about cultural change in a management situation is to alter the social climate. A good example is the new "sensitivity"

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training which attempts to make top management aware of the importance of human reaction to management decisions and actions. The object is to make the entire hierarchy aware of the importance of two-way communication, consultative supervision and person-to-person interaction. It is now realized that one cannot alter behaviour merely by teaching the techniques of human relations, and as such the management must be made receptive to the new ideas.

### Research In Human Relations.

The intensification of social science research in the 20th century is both a cause and a symptom among the forces which gave rise to the human relations-in-management movement. The origin of the modern social survey is credited to the French sociologist Le Play around 1850.

### Hawthorne Studies.

In U.S.A the Hawthorne studies at the Western Electric Co. Chicago, were conducted during 1920s by Elton Mayo and his co-workers for a period of 5 years. These studies helped to bring into being the so-called "Human relation" school. The experiments were conducted to measure how productivity was affected by certain changes in physical working conditions. The investigators placed five girls in a separate Relay Assembly Test Room, and placed an observer in the room to keep accurate records and maintained a friendly atmosphere. During the first few months physical conditions were maintained without change in order to get the girls accustomed to the test room. In this period hourly output rose for no apparent cause. The physical conditions were then gradually improved; hours were decreased below the original 48 hours week, rest periods of different lengths and frequencies were introduced. Hourly output rose steadily usually more than enough to counterbalance the decline in hours of work. After a year and a half of charting these changes, it was decided to withdraw all improvements in physical working conditions and return to the original conditions at the beginning of the experiment. As a result hourly output fell somewhat.

In the next period hours were reduced and rest periods brought back. Hourly output then rose very sharply, so much so that despite the decline in hours it brought weekly output to its peaks. Perhaps the reason could be found in the changed operation of Hawthorne's incentive wage plan, i.e. a plan where higher production was rewarded by bonuses. In order to isolate the influence of wage incentive two supplementary experiments were conducted. First by, five other girls were organized

into a second Relay Assembly Test Room, identical in every way to the first except for the change in wage incentive. These supplementary experiments convinced the research workers that neither wage incentives alone, nor all the changes in physical conditions taken together, could explain the increases in output in the first two years of the Relay Assembly Test Room experiment.

Mayo and his co-workers calculated that the increase in output was related to the change in the factor of human relations. The experimental data demonstrated that other factors being constant, change in the style of supervision has a direct bearing on productivity. The girls received more attention and had grown into a close-knit groups. They cooperated not only with the experiments but also with each other. They grew more and more to enjoy their interpersonal relationships at work. Out of this grew "new group loyalties" and solidarities i.e. informal organization. In brief, the human relations between workers and their supervisor and among the workers themselves are an important factor on workers behaviour, atleast as important as physical working conditions and monetary incentives. Since the explicit formulation of the importance of the factor of "Human Relations" in administration by the now popularly known Hawthorne's studies, there has been a number of similar research studies. The conclusion was that the rise in production throughout the exercise was not due to the experimental periods, wage changes, or to any other physical factors but was, due to the change in the attitude of the workers.

#### Chesapeake & Ohio Railways Research Project:

The research work in human relation on the Chesapeake and Ohio Railways in U. S. A ; was carried out by Katz *et al* (1950) to study the Productivity and some of the factors i.e. characteristics of supervision and morale of the employees which affect it. In brief, the research findings showed that the behaviour of the first level supervisor was an important factor in determining the Productivity of a work group. Moreover, the various supervisory characteristics which were associated with high Productivity were related to each other in a meaningful way. High Productivity is not something which a supervisor attains accidentally, nor is it achieved by performing certain magic gestures. The supervisor is successful because he has a different concept of his role and responsibilities, a different set of attitudes towards his employees and a different approach to people and to their modifications on the job.

The supervisor regards the attainment of high productivity as a problem in motivation and sees his role primarily as one of motivating workers to achieve

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a goal, and to create a condition under which the goal can be accomplished. He differentiates his role clearly from that of the workers themselves, he clearly perceives and accepts the responsibility of leadership. The practice of working along with the men, doing what they do, rather than concentrating on supervisory and planning activities, is typical of the low producing supervisor. The high producing supervisor sees the job in terms of the employees needs and aspirations; he is employee-oriented, but does not abdicate the leadership position. His men report that he takes a personal interest in them and that he behaves in an understanding, non-punitive fashion when they encounter problems on the job.

### Human Relation Factors and Productivity :

Human relation factors like leadership, attitude, change, human behaviour, mode of communication, superior-subordinate relationship, significance of training, Delegation of Powers, Co-operation, motivation, participation and conflicts directly or indirectly influence productivity in those areas where human resource are used for the accomplishment of goals/targets. Human relation factors like leadership, attitude, change motivation, not diananation, cooperation and superior subordinate relationship influences productivity in those areas where human resources are used for the accomplishment of goals targets. Figure No. 2 shows that lack of appreciation of human factors lead to low productivity as the human factors are systematically geared to obtain maximum results. The productivity increases with the greater appreciation of human relation factors as shown in figures No. 3 and 4. Figure No. 4 shows that due appreciation of the human relation factors can result in a three times increase in productivity when compared with the one where there is lack of appreciation of human relations factors (Figures 2 and 4). Figure Nos. 5, 6 and 7 show the statistical representation of the levels of productivity in relation to various human relations factors. With the advance of Science and Technology especially in countries like U. S. A., U. K. and Germany ; it is becoming more and more clear that the appreciation of human relation factors has led to increase productivity in those countries. In the following pages, these factors are kriefly discussed.

### Leadership.

The Role of the leader in the field of productivity and human relations is of paramount importance. Leadership may be defined as the projection of personality. It is that combination of persuasion, compulsion and example that makes other people

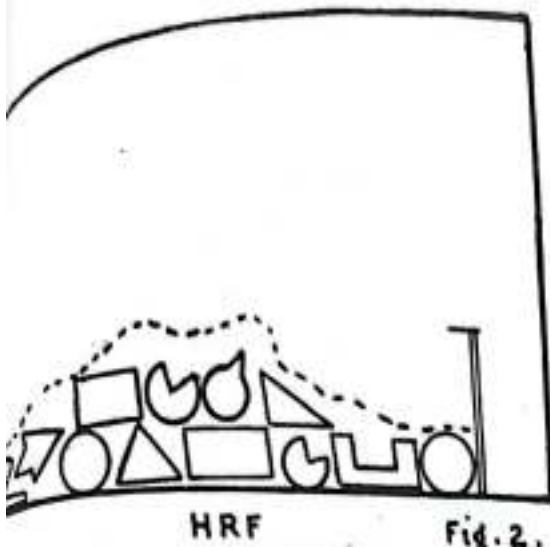


Fig. 2.

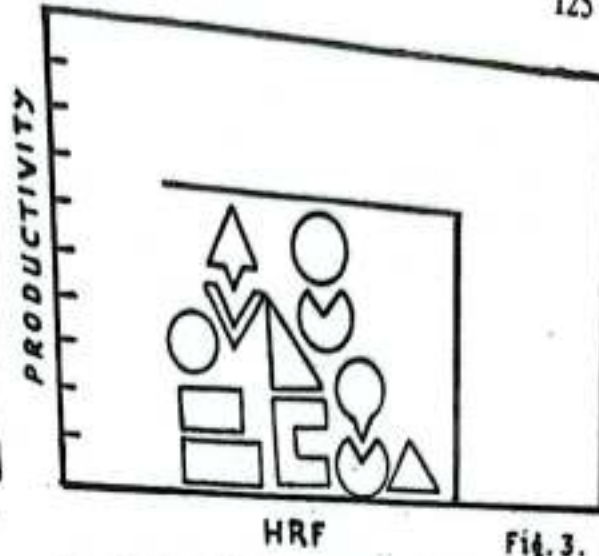


Fig. 3.

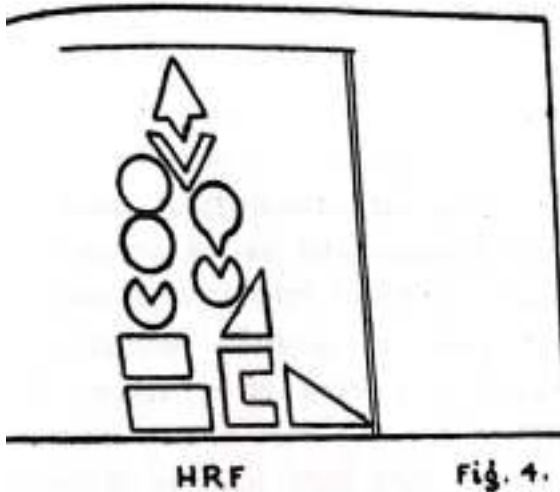


Fig. 4.

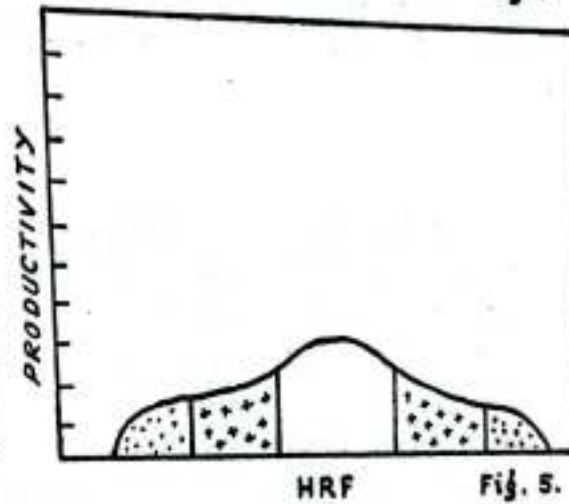


Fig. 5.

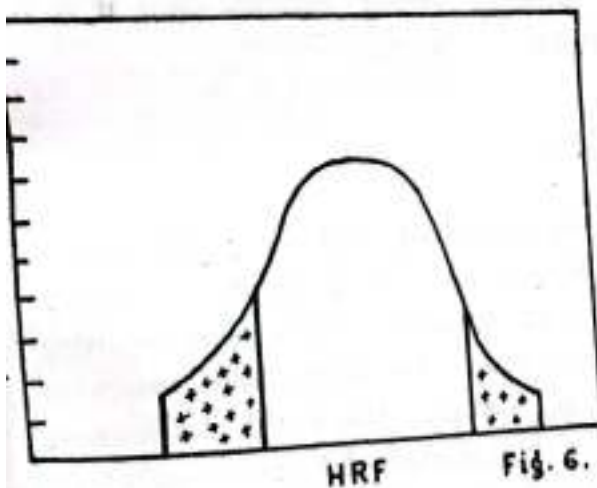


Fig. 6.

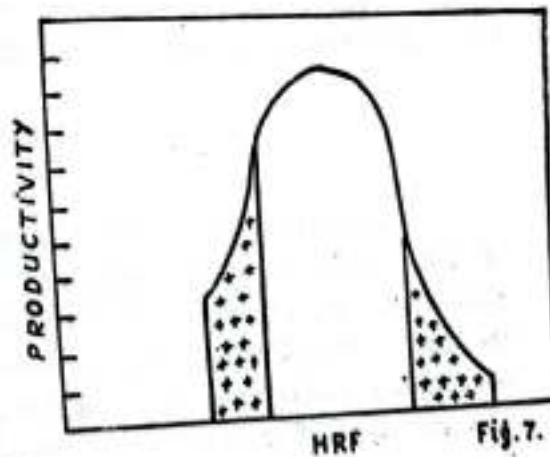


Fig. 7.

FIGS. 2 TO 7 SHOW THAT THE APPRECIATION OF HUMAN RELATIONS FACTORS (HRF) INCREASES THE LEVEL OF PRODUCTIVITY.

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do what the leader wants them to do. The personality of a successful leader is a blend of many qualities, *i.e.*, creativity, vision, courage, drive, will power, judgement and flexibility of mind, ability to delegate authority, sincerity, sense of humour, ability to listen and learn, control and coordination, co-operation, development of people, sense of participation, vision and courage are the basis of leadership. It is no more in the higher than in the lower level of command, but the greater the responsibility the more the emphasis shifts from physical to moral courage—a much rarer quality essential to higher leadership. Will power is the most obvious requirement in a leader's make up. The main task of a leader is to make decisions. A man has no right to set himself up as a leader unless he knows more than those he is to lead. The leader is one who confers, listens, reads, deliberates with advisors and subordinates, and then acts in a democratic manner.

### Attitudes.

A knowledge about attitudes is essential to the administrator because he remains in constant contact with people as a leader and as an organizer of work resulting in productivity. Attitudes are patterns of behaviour in response to particular people and the most familiar kinds of attitudes are political, religious and social ones. Attitude is treated as a frame of reference. The administrator should develop an appreciation of the fact that human relations problems largely stem from misunderstanding that have their basis in different frames of references. The behaviour of another person becomes clear if it is analysed in terms of his own frame of reference.

### Change.

It is recognized that change increases productivity and the principal areas of change with which the supervisor is charged are (1) the patterns of organizational behaviour (2) systems and (3) the work methods of individuals involving the loss of old skills and the acquisition of new. The tremendous growth of organization during and after World War II, has necessitated the development of a new type of manager whose behaviour is characterized by planning, delegation, of responsibility, mutual feed-back, communication, working, consultation and listening and developmental coaching. The most pertinent change, it would seem, for the supervisor is an increase in his social awareness a deeper understanding of the cultural and behavioural forces at play within his own job sphere. He must realize that there is a difference between understanding certain values and internalizing them to make them a part of his own personal values.

Internalizing is a term sometimes used by behavioural scientists to indicate a belief that the idea for change came from those affected by it.

### Goals.

It is now known that productivity increases when goals of employees and organization correspond. Numerous research studies *i.e.* Armed Services, clerical workers produce extensive evidence that productivity can be increased substantially and waste correspondingly lessened when the goal of work groups shift so as to become more consistent with the objectives of the organization. This was probably the most striking result of Hawthorne experiments. When the attitudes of the girls in the first Relay Assembly Room gradually shifted from opposition to the objectives of the company to greater acceptance of these objectives a substantial increase in the production occurred and important information about the total operation of which management has been unaware began to flow.

### Human behaviour.

Although man is distinguished from other animals by virtue of the fact that he thinks and reasons, he is only partly a rational animal. A tremendous proportion of human behaviour is irrational in nature. The supervisor should try to understand the causes for irrational behaviour that interfere with management objectives. Some of this behaviour can be partly altered by training while some is resistant to change. It is important for the supervisor to remember that behaviour is usually not the result of careful weighing of the facts and the choice of alternatives. Perhaps the preponderance of man's behaviour is the result of unconscious motivation. This is why the good supervisor is one who seems to have a high capacity for sensing when and how workers may react on a non-rational basis. One of the difficulties in discussing rational and irrational behaviour is that what seems perfectly rational to some, will seem highly irrational to others.

### Communication.

The important element in good human relations governing superior-subordinate set up in an organization, is the mode of communication. There is no question that one of the foundation stones upon which organization rests is a system or systems of communication. The problem of communication is very

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important in the effective integration of any group or of a group of groups. The relationship between communication and decision making is now regarded as extremely important. The channel of communication between the superior and the subordinate must be a two-way affair. The first step should be to communicate in a language which is easily understandable and then to make the rank and file feel identified with the organization. This ties indirectly with the sense of belonging, the generation of team work, the practice of consultative supervision, and the development of social satisfaction.

Another step is to develop clarity and frankness in the presentation of data relating to the financial status of the organization. The only approach to the problem seems to be the elementary teaching tactics of stating simple truths over and over, perhaps striving for variety in media of presentation. The information may also be supplied through employee's bulletin board and other media that reach the rank and file. No matter how elaborate a system of formal communication is set up in the organization, this system should always be supplemented by informal channels. Through these channels will flow information, advice, and even orders. The informal communication system is built around the social relationship of the members of the organization.

The informal communication system taken on additional importance when it is remembered that the behaviour of individuals in an organization, is oriented not only towards the organization but also to a certain extent towards their personal goals. Hence, when organization members deal with one another each must attempt to assess the extent to which the other's attitudes and actions are conditioned by personal rather than organizational motives. When a primary relationship has been established between them, it becomes easier for them to make this assessment and easier for them to be frank in regard to their motives.

### **Superior-Subordinate Relationship,**

Sound superior-subordinate relationship is conducive to high productivity. The superior-subordinate relationship is conditioned by environment, or organizational climate, which is conditioned by many opposing forces. An environment conducive to good interpersonal relationships would be one that was in a state of equilibrium. Chapple and Coon (1955) state that equilibrium, or state of equilibrium, are characteristics of both individuals and groups and that individuals in a group adjust their interaction rates to each other. There is no doubt that

the total organization climate effects members at the lowest level of hierarchy. The first line of supervision does absorb some of this pressure, however, and each successively higher level of supervision does the same. Seldom does a supervisor escape, during his employment, the admonition to motivate his employees to greater production.

Research tends to indicate that the employee might be more realistically motivated by the behaviour of his supervisor within the small group of which they are both members. The quality of supervision correlates with occurrence of absenteeism, employee satisfaction is greater under supervisor who do a very good job explaining the reasons for changes in labour standards, a high level of performance tends to be positively associated with supervisor's supportive behaviour.

Peltz (1952) showed that the amount of influence which a superior felt he had with his own superior effected the response of his subordinates to his supervisory acts. When supervisors who had above average influence with their own boss followed procedures which are generally considered to be good "supervisory behaviour" their subordinates tended to react favourably; when superiors who were below average in the amount of influence they had with their superiors practiced these same desirable supervisory procedures they usually failed to obtain a favourable reaction. To function effectively, a superior must have sufficient influence with his own superior to be able to affect the superior's decisions when required. Subordinates expect their supervisors to be able to exercise influence upward in dealing with the problem on the job and in handling problems which affect their well-being.

#### Significance of Training.

Training is a pre-requisite of a competent supervisor. The supervisor should be trained at different stage of his service career and the training of his subordinates should be his responsibility. Training has as its goal/behavioural change, which ultimately constitutes organization change. Change in the supervisor, in the employee and in the organization will be achieved to a significant degree only through integrated training within the superior-subordinate relationship. Change in the organization will best be realized if the supervisory role incorporates the change agent role. Within the chain of successive superior-subordinate relationships, change must be both permitted and stimulated. The supervisor must

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accept people as they are. A personality that has been formed by countless influences over a period of several decades cannot be remoulded by even the most skilled supervisor.

A living person is constantly changing; he will not be tomorrow exactly the same as he is today. The new developmental management will have a large role for training, but it will be an altered role. Such training in the human relations field as was carried out in the past was, paradoxically, both stereotyped and unstructured. The human relations training of the future will be much more sophisticated, as will be the trainers themselves. The increasing intellectual content of job technology at all levels will bring a nucleus of people with intellectual curiosity who will ask probing questions. This will stimulate the trainers to become familiar with pertinent literature in the behaviour sciences.

### Delegation Of Powers.

Delegation of powers at appropriate levels increases productivity and the ideal delegator tries to minimize harmful anxieties on the part of his subordinates but he realizes that in order to do so he must master his own anxieties. Therefore he has learned to absorb heat from above and refrain from passing it on in the same form that he has received it. He is constantly evaluating his people in his own mind, knowing the degree to which each is able to assume authority and make decisions on his own. He is constantly trying to meet their needs—to be helpful without going so far as to invade their sphere for growth through self-reliance. In discussing problems he calls for suggestions as to solutions but he is careful to leave the decisions to the subordinates. He is able to influence people to alter long-established practices deeply rooted in their culture and he learns to work through their own leaders and groups.

### Cooperation.

In the field of Human Relations, cooperation cannot replace conflicts unless means are provided for the rank and file, not only to communicate their sentiments and feelings upward, but also to assure that these communications will be received, considered, and acted upon. It should be emphasized in management training that conferences will conform to a pattern if permitted to develop naturally. This pattern will usually go through the following steps. (1) Subordinates fail to speak up in the presence of their supervisor (2) when after a time they become sure that they can speak up with impunity, a conflict situation arises not only between the superior and-

to subordinates, but perhaps between members of group, (3) if proper time is permitted to elapse, these conflicts will subside through their own catharsis and the group will begin to come together through its own thinking; (4) the law of the situation will emerge; (5) it will usually not be necessary to take a vote to ascertain the dominant opinions and sentiments, because they will emerge in the form of a "sense of the meeting" rather than in a vote of 'Yes' or 'No'. A new day in human resources would emerge if management people could be made to realize that this pattern is inevitable and that their apprehensions of meetings where there is free discussion by subordinates is groundless.

### **Motivation.**

Motivation may be seen as a combination of forces maintaining human activity. Motivation, morale and incentives are distinctive aspects of a person's connection with his work organization. Motivation is something that moves the person to action and continues him in the course of action. Motivation in the organization is continuous. The person composing the organization, once they become a part of it, automatically fall into a pattern of motivation initiating and sustaining their organization activities. In the context of motivation, three features of the work assignment—task duties, and rights are seen as impersonal environmental forces moulding behaviour in each work assignment. They channel technical activities and the activities concerned with general behaviour in the work organization. It can be concluded that a system of motivation is an essential ingredient in any organization. Furthermore, it is a permanent feature of an organization and tends to reflect the nature of the organization, its goals, objectives and underlying philosophy.

There are two ways of measuring morale, depending on the definition. Morale has been compared to the state of health of a living body. Lack of morale like lack of health cannot often be reduced to a simple cause. An understanding of problems relating to morale requires a useful way of thinking about human being in their associations with one another as a social system. Viewing from this angle, the problems of morale in an organization breakdown into two parts (1) the daily problems of maintaining internal equilibrium with the organization (2) the daily problems of diagnosing possible sources of interference, of locating some spots, of liquidating human tensions and strains among individuals and groups. These would be the two controls in the hands of the administrator to keep the morale tone right, for higher productivity.

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An important part of the motivation for work is the feeling that the job to be done is important and preferably that theorists also feel the same way about it. This sense of importance of one's own job is first of all the product of the ways in which that job is valued in the society.

### Participation.

Participation of employees in decision-making is a must in the field of productivity and Human Relations as participation promotes confidence, understanding and sense of responsibility between workers and the management and thereby stimulates cooperative motivation. Some of the advantages which stem from participation are (1) A higher rate of output and increased quality of product as a result of greater personal effort and attention on the part of subordinates. (2) A reduction in absenteeism and tardiness (3) A reduction in the number of grievances and more peaceful superior-subordinates and superior-union relations, (4) A greater readiness to accept change. (5) Greater ease in the management of subordinates (6) The improved quality of decisions. Furthermore, participation tends to break down the barriers, making the information available to superiors.

### Conflicts.

An organization operating under newer theory is not free from conflicts. Conflicts and differences of opinion exist in a healthy, virile organization, for it is usually from such differences that new and better objectives and methods emerge. Differences are essential to progress, but unresolved differences can immobilize an organization. The central problem, consequently, becomes not how to reduce or eliminate conflicts but how to deal constructively with them. Effective organizations have the capacity to handle conflicts. Confidence, loyalty, and cooperative motivation produce earnest, sincere and determined effects to find solutions to conflicts. There is greater motivation to find a constructive solution than to maintain an irreconcilable conflict. The solutions reached are often highly creative and represent a far better solution than any initially proposed by the conflicting interests.

### Need for Research in Social Sciences.

Research is the key to knowledge and in knowledge lies the socio-economical development of mankind. As the present day administrator is associated with the development of natural and human resources, it is becoming morand

one imperative that he should be research-oriented and training-minded in order to be able to utilize human resources to ensure maximum productivity. Whereas physical and biological research applied to the country's resources and industrial development, is receiving increasing attention and support, the vital role of research in the Social Sciences—Economics, political science, Sociology, human behaviour, Anthropology, and Administration, has not been fully recognised. In the present Age of Science and Technology, there is a need for the establishment of Pakistan Council of Social Sciences Research just as we have Pakistan Council of Scientific and Industrial Research, Pakistan Medical Research Council and others. The need for Social Sciences is great as people and the Government are making plans for social and economic development. Information/data of statistical value must be collected and analysed to make such plans realistic.

Some of the professional organizations, are making a good beginning but at the moment are not actively engaged in the field of research. To overcome these deficiencies, it is desirable that Pakistan Council of Sciences Research be developed. The Council should not undertake research by itself but it should act as a source of dynamic leadership to plan, encourage, and organize research in Social sciences in different universities and institutions in Pakistan. The creation of this council with a small grant for operating purposes and a large grant for development would in itself stimulate the advance of social science and thereby will contribute to the development of Pakistan.

The main problem in Pakistan is to provide a reasonable standard of living to our people keeping in view our limited natural resources but abundant human resources. This means that the entire population is to be inspired, to bring about a national awakening and thereby to create an up-surge for balanced development by giving their best both individually and collectively, with a view to achieve maximum productivity with the minimum loss of time. If the developing economy of Pakistan is to achieve the planned objectives, the problem of human relations and administrative trainings should receive as much attention as the technical "know-how" for the successful implementation of our National Plans. It is only through the development of Human resources that we can bring to our people the confronting realization that Independence has brought with it something more substantial than a mere change of British Raj in the Indo-Pakistan subcontinent.

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Different aspects of productivity and Human Relations are intricately linked up in organization—a social institution. Increase in productivity can be achieved by satisfying man's socio-biological needs which are the basis of Human Relations. An understanding of the problems associated with Human relations will materially contribute in increasing productivity in Pakistan. The administrator must realize the significance of human relations in productivity. The personality of an administrator should be a blend of many qualities—creativity, vision, drive, courage, judgement, ability to delegate authority, sense of responsibility, ability to listen and communicate, sense of participation, sincerity, sense of humour, control and co-ordination, flexibility of mind and development of people.

Furthermore a change is a must towards the development of a social welfare state which can be gradually brought about through the understanding of Human Relations particularly when the planners in Pakistan are busy with the 5 years plans in view of the perspective Plan. As the administrators/specialists are associated with the development of natural and human resources, it is becoming more and more imperative that they should be research-oriented and training-minded in order to utilize human resources to ensure maximum productivity.

The need for research in social sciences is great as the people and the Government are making plans for the socioeconomical development. Information-data of statistical value, must be collected and analysed to make such plans realistic. To overcome some of the difficulties faced by the planners/administrators/specialists, it is desirable that Pakistan Council of Social Sciences Research, be established, to plan research especially on problems faced by us in the field of Productivity and Human Relations.

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# LABORATORY IDENTIFICATION OF HUMAN PARASITES A PRE-REQUISITE TO RADICAL TREATMENT\*

By

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## INTRODUCTION

The types of animal parasites, which occur in man, present a great and varied assortment. They are rather extensive both in quality and quantity. One may examine any community, at any one place and at any one time and may find one or more of these loathsome creatures in apparently healthy persons. The father, the son and the brother are as much exposed to the parasitic invasions as the mother, the daughter and the sister are. These parasites make no difference between the high and low either. In their eyes the bourgeois and serf are alike. The habits of the community, the appropriate environmental conditions and the presence of adequate sources of infection are the only needs for the parasite to keep going.

## DISTRIBUTION

The animal parasites attacking man are usually most catholic in nature and staunch in aptitude. In many cases the human parasites observe a very rigid geographical distribution. The parasites, which are cosmopolitan in distribution, usually differ considerably in their incidence from one geographical area to the other.

*Enterobius vermicularis* (the seat worm) is a specific parasite of *Homo sapiens*. According to consensus of opinion, it worries every child which survives. Those, who had an advantage of hearing a lecture or two on general parasitology, must be convinced of its presence at least once in their life-time. A few, who deny the fact are those who lack comprehension or are the victims of pretension. 99.9 per cent human beings experience the striking manifestation of *enterobiasis* and 0.1 per cent probably have bad memory or are used to wilful misstatement or need to know more of its biology. The incidence of this human parasite, due to obvious reasons, is usually high in temperate and cold countries than in warm countries.

Both the distribution and prevalence of some animal parasites is well marked in some countries than in others. Some geographical areas may point out with pride

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the absence of some of the disgusting organisms. The Rhodesian and Gambian *trypanosomiasis* for example, are endemic in Africa while Chagas *trypanosomiasis* is confined to the South America. The endemicity of visceral *leishmaniasis* (*L. donovani*) is rather limited to East Pakistan as against tropical *leishmaniasis* (*L. tropica*) which may assume endemic proportions in some parts of West Pakistan. The *elephantiasis* (*Wuchereria bancrofti*) is said to be indigenous throughout warm countries. In Indo-Pakistan subcontinent, however, it is apparently confined to the Eastern and South-Eastern coasts along the Bay of Bengal and continued via Cape Cameron to the Western ghats along the Arabian Sea. The guinea worm (*Dracunculus medinensis*), one of its cousins on the other hand, is confined to those parts of the tropical countries, where population depends primarily on impounded rain waters for drinking. In West Pakistan *dracontiasis* is prevalent in those districts where the step wells are the only source of drinking water. The disease is prevalent in Attock, Dera Ghazi Khan, Muzaffargarh and Mianwali. It is also endemic in the tribal belt along our North-west Frontier region. The disease is also rampant in vast Sind desert, which continues to Jodhpur State (India) in the east and Rann of Kutch in the West. Our East Pakistan has the reputation of freedom from the ravages of Arabian serpent. It will not be out of place to mention that the reports of *dracontiasis* from places like Lahore, refer to hospital cases and not to an incidence of local origin. While interpreting such records one should keep an eye on the epidemiology of the parasite.

### HOST-PARASITE RELATIONSHIP

The presence of some categories of parasites in man always causes potential pathogenicity. The status of other parasites, however, may oscillate between harmful and harmless affects, while in a good lot of them, the host-parasite relationship may be only of commensal nature.

The pathogenic forms of animal parasites and animal transmitters of disease producing agents may cause tremendous amount of morbidity, mortality and economic losses. Try, what one may, the human sufferings cannot be evaluated on the basis of compensation. The toxic manifestations, fever, inflammation, generalised and localised pains which are attributed to parasites, have a cumulative effect on the host. The parasite may render a metabolic imbalance and disturb the physical, mental and social well being of the victim. The physician is the first benefactor, who has to play an important role in bringing him to normality.

A parasitologist is concerned both with the presence of the animal parasite and its effects on the host where as the primary concern of the clinician is with the parasite

as it affects a patient. In infections with the pathogenic types of parasites, the host may show certain signs and symptoms. The clinician is required to detect the parasite accurately from the history the patient may give to him and administer presumptive through radical treatment as soon as possible. In a country, where there is one clinician for every 20,000 people, neither appropriate history can be taken nor accurate diagnosis can be made. In routine general practice "clinical sense" becomes a myth. A casual visit to a government aided dispensary will show that each medical officer may attend to 3-400 new patients every day. On a very conservative estimate, one cannot devote more than a minute on each patient. It has been observed that in most cases the medical officer keeps on writing the prescription and seldom raises his head and see how the patient looks like. The amount of guess work involved and fallacy to which the clinical sense is reduced in such cases, is more than obvious.

The animal parasites which do some definite damage are recognised by the symptoms detected in the host. In these cases, the harm exceeds the amount of repairs. When the process of healing is rapid, the amount of destruction may not be appreciated, visualised or felt. In the absence of an evidence of harm the presence of parasite is likely to be missed. It is only small proportion of parasitosis in which process of harm is far too extensive than the speed of repair work going on, and which demonstrate real symptoms and thus rendered identifiable. For each action of a pathogenic parasite, there is an apparent equal and opposite reaction in the human host. The appreciable reactions appear in the form of symptoms. We may call these as shadows of parasitosis and the physician has to decipher these most carefully.

The word symptom is derived from the Greek word *symptomata* and means "anything that happens". It is a phenomenon of disease and denotes a deviation from the normal organic or functional condition of a person. The events provoked by pathogenic parasites are abnormal sensations. The victim may suffer from change in function, or observed passing from one state of form to another, or complain of departure in sensation. The subjective symptoms are described by the patient. From a carefully taken history, the clinician may guess the cause of the trouble and complaint. The clinical sense leads him to a tentative diagnosis of the disease and help him to follow a line of treatment. Obviously this procedure may lead one to faulty conclusions. From an on-the-spot physical examination of the patient, the physician discovers the signs which are objective in nature. A morbid phenomenon, more frequently warrant consideration of more than one disease. Although some symptoms may occur during the course of a disease yet may have no relation with the

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disease involved. Certain morbid phenomenon may occur but may not always accompany a particular disease. The symptoms of doubtful significance caused lot of confusion yesterday, may result in disorder today and will continue contributing irregularity in future too. Similar pathognomonic symptoms were recorded in several diseases in the past, are still noticed at present and will be found in future and continue precluding correct diagnosis.

Inexperience and inexplicability may go together in parasitology. An indolent physician may not deliver the goods and an indignant parasitologist may also not fulfill the desideratum. It is an art to correlate a pertinent fact and match it well with a disease. A physician may not be able to make full use of the information and draw a clinical picture if he is in haste. Who knows when an information is important enough to form the basis of differential diagnosis. How thorough the investigation of any case should be is in itself a problem. Theoretically speaking, every patient should have the benefit of every available method of study. In parasitology it may be technically possible and financially feasible. Diagnosis of many animal parasites does not involve any elaborate arrangement. It is therefore, democratic to evaluate each case individually when an infection with animal parasites is involved and an infestation is suspected.

### SYMPTOMS

Inflammation is a defensive process against an injury. It results whenever and in whatever way the tissues or cells are injured or destroyed. These tissue reactions may be evoked by a number of animate and inanimate causative organisms and irritating agents.

Fever is symptomatic of inflammation. Whereas, there is undulating fever in kala-azar there is also definite paroxysms of chills, fever and sweating in malaria. Infections with certain bacterias, rickettsias, viruses, protozoas may also produce paroxysms. It is an experienced clinician only, who may differentiate with irregular accuracy, between Kala-azar, malaria, typhoid, paratyphoid, relapsing fevers, undulating fevers, tuberculosis, influenza and septic conditions of unknown etiology—P.U.Os. is an important category of fevers and a conspicuous proportion of such cases is regularly reported from our dispensaries.

Asthenia is another common complaint of the modern man, specially when he comes from metropolis. It may be well marked in almost all the diseases, involving the trunk. If it is present in *ascariasis*, it may be significant in *ancylostomiasis*, *schistosomiasis*, *trichiuriasis*, malaria, *hymenolepiasis* and *taeniasis* also.

Malnutrition may occur in almost all types of parasitosis. It is however, well marked in *ascariasis*, *ancylostomiasis*, *strongyloidosis*, *trichuriasis*, *hymenolepiasis* and *taeniasis*.

Acute abdominal distress commonly occurs in *amoebiasis*. Due to disturbances in normal functions of digestive tract, considerable distress may also occur in other abdominal and intestinal infections.

*Appendicitis* may occur when vermiform appendix is irritated due to one and other reason. An infection with hookworms, roundworms, seatworms, whipworms and tapeworms may predispose the victim to appendicitis.

Intestinal pains are common complaints. Any disease involving structures, both within or outside abdominal cavity may cause abdominal pains. A skillfully elicited history is of primary importance and can help a physician to diagnose the disease fairly accurately and may require the laboratory services only to confirm the findings. The abdominal discomfort may vary from consciousness or slight uneasiness to intense agony and may indicate either disfunction or an organic disease. The pain varies both in kind and quality. It may be due to an excitement or a stimulus. The history should give duration of pain, its change in character, the gradual or abrupt onset, constancy, periodicity, proximal nature, rhythmic nature, lancinating, griding or pressing nature, relationship with other body functions, relief measures and aggravating measures.

Colitis has been employed inaccurately in describing all functional and inflammatory diseases of colon. In literature the terms spastic, functional and mucous colitis are in common use. In Pakistan amoebic colitis is one of the most commonly spoken diseases.

Purely functional disturbance may not cause an inflammation and therefore, some workers designate it as irritable colon. All pathogenic infections may inflame the large intestines and make them weak. The cramps and diarrhoeas with or without mucus and pus are obvious results of such attacks and counter attacks.

Dysentery includes the condition in which intestinal discharges containing blood and mucus are the common symptoms. Broadly speaking, the dysentery is

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either protozoal, or helminthic or bacillary in origin. *Amoebiasis* and *balantidiasis* are protozoal dysenteries. Intestinal flagellates may cause either diarrhoea or dysentery. Intestinal *coccidiasis* may also be associated with intestinal disturbances. Schistosomal dysenteries are common in Egypt, French West Africa, Nigeria, China, Japan, Burma and Philippines. In pernicious infections with malaria and Kala-azar also catarrhoeal dysentery is of common occurrence. Painful stools, containing pus and blood may also pass in hookworm and whipworm infections. Amoebic colitis is a deep rooted phobia. It is responsible for much of 'self medication'. In Lahore alone, every third person complains of it and may be in possession of a vial of amoebicide. Taking of these specific drugs has become a routine with certain persons. It may of course give temporary relief but no cure. Obviously it is too much to expect a cure without knowing the cause and taking a radical treatment.

Diarrhoea indicates excessive speed in the transport of faeces. There are many factors that may hasten evacuation of faeces and cause diarrhoea. The common sources of diarrhoea may be bacterial, mechanical, chemical, metabolic, functional and allergic in nature. In some cases, diarrhoea is produced directly through stimulation of the bowel by central nervous system. The reflex diarrhoea may be due to the irritating impulses arising in organs outside the alimentary tract or in the intestinal mucosa. The increased neuro-muscular excitability of the gut may cause mechanical diarrhoea. The impulses may originate either in intestinal mucosa, or the wall of the gut. Impulses arising in abdominal viscera, in kidney, in somatic nerve roots may also hasten passage of stools.

Severe diarrhoeas usually occur from bacterial infections of the intestinal canal. Intermittent episodes may however, occur in *amoebiasis*, *balantidiasis*, *giardiasis*, *strongyloidiasis*, *trichiuriasis* and *hymenolepiasis*.

Chronic indigestion regularly occurs in intestinal tuberculosis but it is also the complaint in chronic *amoebiasis*, *giardiasis*, and severe *trichiuriasis*. Indigestion may also occur in *ascariasis*, *hymenolepiasis*, *taeniasis*, *strongyloidiasis* and viral infections.

Ulceration of the wall of intestines occurs in *amoebiasis*, *balantidiasis* and *ankylostomiasis*. Severe infections of *trichiuriasis* and *enterobiasis* may also cause severe damage to mucosa in caecal area.

Irritation of the mucosa in dwarf tapeworm, marked irritation and inflammation of intestinal epithelium in whipworm and sloughing of mucosa in *strongylo-*

*leishmaniasis* generally occurs. Duodenum, jejunum and ileum become tender, painful and irritable in *ancylostomiasis*.

Splenomegaly occurs in malaria. The spleen is well enlarged in visceral *leishmaniasis*. In East Pakistan, where the two diseases are well distributed a diagnosis based on splenomegaly alone will certainly be misleading.

Frequently our attention is focused on parasitic worms as causative agents of appendicitis. Hookworm, roundworm, whipworm and seatworm infections are already known to provoke acute or subacute inflammatory process of appendicular mucosa.

The metabolites of roundworms may produce sensitization phenomenon and bronchial asthma is one of the common complaints. Similar manifestation may be noticed in *ancylostomiasis*, *strongyloidiasis*, *trichuriasis*, *taeniasis* and *hymenolepiasis*.

A typical pneumonia during the migration of larvae through the lungs may occur in *ascariasis* and *ancylostomiasis*. The trouble has also been noticed in Kala-azar and *strongyloidiasis*.

Hypersensitizing reaction during the migration of worms may also occur in *Ascaris* and *W. bancrofti*.

It is a common complaint that in endemic areas, where the remains of the roundworms are suspended in the atmosphere, allergic manifestation are more common in the communities. Allergic manifestations due to other helminthic worms are also of frequent occurrence.

Traumatic damage to intestinal mucosa is of common occurrence in *strongyloidiasis*, *trichiuriasis* and *ascariasis*. Gastric or duodenal trauma in *ascariasis* is usually confused for peptic ulcers.

Physical burden is of common occurrence in beef-tapeworm and roundworm infections.

From a perusal of this information one may come to the conclusion, that no one symptom can be attributed to one specific parasite. In other words, the symptoms

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attributable to parasitosis are not pathognomonic. The history taken from the patient and physical examination made may provide clues to the clinicians to certain possibilities. The clinical approach therefore, must be followed by a laboratory diagnosis.

### LABORATORY SERVICE

For laboratory examination of a parasitological specimen, we need a well trained technician in the field of parasitology. One develops skill after hard labour and with experience one develops confidence. Specimens must not only be satisfactory for examination but must also be collected properly, prepared correctly and examined carefully. Much may depend upon the time, when the specimen is obtained, how it is obtained and who examined it. A competent collector, an efficient technician, a qualified microscopist and a skilled worker are essential to confirm a presumptive identification and strengthen a tentative decision.

The following concrete cases may probably illustrate the point under review. These cases decidedly suffered because no laboratory examination was ever made. The presumptive treatment may sometime aggravate the clinically demonstrable symptoms. For normal response to treatment, earlier a patient is put on radical treatment, better it is.

### OBSERVATIONS

*Case I:* A youngman, aged 40, complained of disturbed digestion, vague abdominal discomfort and hunger pain. Although he was eating very rich food yet he was not putting on weight. He was sensitive to an extra weight in the epigastric region but his appetite did not seem to have a level of satisfaction. He was well built, but was very pale. He was very hard working by nature, but always felt tired. Duration of trouble 3-4 years.

He has been under the treatment of various doctors during the last 3-4 years. During this period he also remained under the treatment of a top class physicians of Lahore.

From a perusal of prescriptions, it was found that he was treated for *amoebiasis*, *ascariasis*, *ancylostomiasis* and *hymenolepiasis* at different times. All these treatments were given to remove the symptoms. The cause was not removed and improvement in his condition never occurred.

We examined his stool in March 1953 and found several eggs of *Taenia* in each stool. Since the Lahorites take lot of beef kebabs, and *Cysticercus bovis* is frequently observed in cattle, the infection was considered to be of *T. saginata*. The patient did not give any history of spontaneously passing gravid proglottids. However, he did give history of passing segment-like structures in the faeces.

The patient was given a saline purgative at night. In the morning, on empty stomach, Filix-mas (Oleoresin of aspidium) was administered in gelatin capsules (does divided in 3 doses, each after half an hour). Two hours after, a dose of saline purgative was given. No food was allowed until complete evacuation of stool was had. The patient brought full size worm, complete with the head and it is now in our teaching collection.

The patient thrived hereafter remarkably. Definite improvement in the general health made him jubilant. He does not now complain of abdominal discomfort nor of fullness in epigastria region. This is an example, where clinical diagnosis and presumptive treatment did not relieve the patient of the agony. Laboratory diagnosis and radical treatment successfully removed the cause, eliminated the mechanical obstruction and toxic effects and gave the patient complete recovery from the annoyance.

**Case II:** Mr. A.A., age 25 years, has been suffering from looseness of bowels and flatulence for the past one year. There is a history of diarrhoea, alternating with constipation with vague abdominal discomfort. Sometimes the stools also contained mucus.

Dysentery was not confirmed by bacteriological and protozoological examinations. However, a clinical laboratory reported the presence of *Taenia* eggs. The physician therefore, put him on Filix mass (oleoresin of male fern). He was given several courses of this drug at suitable intervals but the patient did not get any relief.

With a view to obtain second opinion, the physician advised the patient to get the stools examined from us. We found typical ova of *Hymenolepis nana* but no *Taenia seginata* eggs. A microscopist, used to routine examinations, recognises *Taenia* eggs from 3 pairs of hooklets. The *H. nana* eggs may resemble *T. saginata* eggs more or less in all details. However, in *H. nana* eggs, the oncosphere is enclosed in a membrane which is provided with two polar thickenings, giving rise

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to 4-8 polar filaments. These flagellas trail round between the shell and the body of the embryo and give a distinctive character to these eggs.

Infection with the dwarf tapeworm is comparatively more common than beef tapeworm. *Hymenolepiasis* usually gives no alarming symptoms and its treatment therefore, does not call for great deal of attention. A perusal of standard books on tropical medicine and clinical parasitology will show that anthelmintics, usually effective in the treatment of beef tapeworm infection are not helpful in *Hymenolepiasis*. Atabrine has been found highly effective in moderate infections. Complete elimination of the worm from hyperinfective types of infection however, occurs after repeated treatment.

*H. nana* does not depend upon intermediate hosts. Like *Enterobius vermicularis*, infection is direct from patient to patient. Internal autoinfection is an important advantage to the parasite. Most of the mild infections, in due course of time, become heavy infections because some of the eggs continue hatching within the gut. The anthelmintic acts on the adult worms in the intestinal canal. The embryos, which after emergence enter in the submucosal coat of intestinal villi and develop into cysticercoid, are not affected by the drug. The treatment therefore, is required to be repeated.

This case draws our attention to the fact that the parasitosis are not diagnostically specific and a competent microscopist is essential to lend support to the physician. The tentative clinical diagnosis must always be evaluated in the light of the laboratory findings. The overall clinical picture must commensurate both the physicians' discrimination and the parasitologists opinion.

*Case III.* Mr. I. R. S., a child of 10 years, complained of periodic diarrhoea and abdominal discomfort for about 2-3 years. During this period he was treated for amoebic dysentery and temporary amelioration of symptoms was had. Stool examination by a private laboratory revealed the presence of *E. histolytica*. He was put on diiodoquin, enterovioform and emetine at different times but with no permanent relief.

We examined this boy in April 1965 and found *Giardia intestinalis* (++++) *E. coli* (+++), *I. butschlii* (+) and *E. vermicularis* (+). He was immediately put on a course of Atebrin. There was rapid disappearance of the flagellate parasite. Symptoms disappeared and general condition of the patient improved.

The stool was again examined a fortnight after the treatment and again after one and two months. The repeated examination failed to reveal the parasite. Every time he was seen, he was found in better state of health.

In this case an unnecessary medication was continued for considerable long time. Most probably *E. coli* was identified as a race of *E. histolytica* and therefore wrongly treated for amoebiasis.

**Case IV:** *E. histolytica* is an important human parasite. More important, however apart from its pathogenicity, it is cause of a serious phobia. In Lahore, every 3rd or 4th man considers himself a victim of this amoeba. The dread is usually directly proportionate to the level of education. An England-return suffers from ghost symptoms comparably more than his cousin, the product of a Pakistani University. The fear also haunts urban people more than those who hail from rural areas. The phobia is so much deep-rooted that a person complaining of cramps, diarrhoea and passing mucus and pus in the stool is, more than often diagnosed as a case of amoebic colitis and invariably the physicians, the vaidas and the hakims prescribe an anti-amoebic drug to such cases. The proportion of such persons, who after self diagnosis resort to self medication, is also large. The medicines which give symptomatic relief are more popular. In the absence of proper diagnosis, when no radical treatment is given, the symptoms apt to recur after some time. The reappearance of clinical manifestations is considered as relapse and the presumptive treatment is repeated. This may continue in some cases throughout the life-time of the victim.

Overall frequency of pseudo amoebiasis leads to repeated intake of anti-amoebic drugs. These chronic cases are usually satisfied with an amelioration of physical condition and therefore, never take full course of the drugs. Little knowledge is always dangerous, but it is doubly hazardous and extremely perilous when a potentially highly toxic drug and contra-indication are involved.

An advocate, who had an advantage of spending fair amount of his time in foreign countries, met me in a banquet. After a word or two of introduction it was told that he was suffering from amoebic colitis since the last four or five years, and was under treatment since then. During these years of doubts and suspense he had the privilege of consulting top most physicians of the country. As far as the disease is concerned, it continued playing hide and seek with him and symptoms remained constantly hopping, stepping and jumping.

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*Amoebiasis* is a phobia in at least 80 percent cases. The root causes of this bias are probably some of the survey reports, which were published by Wanyan and O'Conner in 1916 and 1917. Fuel was added to the fire when the reports from School of Tropical Medicine, Calcutta and annual Public Health Reports of the provinces revealed that the incidence of amoebic dysentery in the subcontinent varied from 20-25 percent.

According to the consensus of opinion parasitism and parasitic infestations are universal conditions of human life. The conditions of life are less favourable to the existence of parasitic organisms in civilised communities. The habits of the people and the sanitary environments influence their distribution considerably. Since in this country the climate is favourable, the water supply is bad, promiscuous defaecation is common and standard of sanitation is in a stage of primitiveness therefore, there are better chances of distribution of parasite in the country. The incidence of a parasite however, should not be accepted without substantive evidence. Moreover, 20-35 percent infection is not in a representative sample. Hospital figures stand both for patients and out patients, who attend hospital for one or the other complaint.

It is not always possible for a physician to make a correct and early differentiation diagnosis of amoebic dysentery by inspection of cellular exudates. The problem of ulcerative colitis remains unsolved. *E. histolytica* may be one aetiological factor. In such cases the presence of some of its stages must be searched for.

Man harbours four species of *Entamoeba*. In routine examinations, the size of organisms usually decides the species involved. The number of nuclei present in the cyst is another step towards correct diagnosis. The form of chromatoidal bodies, if visible may also provide an extra information towards definite identification. Nuclear membrane and its internal line (plaques and granules) need to be carefully studied. The size and location of Karyosome is also important to be studied.

|                                     |     | trophozoites (mi) | cysts (microns) |
|-------------------------------------|-----|-------------------|-----------------|
| 1. <i>E. histolytica</i> (non-path) | ... |                   |                 |
| 2. " (path-strain)                  | ... | 10-20             | 3. 5-10 (7.7)   |
| 3. <i>E. coli</i>                   | ... | 30-60             | 12-13 (10-20)   |
| 4. <i>E. hartmanni</i>              | ... | 15-50             | 16-17 (10-33)   |
| 5. <i>E. polecki</i>                | ... | 5-12 (7)          | 3.8-9.3 (4-6)   |
|                                     | ... | 8-25              | 5-11            |

The pathogenic amoebas may change back and forth between harmful and harmless states. This oscillation may be either due to fluctuations in the conditions of the gut or due to a nonpathogenic strain of this parasite. The producing potentialities of *E. histolytica* are not only limited to the acute and severe conditions but may also extend to chronic disease, with varied and irregular manifestations. This labyrinthine and winding behaviour of *E. histolytica* has made diagnosis a problem. From clinical signs, which are many and varied, a definite diagnosis cannot be established without demonstrating the causative agent. For this purpose, the stools and material collected at perianth may be carefully examined by a competent microscopist. It needs lot of patience and perseverance. For satisfactory results, at least 6 consecutive stool examinations are needed to be made. There is still great scope for the development of better diagnostic tools.

Much is still needed to improve culturing of the causative agent under the proper circumstances. A useable complement fixation procedure needs to be evolved. Fundamental understanding of the disease is desired to be developed and new means of diagnosis have to be found out. Morphological distinction between *E. histolytica* and other allied forms has been a matter of difficulty. Cyto-chemical methods have to be improved upon. There is probably a definite pattern of distribution and cyclic change of nucleic acid in protozoa. Practical utility of these methods has to be found out.

**Case V: Malaria Eradication** is being pursued today in almost all the endemic countries. In this programme the microscopic examination of the blood slides is the main tool for the malarimetric surveys and the detection of the malaria cases. With the age of MEP, the parasitological work is obliged to become more active. Efficiency of the laboratory becomes essential when decimation of the positive cases occurs. This is the time when malariologist insists that the thick smears be made thick enough to have twenty or more leucocytes in most of the fields. Examination should be made systematically from edge to edge and the thick smears should be scrutinised in at least 100 fields. When transmission is at its lowest ebb, most of the positive cases are likely to be missed. Poor microscopist may also lower the quality of work. For this reason better training, thorough grinding, proper selection and sufficient supervision of microscopist becomes very essential. In countries, from which malaria has been eradicated or in countries where the problem never occurred, the microscopist has either lost interest in the parasite all together or is not conversant with it and therefore miss it more than often. We encountered an interesting case of this nature.

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Recently a Pakistani went abroad for higher studies. He stayed in a teaching Institute for one academic year. A month before sitting for his diploma examination, he had a feeling of generalised aching and muscular pain. The body temperature was periodically above normal. He attributed the whole trouble to examination phobia, hard work and reduced body resistance. One day, when his temperature rose high up and he also felt bad otherwise, he consulted the college physician. He was admitted to the hospital and was subjected to complicated tests. The presumptive treatment did not correct his physical condition. Although he had gone from a malarious place, yet his slide was not examined for malaria parasite and he was not given the anti malaria drug. The procedural routine of the hospital prolonged his stay in the hospital but hospitalisation did not help him to come back to normal. He missed his examination. The rules did not help him to extend his stay in the country and avail the next chance. He returned frustrated without the diploma.

If the physician-in-charge of this particular case had taken a clue from his place of origin he would have suspected him a case of malaria. Examination of the blood smear and administration of antimalarials should have been simple procedure and sure treatment. He could be put back to work without much ado, saved of worry and anxiety and relieved of the agony.

It is widely recognised by the experienced clinicians that a skillfully taken history, with a careful analysis of the chief complaints and of the course of illness, will more frequently than not, indicate the probable diagnosis, even before a physical examination is made or any laboratory tests are performed. A critical physician can learn more in a majority of cases from what his patient says than from any other avenue of inquiry. A physician groups the symptoms together and forms a quickly recognisable complexes or syndroms. This trick usually lulls into a false complacency. Many techniques are now available to make accurate diagnosis. Interpretations of the common symptoms, which bring the patient to the physician, however, correct these may be, still warrant laboratory confirmation. As a matter of fact no device can serve as a substitute in the art of diagnosis. However, it re-emphasizes the obligation of a physician to know wherefrom his patient comes and where he has been.

### **SATISFACTORY HISTORY TAKING**

Our knowledge of symptoms is yet incomplete. The critical and the analytical thinking has not so far been given the place it deserves. Therefore confusion here and refutation there is of general occurrence in the diagnosis of parasitosis,

Taking of a satisfactory history is not a simple task. One may know more with tact and diplomacy. There should be an understanding between the patient and physician. A sympathetic approach may put the patient at ease. A quick and accurate appraisal of personality should be first step towards diagnosis. Haste, intolerance and irritability are antagonistic. The patient needs to be guided to give pertinent facts of his complaint. Without careful and intelligent questioning most of the patients may give hurried, confused and inexact account. Sympathetic comments throughout history taking encourage patient to give appropriate nature and duration of symptoms. An average Pakistani usually gives an exaggerated version and an inexact narration. Very careful judgment is needed to sift chaff from the grain and evaluate the statement in such a way as to get correct diagnosis. The account may suggest a number of possible diagnoses, therefore each important symptom will have to be carefully analysed.

Pain is usual complaint in almost all the intestinal parasites. Its location, intensity and time are important points to be known. It is pertinent to ask when it starts and how it stops. If it was of continuous nature or of intermittent type. Age of pain is a relevant point to be known. Many patients may not actually tell as to when the trouble actually commenced, when it gets aggravated and how it is relieved. Does it subside after meals, defaecation, lying down and excretion. Has it any relationship with any other symptoms. What action alleviate the trouble and how the distress is aggravated. In many cases, the bowel movement may give a temporary relief. In some cases full stomach may lessen the discomfort while in others it subsides 2-3 hours after meals.

Day to day and hour-to-hour activities of the host influence to and fro movements of intestinal parasites. A vegetable grower, who works continuously in the fields, has more chances of hookworm infection as against a person who never have a chance to work and walk on the infected fields. The eating habits also play important role in the movement of the parasite from the intermediate host to the definitive host. Polluted foods are great dangers. Protected waters guarantee safety from intestinal parasites. But improper storage and defective plumbing is also a threat to man's well being. Shallow wells, curb wells and step wells and open water reservoirs may initiate any intestinal infestation. The working environments, recreation pattern and resting habits of the patient may give clue to an infection. Patient's avocations are also necessary to be recorded.

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## CONCLUSIONS

From the few examples quoted above, one may venture to invite attention to the fact, that no matter how shrewd a physician may be, there is still margin of omission. The services of a laboratory therefore, should always be utilised and the tentative diagnosis should always be got confirmed.

Identification of parasites is a specialised job. Hard labour, continuous examination of morbid material and repeated study of morphological characters may make one a shrewd microscopist. Without keen observation power, one cannot make a differential diagnosis. To become a good microscopist one needs to be a scholar, soldier and saint. The ova of *Hymenolepis nana* contains an embryo, which is surrounded by two distinct embryonic walls. At each pole of the inner membrane there is a slight projection provided with filaments, which usually lie between the two membranes. A microscopist in hurry will see the embryo with 3 pairs of hooklets and make a quick declaration "*Taenia saginata*". Vegetable cells are generally present in the faeces and cause of considerable confusion. A raw technician, more than often finds great resemblance of *Ascaris lumbricoides* in these cells. The cysts of *Endolimax nana* may always be mistaken for small cysts of *Entamoeba histolytica*. When the species viz. [*E. histolytica*, *E. hartmanni*, *E. polecki* and *E. coli*, agreeing closely in some striking characters are involved, the advantage of benefit of doubt goes to the pathogenic species. Since its depredation are known and most of the stool samples come from symptomatic cases, the microscopist picks up the bias before he examines the slide. For him a patient complaining of entero-gastric troubles is a reservoir of noxious animal parasites. It results in more cases of amoebiasis than obviously there may be.

To find a cyst of *E. histolytica* is a thrill. So far our laboratory did not find this protozoa in most stool samples declared positive by the clinical laboratories. Unless the microscopists in the clinical laboratories are specifically trained in the identification of animal parasite, this confusion would continue prevailing.

There is great scope in streamlining our laboratory procedures. Instead of routine examinations we should resort to critical examination of the material. This course is specially warranted in those cases where the parasite is either not found or closely allied forms are involved. If the formed stool does not help, material after a saline purge must be obtained and examined. If there are amoebic ulcers in the rectum, an examination of scrapings obtained through proctoscope may demonstrate the pathogenic organisms. In doubtful identifications a permanent preparation is the only alternative. Besides the time required for staining, this method cannot be recommended for all cases. A rapid method of staining amoebas has yet to be evolved, so that the nuclear structure can be properly studied and correct identification may be made. For accurate diagnoses of the organisms, it may be cultivated in vitro. For this purpose many good media are available and the laboratory is required to master one of the technique for good results. Culture techniques for certain species of protozoa are not yet perfected. We still need to find, for instance, a culture medium for *Giardia intestinalis*.

Immunologic tests may also provide reliable clues to some animal parasitic infections. Complement fixation, precipitin tests, agglutination reactions, intradermal reactions and specific dye tests are some of the immunologic tests in use. Dependable immunologic techniques for the diagnosis of *amoebiasis* has not yet been fully developed. Although the value of immunological tests, as routine procedures, are of limited nature, yet may be found useful in disputed cases. Bright fluorescence observed in amoebas, exposed to tagged homologous antiserum, was found of diagnostic importance by Goldman (1953-1954). Further development of this technique is highly desirable. The cytochemical techniques help in the interpretation of functional phenomenon. Recent advances in cytochemistry make it possible to localise accurately the distribution of two nucleic acids in cells. The presence of Feulogen positive material (DNA) has been demonstrated of having cyclic changes during nuclear division. Ribonucleic acid (RNA) is present in *E. histolytica* and *E. coli*. These methods are of academic interest.

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The departments of Parasitology attached to our universities may develop a school of research in the field of their own choice. Although there are many excellent techniques for fixation and staining of morbid material, yet there is scope to modify techniques of coprologic examination and parasitological diagnosis suiting our laboratories. An effort has also to be made to man the clinical laboratories with well trained microscopists. A mill, where these microscopists can be properly grinded, needs to be immediately organised and speedily established and uniform system of training the technicians has to be evolved. Systematic training will reduce chances of guess work, diminish ghost parasites and ultimately stop worrying both the microscopist and the clinician. Close cooperation between the clinician and the parasitologist will help in sifting of accessory symptoms from the pathognomonic symptoms. As long as metabolic balance of the host is not corrected, cause of toxic manifestation is not removed, overall damage produced by the parasite is not checked, the man-machine cannot be put to commission. Whereas the physician has to read subjective and objective symptoms, the parasitologist has to lend support to diagnosis. Better cooperation between the clinician and laboratory will mean correct diagnosis, early management of the disease and speedy recovery of the patient. Quick go back to work will amount to lesser wastage of man power and it will lead the nation to prosperity.

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# ROLE OF FISH IN THE TRANSMISSION OF HUMAN PARASITES

By

Miss Tasneem A. Rahman, M.Sc., (Zool.) Panjab University  
(New Campus), Lahore.

## 1. INTRODUCTION

1.1. **Human Population :** According to a conservative estimate, the human population stood at 300 crores in 1950. This peak obviously reached in about 200 thousand years.

The rate of growth in human population has doubled since 1945 from 1 per cent to 2 per cent. Today the lofty growth rate is estimated to be 4 per cent. For a statistician, it is probably not an unprecedented phenomenon because he always thinks in the term of an equation which reads  $\log G = 1/N (\log a + \log b + \dots + \log k)$ . Popularly the offervascence is represented as  $1+1=3$ .

This population explosion has alerted both the developed and developing countries alike. Today every conscientious citizen is worrying seriously and waring against this problem with an earnest zeal.

Population pressure is not a new problem. This preposition created problems right from the day the man left the cave and occupied the cabin. The primitive man had rudimentary, public health concept, the modern society developed it to the present level. Man defeated diseases, reduced disabilities, prevented wastage, minimised hazards, curtailed short comings, removed ignorance, stopped malpractices and indirectly created population imbalance. The infant mortality has dropped down significantly during recent years and likewise the human life span has increased tremendously. The health of the man has become fit and fine. This endeavour though reduced sufferings, but created the problem of population pressure. Today the unbridled human reproduction, adds 300 mouths every hour, 7,000 every day, 200,000 every month and 2,500,000 every year to the human population. Formarly apart from war, the pestilence and famines checked population pressures. Today, it is the food supply, which is obliged to restrain population ebulliency.

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Over population, to an economist poses a multigenerous problem. It is not simple numerical density. It actually denotes "more inhabitants than can be supported out of the natural resources available". Every additional birth is a warrant of multifarious needs and a requisition for more and more supplies out of the stocks.

1.2. **Food**: Food is a biological need for growth and energy. Every animal needs it to replace and regulate body tissues. It is a matter of instinct that all animals know, that food sustains life. Necessity is the mother of invention. To provide supplements and replenish energy is a natural urge. It was primary demand of hunger, that impelled man to find new foods. An assurance of regular supply of food has always been his important aim of life. The absolutely indispensable necessity made man an omnivorous creature, both in principle and practice. All animals are busy in searching food as a matter of natural impulse. Man is also in pursuit of right type of food as a matter of reasoning. The more he knows of the essentials, the more he eats the selected food.

1.3. **Historical**: Adam was dropped down from heaven, when he went near the prohibited food. According to our common belief, the prohibited food was a cereal. Naturally, the early man must be scared of grasses. If it is true, the millets and cereals must have become part of his food a long time after his exodus from the garden of Eden to the mother earth. Time is best healer. He gradually developed interests in barley, rye, wheat, oat, maize and millets. The agriculture and horticulture became apparent when he found that the cereals were most economical source of energy for him.

It is not only consensus of opinion, but the caves speak loudly that man was a predator in early days of acclimatization. In primitive stages of his history, the man hunted and fished for his food in deep seas, lakes and rivers. Fishing remained a popular pass time ever since.

The early man was beast of prey in nature. The cave man invaded nests to rob eggs and nestlings. Capturing of birds during night from the roosting places was his fruitful avocation. Quietly catching fish from the crystal clear water was his beneficial hobby. Man took advantage of his superiority over other animals in all stages of social development. He evolved devices of quickly securing animals for his benefit. He harnessed wild animals and used them for his food. Continuous experience made him to find the tamable mammals and

domesticate them. He assured to himself a dependable food supply. Nomades of today, who maintain herds of cattle and flocks of sheep and guarantee to their kith and kin a regular food supply, are testimony to this fact.

Human life on the surface of this globe has remained full of events and conquests. Although saints and sages held *Zar* (wealth) *Zan* (women), *Zamin* (land) and *Zuban* (tongue) responsible for most of these events, yet the scholars believe that most of the conquests revolved round one single item—food out of Land and Lake. Ever since the man descended on the mother land he continued finding new methods of food preparation on one hand and finding new food supplements and resources on the other. It was not mere variety, which remained spice of life but it was the stark necessity that impelled in him the foraging habits.

Man started fortuitous screening of foods in an early stage of his social development. In spite of meagre knowledge of essential nutriment, early man took keen interest in variety. Trial and error formula helped him throughout to select certain foods and reject others. Food played an important role in promoting and maintaining human health and welfare. Although the significance of a balanced diet was not known to him for very long time, yet he continued meeting the requirements of his body spontaneously. It was the closely woven interest that made him know the biological values of different foods he ate. Judging from the age of mankind, the knowledge of food reached its zenith in recent years. Formerly he recognised various emotional uses of food. Some foods were considered good sedatives and relieved man of worry and tension. At times, certain foods were suggested as tranquilizers.

Food has always been used as a yard stick of human financial success and a measure of one's social status. A sumptuous dinner is taken as symbol of luxury and a sign of richness, while a simple grub is an emblem of austerity. Food may compensate security and make amends for love. In a servile manner, a community may stick to one food. A mentally slave nation lacks determination, and is also short of fore sight. There can be no food shortage in a country if its people know to live on alternatives.

The modern man is omnivorous in nature. Appropriate proportion of different foods fulfills his requirements. For excellent health, he looks for right type of food. To keep abreast with the explosive rise in population, man is

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obliged to look for more productive resources. To meet the demand of billion hungry human beings, man is to girdle his lion and be up and continue finding new foods like his fore-fathers. Today, the man is confronting same food problems which his predecessors faced. However, the geneses of the problem differs in prosopography.

Eating is highly personal matter. It is obviously a very strong habit. The political and religious beliefs are subject to vigorous changes. The food habits are more or less static in nature. One may have character of multiple personality but will have restricted tastes. The behaviour of tongue and palate is usually of conservative nature. Food habits are formed in childhood. Certain foods are taken not because of their vitamine and protein contents but because of habit. The food habits, therefore differ from region to region. To quote an example, people in Far East do not eat what the counter parts in Middle East do relish.

Those, who are reluctant of changing food habits, even when aware of uncertainty and unsuitability, are conservatives of first water. Although ill health, due to faulty diet, inefficient food and imbalanced nutrition, is slur. yet we in Pakistan stick to our basic food of cereal grains. Our Dacca bothers prefer rice even when other delicacies are on the table while a Lahorite prefers *chapati* over all the dishes known to mankind.

Space available to man for living is limited. There is also dearth of ploughable land. The production of food from a unit area cannot be raised beyond a certain level. In the light of limitations, man is to find new foods. So as to evade depredations due to shortage of food, a change in food habits is very much warranted.

The fertility of man and fertility of land are vast asunder and cannot, by any stretch of imagination, be balanced conveniently. The human population increases in geometrical progression. It took two hundred thousand years for the world population to reach the number of 300 crores in 1950. This population explosion has stunned the developed and developing countries alike. The human population is still shooting and swelling each year. Human food increases in arithmetical progression. When compared with manpower, the human food supply shrinks and slims each year. Human population and human food are two straight lines which diverge, diverge and diverge slowly, steadily and silently. Ever increasing food demand justifies that man must change

his food habits. He must develop new tastes and change his staple food concept both in its application and in sphere.

In Simian period, man discovered the utility of proteins and learnt to live on animal kingdom. Diversion from vegetable food to animal food gave tremendous impetus to the evolution of hunting devices. Introduction of cooking system brought another change in human dietary habits. These changes did not come in quick succession but definitely casted marked influence on human culture and creed.

Live stock remained a reliable source of animal proteins to man. The domestic animals have been found healthy competitors of man for their food. The fields available for growing human food, have either to be set apart for grazing the herds or have to be reserved for growing fodder for them. The population pressure justified use of each unit of culturable land for raising human food. In our country, animal wealth is extremely scarce. Our agricultural practices permit slaughtering of unwanted animals only. To think of quality meat, is a dream in fairy land.

Meat is an excellent source of proteins. To keep the nation in excellent health means providing good, wholesome and sufficient food. It is an indirect hint to explore and to exploit new sources. The modern man is facing same food difficulties which his fore-fathers probably faced in mediæval days. Formerly, it was the lack of knowledge to produce the proper food at proper time. Now, it is the population pressure which is posing a challenge. More vigorous efforts are needed to meet this challenge. Although the age on the globe has made man wiser, yet the social, religious and political restrictions seriously thwarted his action. Ignorance is an other dragon to frustrate activity. For his very existance, man is to fight the situation tooth and nail, find new fields to forage and adapt new means to consume. To keep abreast with modernity in the sputnik age, man may probably be obliged to have food supplies from other planets. Till that age comes, dignity of mankind lies in finding new sources from within own mother earth.

Man is not yet wise enough so as to synthesize a bun by simply sitting in the sun. Time is however rife, when food, which could be grown and harvested around the human habitats, will not fulfill the human needs either. More the mysteries of nutrition are revealed, the more the need is felt to switch on to new foods. In a poor person, the hunger craves for food, while a rich yells for nutritive values. The former longs eagerly for quantity, while the later begs vehemently for the

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quality. The ruffages satisfy one and the concentrates satiate the other. The more one understands the needs of his body the more he feels ridiculed. The knowledge gives rise to the problem of having. The prohibitive cost of a balanced diet becomes a limiting factor. The situation calls for alternative foods, which may suit all pockets. In economics, the rate of commodities is controlled by the formula of supply and demand. Things are cheaper, when supply is more and demand is less. Urbanization upsets the flow of supply for food, more tangible formula will be, to find choice of two possibilities. When land cannot be explored any further, the vast waters should be fully exploited. Sea and other water collections are full of enormous food resources. The rivers harbour bushels of human eating material. The lakes house a variety of fine nutriment. Suitable arrangements to harness waters, like land, have to be made.

Mutton, beef and fish provide substantial amount of meat for human consumption. The nutritive value of these proteins is equally high. The fat contents of different types of meats, however differ considerably from source to source.

The term fisheries means taking of all kinds of water products for commercial purposes. Besides catching and netting true fish, it also includes collecting of lobsters, crabs, shrimps, oysters, clams, frogs and turtles. All nations, irrespective of caste, creed and colour relish the meat of these animals. Trade in the commodities and products found in water is of great antiquity. The fishes are being salted, dried, smoked, pickled and preserved for storage and export since time immemorial.

Fishing always furnished a certain amount of thrill. The thrill developed it from catching by simply waiting at the water edge to an elaborate piscatorial art. Angling in creeks is being replaced by fascinating fishing in the sea. From avocation, it is elevating to improved economical trade. From simple barter to a business. This lofty industry has the future to become a corner stone of human prosperity. Apart from food, the industry provides employment to millions. It is most lucrative. Proportion of profits, for each unit invested are enormous.

In the world, there are more species of true forms of fishes than there are other classes of vertebrate animals. The fossil records show, that true fish were present in the earth from the beginning of the Devonian period, estimated as a matter of 355,000 thousand years. Almost every known type of water has its own life. Man is required to take full advantage of the enormous sources available in the sea.

Fish resemble other meats in nutritive value. When compared with mutton and beef, fish is a cheap and wholesome source of nitrogenous foods. It, however, contains more water and refuse. Protein food it supplies, is however lower in concentration (about 10 percent). Protein contents may usually vary from one-sixth to one-seventh of the total weight. Because of short, flake like muscle fibres, the fish meat is easily digestible and has very high nutritional value. It contains less iron but somewhat more calcium than mutton and beef. Fish liver oils are extremely rich in vitamins A and D. Anti-rachitis properties of cod-liver oil are due to this rich content. Fish may also provide considerable amounts of vitamin B and also substantial quantities of essential minerals—copper, iron, phosphorus and calcium, which are so essential for the upkeep of human body. The salt water fish are excellent source of iodine, an essential protective food and a prophylactic against goiter. On the whole, fishes offer radiant energy to man and it is up to him to avail of the opportunities.

In fat fish the oils are dispersed throughout the flesh. Salmons and herrings are rich in fat. These are more nourishing but are less easily digestible. The fat fish is an excellent energy food.

The white fish are non oily. Fatty oils in these are scattered in the liver. Turbot and flat are common examples.

The tough connective tissue is very little and elastine is almost negligible in fish. The want of these has made flesh of fish an easily digestible meat. The muscle fibres are short and less tough. Fat is well dispersed in the flesh.

Cooking of fish is most easy. Cooking makes it palatable rather than tender. Of course washing and adding of the spices is to make it odourless. Due to the absence of connective tissues, almost no shrinking of the fish occurs after cooking.

Fish was a symbol of christ in the primitive and medieval christian art. Its true origin may be found in the initial letters of the name and title of Jesus in Greek. It is an article of faith with some to eat fish on Fridays. One may probably find a clue to "meatless day" from this page of the history. Today a meatless day is a matter of legislation, while yesterday it was a matter of religious belief. Today people evade the public law, yesterday it was practiced blindly. The modern man coins reasons to escape, yesterday it was a solemn pledge, a duty.

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## 2. ANNOYANCE CAUSED BY FISH

There is a complicated relationship between all the branches of animal kingdom. Likewise, some are obliged to depend upon fish, either for their direct existence or immediately for their survival, and many depend on it for shelter and food. For parasitic animals, the fish may be relatively *fast host* for some, while for others it may be intermediate host and a warm blooded animal involved too as a definitive host. The parasites, which may make no distinction between man and other animals, pose a most annoying situation. Man is involved after eating a fish, harbouring infective stages of the parasite. The most sinister way is the psychological effect, to which man may be subjected after enjoying a fish preparation. Fish are also associated with allergic reactions in sensitive persons. In the following pages an effort has been made to present a brief account of many and varied ways, in which a fish may annoy man. A knowledge of these hazards is essential for those, who advocate that prevention is better than cure. To warn is to fore arm and render help to evade some of the serious situations. If preventive steps are taken in the light of this information, much of the national resources can be utilised in some other useful projects. The sages stressed that a stitch in time always saves putting nine stitches afterwards.

2.1. **Fads:** The gods of superstition influenced man since time immemorial. This ghost haunted him both in the west and the east and gave rise to universal food fads.

Undue reverence, regard and respect to certain religious rites and social ceremonies are hard nuts, not only headaches but unbearable pains in the neck. Even when there are ample supplies, certain persons do not eat certain foods at certain times. The pulpy fruit of tomato is accused for making acid and causing asthma and colic. The charges levelled against citrus fruits are that during winter, the nose and throat diseases are due to oranges. A nasty stigma is put on leafy cabbages and most of the Lahorites avoid this vegetable. The starchy foods and proteins are considerable to be incompatible. Equally ridiculous is that in our culture fish and milk are prohibited in the same meal.

Although there is usually an ever widening gap between the believers and the faithless groups, yet superstitions give rise to hope and frustration equally, both in those who accept as truth something not actually demonstrated and also in those who are perfidious. A fruitless quest leaves the nonbelievers angry and exhausted. An episode always gives rise to a suspicion. Doubt is not a com-

promise but a step towards believing. There seems to be some sense, when one says that both cult and fads developed from habits.

The vegetarians associate the consumption of beef, mutton and fish with masculinity, virility and aggression. In some casts and creeds, therefore, the female folks are strictly vegetarians while men only are allowed to eat foods obtained from animals. The martial races eat more meat. The king of the Jungle is carnivorous. All the ruling nations of the world are meat eating nations, is also its corollary.

The food superstitions have been brought down through the ages with no bases of truth. These are typical products of illiteracy and inadequate instructions. As the human knowledge advances and reliable information is made available the food fads loose momentum and die their natural death. There are unlimited opportunities for the educators in this country to improve the eating practices of the people.

In our beloved country, the silly superstitions still occupy the floor. Try what one may, the staunch and strict grand granny would not allow eating of fish and milk in the same meal. She believes that it is dietary fault, which causes leukoderma.

Under the strong influence of religious faith, some of us donot eat scaleless fish. It is generally believed that only scaleless fish are carnivorous and relish human meat the most. When we donot eat meat eating mammals, why should we eat meat eating pisces and cannibal fish, is a strong argument. If accepted lying down, the man will forfeit the advantage of enjoying some very tasty fishes of the world.

Special and exceptional merits are always attributed to certain foods. Special foods for this and that occasion have given rise to silly fads. Certain persons exploited the queer notions of the people and helped deep rooting.

Better information, when projected and presented in a proper way, dispells the deceptions. In advanced countries, fish is now eaten with cream, why not in advancing countries. Health educations is continuing to evolve and improve in its conceptual forms. Our people are ever ready to accept new dogmas and change old orders if they are convinced that these are to assist them in com-

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compensating for the damage already done to them by doing certain things. The new practices now preached will protect them against the adversities. Mankind has been fighting against all forces, whether animate or inanimate, which thwarted his progress. The people must be got to know the problem. Once it is known the scientific facts can be brought to bear.

**2.2. Idiosyncracies :** A man is sometimes unreasonably emotional in the selection of his food. Sometimes, someone after some extensive experience has ably said, "*my stomach wont take it, can my brain.*" Mind must adjust before the stomach accepts, stands to reason. What is not agreeable to the stomach is also not tolerated by the brain is simple principle. Idiosyncracies have a strong hold of human mind. Simple prejudices may lead to ill-health. Certain whims may be nauseating. Fascinating foods may become fastidious. Unliked foods may become most repugnant. Faintest traces of dislikes may lead to serious episodes. The intricacies, if revealed, the idiosyncracies may stop rightaway and comic loses saved.

One denies to himself over-whelming benefits, when one refuses certain foods. Certain persons do not take milk, except when little coffee or strong tea is added to it. A strong determination, however, works well. Personal short coming can be easily avoided and definitely evaded.

Certain foods are contraindicated in certain cases. When medical advice is involved, the avoidance is in order. Otherwise in food, nothing is good and nothing is bad but thinking power makes it so.

**2.3. Accidental Harms :** Blood thirsty terrestrial leeches are notorious for springing into the wayfarers and causing sufficient exsanguination. Travelers who lap up water from springs, run a risk of acquiring infestation with the aquatic leeches.

There are no blood thirsty fishes. Narrow bodied fishes however, sometimes may get into nose, ear and mouth of waders and bathers. There are cases on record, when a slender fish bored into the urethra of persons and caused lot of agony. The wound caused, may get infected with pyogenic organisms and initiate untold misery.

**2.4. Allergies :** Allergic diseases are known from earlier recorded history of man. The causes are inproportionate to the pattern of symptoms. Almost

all foods can cause allergies. Certain foods are less prone to do so, while others are notorious in this regard. The refined foods (sugars for instance) are solitary exceptions. The befitting epithet "*One man's meat is another man's poison*" is a testimony to the popular identity of the fact.

It is now universally accepted, that some individuals in a normal community are very sensitive to fish. The degrees of sensitiveness may be more to preserved fish than to the fresh fish. Urticarial wheals and furring of the tongues are common complaints of the idiomorphic persons. In others the edible fish may produce violent and acute allergies such as vomiting, generalised hives, asthma and shock. The major influence of allergies has however, been found in modern communities.

Of all the diseases, the allergies have been most neglected and most abused in the past. Now-a-days however, not only the victim but also his kith and kin take an exaggerated action if an emergency of this nature ever occurs.

The trouble is becoming proportionately more in Lahorites on meatless days, when fish becomes an important dietary item. Most of the cases in general may occur during the months of July, August and September. The allergies generally disappear promptly after giving pancreatin.

It is interesting to know that if a person is allergic to a particular food, then there are fair chances that he might also be allergic to other biologically related foods. The family relatives tend to have similar allergenic proportions. Persons allergic to one fish, will likely be allergic to another fish, but not necessarily to shrimps, crabs, or lobsters, which live in water but are not at all related to true fishes. Acute urticaria caused by shell fish is (not exactly the same as caused by salt water fish.

Some persons are allergic to the odour of fish and of its cousins. Frying, cooking or even emanations from raw fish may produce urticaria, eczema and asthma in fish-sensitive persons.

**2.5. Fish Bites :** There are several types of fish, which are capable of biting and inflicting serious wounds to the victims.

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All these fishes have a well developed row of teeth. In some the teeth are connected to a specific poisonous sac, located right below. During biting the secreted poison is introduced from the pouch into the wound through a minute pore (*Muraena* sp). In others, the poison is secreted by certain epithelial cells, present within the mouth and the venom directly contaminates the wound inflicted during biting and causes ill effects.

In other cases, the poison is Neuro-Cardiac in action. The victim becomes extremely restless due to irritation and burning sensation.

Fish belonging to the family *Scorpaenidae* possess poison glands in the dorsal spines, while in *Tracinaidae*, the mucus is poisonous. These fish lurk in sand and are warning to bathers. The carnivorous fishes of the seas and some ascending rivers (*F. Betrachidae*) have two dorsal and operable spines.

2.6. **Fish Stings** : There are several fishes which are notorious for inflicting irritating stings. Some victims experience stabbing pain. Ignorants usually fall an easy victim while bathing or wading in waters, rich in trouble-some fish.

The spiny fish are in general known to secrete an irritant slime. The exasperating material is either distributed over the entire body surface or more frequently is secreted by glands, situated at the base of highly developed spines, which serve to inject the venom. The poison is usually harmless when injected in small doses. In some forms the toxicity is slight while in others it is virulent enough so as to give rise to serious troubles. Severe inflammation of the wound and convulsions are of common occurrence. Cases of death due to fish stings have also been reported.

In Trygonids, the tail on upper side is armed with a barbed spine. In some species, this spine is linked with a poison secreting gland. Stepping on these fishes, during wading, causes deep and painful wounds. The poison finds its way in to the wound when the barb is broken. The danger is exaggerated when the barb is contaminated with *Tetanus bacilli*. The inoculant may not be felt right then.

The torpedinids (electric rays) are electrically positive (+ ve) on the dorsum and negative (- ve) on the ventrum. The victim may receive terrible shock on contact with the two distinct points, and get a temporarily paralysed arm. This

trouble is extremely common in fishermen working in the sea, rich in electric rays. There are several species of this class in Arabian Sea.

Some types of fish are furnished with a grooved spine, which passes through each gill coverts. The dorsal fin in others may be connected to a poisonous apparatus. Want of knowledge may take some innocent persons to points harbouring the dangerous fish. The waders and the bathers may strike at the fins, get wounded and experience throbbing pain. Choking sensation, a feeling of suffocation, excitement and aberration of the mind are some of the common complaints. Serious stabbing pain may make a person deliriant. Ultimately the victim may be found collapsing and even may die.

In most cases, the pain is localised. When the feet is involved, the whole extremity is painful.

The wounds caused by the stings may become inflamed and oedematous. Generally the spot may be demarcated by erythematous area, which later turns black. Some patients are in extreme agony, twist body with violence and writhe painfully as if suffering from Kidney Colic. Nausea and vomiting are common. In some, it may accompany diarrhoea. The toxin may also cause numbness and an urticarial rash. Nervousness and profuse perspiration are some other symptoms. The victim may become pale. Other symptoms reported are dyspnea and severe tachycardia. In rare instances, the wound may even become gangrenous. These fishes may become serious hazards during spawning period.

*Proventive Methods.* No attempts can probably be made to reduce the population of dangerous fishes. The best is to avoid going to waters, harbouring such fishes. For the protection of new persons in a locality, the spots beset with danger must be well marked.

The peril and hazard can be put at bay by providing First-Aid facilities and adopting conservative management on the spot.

As the poison involved, rapidly enters general circulation, local treatment should be directed to prevent absorption of the poison. A ligature, tied immediately above the bite may prevent absorption of the neurotoxins. Suction, applied to withdraw the poison, may also be fruitfully tried.

Rinsing of the wound with strong solution of potassium permanganate may destroy the toxins. A drop of ammonia fortes, if applied to the wound may also give relief. Area round the puncture, if infiltrated with 2 percent solution of procaine and 1:10,000 adrenaline hydrochloride may be found useful. Precautions, advocated in scorpion and snake bites, if adopted well in time, will be found beneficial to the patient. Sedatives are generally indicated.

**2.7 Fish Poisons :** Nature always presents a contrasting phenomenon. A careful survey of the vast world will show that a friend and a foe usually coexist in nature. A handsome cock and a hideous hen make biological partners. In human society, a humble peasant and a haughty pantata live together. A herd brought up in stinky muck produce savory milk. The virtuous environments are superimposed by vicious circles. The generous peregrinator lives with greedy pests. These laws of coexistence break monotony of nature. If nature so desired, it could maintain uniformity. We mortals are at its mercy and are obliged to abide with the decision.

Ordinarily, the fish provide most palatable dishes to man, yet there are some species which are naturally poisonous and not fit for human consumption. Certain species of *Tetrodon* when ingested may cause a material hazard. The fishes belonging to the family *Tracinidae* and *Betrachidae* also possess poisonous properties. The poisons are equally potent in raw and cooked fish. The poisonous fishes (*Diodontidae*, *Tetrodontidae*) are usually most unsightly and hideous. Fishes with bony endoskeleton (Pisces: Teleostei) are also poisonous. Fishes belonging to the family *Scorpaenidae* also possess poisonous glands under the dorsal spines. In Japan and China, various *Tetrodon* and *Diadon* species, cause serious hazards each year. Some species of Sturgeon family are also notorious. Violent vomiting is caused by *Synaceia* species found in Indian and Pacific oceans. *Plotosus* species (Mauritius) and widely distributed *Saccobranchus* species (in Indian and Ceylon waters) also produce similar symptoms.

The poisonous fishes when ingested may commonly cause violent gastrointestinal disturbance; and severe urticaria. Some fishes cause most annoying ichthyotoxismus. Other morbid conditions may also be initiated in some cases. The illness usually appears within a few minutes after ingestion. In rare instances, the poison may prove fatal to the victim. The pikes and barbels cause severe gastroenteritis. The lesser poisonous fish cause only nattle rash. The Green-land shark causes alcohol-like intoxication. The Roe and European barbels are notorious for barbel cholera. The smooth puffer is dangerous in Brazil.

Other symptoms of fuguism are nausea, vomiting, dyspnoea and muscular weakness. In fuguismus, the victim may also suffer from cyanosis, dilation of pupils, syncope, relaxation of sphincters and paralysis of speech. Some patients may also complain of dizziness and salivation. Fatal intoxication may occur about 1-2 hours after eating a dangerous roe, pike, barbel and sturgeon.

The venomability is both sporadic and spontaneous in fish. It differs from species to species and from age to age. The toxicity may be most active, pronounced and well marked during spawning period.

The nature of physiological toxins is not yet fully understood. The toxin is said to be an alkaloid and is called Mytipotoxin. The active principle is fugin and resembles curare. The poison is mainly concentrated in the head, liver and ovaries. Its production does not vary from fish to fish only but also from age to age of the fish. In adults the quantity fluctuates from spawning to fallow periods.

Fishes, developing poisonous properties during spawning season, contain venom in ovaries and testes. Some of these fishes remain toxic more or less throughout their life-time but become more toxic during breeding season. Others are perfectly safe during off season but dangerous during spawning. Moreover, it has been found out that these fish are more delicate and subject to rapid decomposition during this period. Intrinsic poisons and decomposing bacterias exaggerate these ill effects. The rule of thumb sign to discriminate between harmful and harmless forms is therefore, valueless. The hazard may be avoided by observing the following precautions.

- i. As far as possible, avoid eating fish, which has bad reputation.
- ii. Abstain fishing during breeding season, specially in waters rich in poisonous fishes.
- iii. Remove viscera and genitalia before eating a fish.

Some non-poisonous fishes may acquire poisonous qualities from the environments in which they live. Certain localities are abundant in poisonous foods. Although this stuff may not be harmful to fish itself yet it renders the fish unsuitable for human consumption.

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Fish living on jelly fish (Medusae) and corals are dangerous. Certain herrings also have bad reputation. Ceylon Sardine is a notorious example. It is apt to acquire poisons, produce cases of collapse and cause death.

**2.8 Putrid Fish :** A fish kept for sometime, may go bad and rendered unfit for human consumption. The decomposing processes vary from fish to fish. A delicate fish may perish quickly while in others the decomposition may commence after a long time. Moreover, it also depends upon the weather conditions. In warm and wet season, a fish may rot quickly, while in cold and dry season the same may be kept raw for longer intervals. Some bacterias are quick growing and rot the fish more quickly than the other forms. Both the caned and cooked decomposed fish are harmful to man. Food poisoning cases due to decomposed fish may be common in some parts of our country.

Fish that dies slowly also rots and decomposes rapidly. Fish taken out from water and killed immediately, is always wholesome and safe for human consumption. Barracuda is subject to rapid decomposition during some parts of its life and becomes highly poisonous.

When a stale fish, rich in putrifying bacteria, is eaten, diarrhoea and stomach pains are usual complaints. Some fishes may cause painful cramps of the body with dyspnoea, cyanosis, cold sweats and dilated pupils. In some cases fish poisoning may end in the death of the victim.

The development of the methods of preservation has partially solved the problem of quick decomposition of the fish. Partially, because some persons have peculiarity of constitution and characteristic temperament and are sensitive to certain chemical preservatives, while others have a strong sense of tolerance. Apart from this, some of the chemical preservatives are injurious in the long run. Boric acid for instance, is now known as one of the most toxic substances with least preservative properties. Slight fluctuation in the dosage of the preservative used may prove hazardous in some cases. Imperfectly preserved fish may also prove poisonous.

In the sensitive lot, rapid onset of the abdominal pain and severe vomiting may occur after eating preserved fish.

**Butulism**—like poisoning arises from eating insufficiently salted fish. These cases are due to the development of soluble toxins by *Cl. Botulinus* :

putrifying bacteria can develop as quickly in imperfectly preserved fish as in stale fish. Some of these bacteria are not killed by heat.

Bacterial diseases in fish are of common occurrence and often epizootic. The fish suffering from Bacterial diseases are usually not fit for human consumption. The diseased fish is not only dangerous itself but may also render a healthy fish an unfit food. The bacteria are usually quick growing and will contaminate the meat of healthy lot if lying close.

In Pakistan, Tuesdays and Wednesdays are meatless days. The well-to-do people may get extra supplies of mutton and beef on Mondays and store the surplus supplies in refrigerators. Some prefer to eat poultry meat. A good proportion of the people however eat fish and eggs.

The venders, dealing in fish kababs and fish rotisseries do roaring business. Fearing of scanty fish supplies on Tuesdays and Wednesdays, most of venders obtain huge fish supplies on Monday. Most of these shops lack cold storage facilities. Big packing cases are stuffed with ice and fish. Partial bacterial decomposition may occur in shabbily stored stale fish. During summer quick rotting may occur. In a country, where the vender is greedy and food inspection is not very rigid, the amount of stale fish consumed cannot be conveniently estimated. Acute food poisoning cases probably frequently occur during summer season but are seldom recorded or reported.

The putrid fish gives rise to gastro-intestinal troubles. In some cases vomiting may accompany diarrhoeas. Urticaria and general rash on the body is usually extremely annoying. The trouble may continue till such time that the digestive tract contain traces of the decomposed fish.

*Preventive Measures:* 'Don't take any risk with any edible fish, if it has commenced putrifaction' is a golden rule. Administer an emetic and evacuate the poison by washing out the stomach. Administer a purgative for speedy evacuation of the unwanted stuff from the intestinal tube. Hot water bottles have extremely soothing effect on patients complaining of acute gastro-enteritis. Morphia injections also alleviate pain.

Always go for a fish, which is firm and has agreeable flavour. Stale fish has intolerable smell. Its gills are never red and its meat is lifeless.

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Evidence of freshness are four, viz., bright gills, prominent eyes, elastic flesh and absence of any but characteristic odour. Don't forget that a clever fisherman may revive gills by colouring agents. Beware of the vender also who may make the eyes prominent by small piece of stick, fixed transversely in the head. The firmly adhering flesh only retains elastic resistance. The fisherman and the vender however, have not been able to camouflage inelasticity. Fish killed immediately after taking from water however, maintains its elasticity for a considerable long time. Frozen fish also keep well for long. Fish should always be refrigerated at low temperature. Fish possessing agreeable flavour is always safe for human consumption.

### 3. FISH AND HUMAN PARASITES

Fish has been found an essential vehicle in the transportation of some zooparasites from one host individual to the other. She may play a role when the mammalian host, including man, contaminates the environments where the fish lives. Later on, the ingestion of such raw or inadequately cooked fish, by a suitable host, set in the cycle in mammalian host.

There is extensive list of the parasites, which are thus maintained in nature. The parasites, which may have 'fish to man' cycle, are briefly discussed below.

#### APHASMID NEMATODE

3.1. The Giant Kidney Worm (*Dictophyma renale*) is fairly common in cat, dog, fox, wolf, otter, weasel, seal, ox and horse. Infestation is also suspected in several other mammals found in U.S.A and Orients. It has been found several times in human beings.

As the name indicates, the blood-red adult worms live in the kidneys and other body cavities of the host. Eggs are very hardy, remain viable for over five years or so and are passed in urine. Under optimum conditions however, embryonation may be completed in about six months. Hatching occurs in leeches (Branchiobdellids) and leech-like oligochaete worms which are gill commensals in cray fish. The second stage encysted larva migrates to bullhead fish when she eats the infected branchiobdellids and cray fish. Third stage larva encysts in the mesentery of the second host. The mammals get infected after eating raw infected fish. The life cycle is completed in about two years.

*Preventive Methods:* Infection, in endemic areas, can be effectively evaded, if all the fresh water fish are eaten after thorough cooking. This cheap and sure method of protection should be made popular through various tools of health education.

### PHASMID NEMATODE

3.2. The Carnivora Fluke (*Gnathostoma spinigerum*) normally occurs, in gastric tumors in cat, dog, leopard and tiger. The parasite is world wide in distribution. It is comparatively more common in tropical countries and has also been recorded from Indo-Pakistan subcontinent.

The infection has also been recorded from man. The authenticated records of human infection are available from India, Thailand, Malaya, China, Japan, Indo-China, Philippines and Java. In man, the worm produces a superficial lesion or abscess and occasionally tumors in other organs. It is said to have not yet fully adopted as a human parasite.

The adult worms are stout, reddish nematodes inhabiting tumors. The eggs are voided in faeces. The motile larva, on emergence enters a suitable cyclop. 14 days after, the larva enters the second stage. Fresh water fish after feeding on cyclops, harbouring the encapsulated stage, acquires the infection. Cray fish, crabs, amphibia, reptiles and many mammals, which are piscivorous, may harbour third stage larva.

*Preventive Measures:* An infection with the carnivore fluke may be conveniently avoided by refusing a dish of raw or semi-cooked fish.

### DIGENETIC TREMATODES

3.3. The Cat Liver Fluke (*Opisthorchis felinus*) is more common in cat, dog, fox and other related mammals. In endemic areas, it may occasionally occur in other mammals, including man. It is of common occurrence in North-Eastern Europe and U. S. S. R. It has also been recorded from man in Indo-Pakistan subcontinent.

The reddish-yellow adult worm occurs in the biliary and pancreatic passages of the mammalian host. The eggs pass in faeces. Hatching occurs in

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certain aquatic snails. The miracidium develops into sporocyst and redias. A couple of months after, mature cercarias are liberated. They actively swim, spin and dive to penetrate through the scales and back into the tissues of fresh water fish and ultimately transformed into metacercaria here. The reservoir host picks up infection after eating raw fish, containing the infective stage.

**Preventive Measures:** Always avoid eating raw or partially and inadequately cooked fish. Since there are so many other intermediate hosts of the cat-liver-fluke, the sanitary disposal of human excreta may solve the problem only partially.

**Note:** There are several other related flukes viz, *O. viverrini* and *O. noverca*, which have occasionally been incriminated from man. The incidence has been very low, warranting no serious attention.

The Thailand Fluke (*O. viverrini*) has the quality to become an important human parasite. It also occurs in fish eating mammals viz., dog and cat.

*O. noverca* is common parasite of pariah dogs and pigs in India. It has been occasionally reported from man. Other allied flukes (*Opisthorchis* sp.) have been record from Ecuador.

3.4. The Chinese Liver Fluke (*Opisthorchis (Clonorchis sinensis)*) occurs in the bile passages of man. In addition to man, this fluke may occurs in cat, dog, tiger and other fish-eating mammal. It is endemic in Korea, Japan and China and has also been recorded from India. The eggs are passed in the faeces of the host and ingested by a suitable snail, in which emergence of miracidia occurs and development upto the second generation radiac is completed. The cercarias on contact with a fresh water fish, pass via scale into the skin and encyst. When such a fish is ingested uncooked by any reservoir host, the meta-cercarias excyst in the duodenum and make their way to the biliary capillaries and reach maturity is about four weeks.

**Preventive Measures:** Thorough cooking of all fresh water fish before consumption will assure protection to human communities. Seasoned fish from endemic areas are also dangerous and therefore, must be avoided.

Addition of ammonium sulphate to manure pits will kill eggs. This procedure may give additional protection to the agricultural communities when human faeces is involved.

**3.5. Egyptian Minute Fluke (*Heterophyes heterophyes*)** in addition to man, has been found in cat, dog, fox and other fish eating mammals. It may be present throughout the orient and is common in Nile Delta. It has also been recorded from Far East.

Eggs pass in faeces. Hatching occurs when ingested by a suitable snail. Sporocysts and one or two generation of radiae develop in this host. The cercariae on emergence, penetrate an appropriate, fresh water fish and encyst. Infection in the definitive host occurs when the fresh-water fish, containing metacercariae, is eaten.

**Preventive Measures :** Abstain from eating raw, under cooked and salted fresh water and salt water fish.

**Note :** There are several other related flukes which have been occasionally recorded from man. Japanese Minute Fluke (*H. katsuradai*) is common in Japan. It causes severe diarrhoea in its victim.

The Philippine Minute Fluke (*H. brevicocca*) was reported from the Philippine islands. It occurs in human intestines and may occasionally cause in some cases abdominal pain and severe diarrhoea. Ordinarily it causes little harm to the human host.

**3.6. The Yokogawas Fluke (*Metagonimus yokogawai*)** lives in the intestines of man, dog and cat. It was once reported from pelican. It is a common heterophyid of Far East, Siberia and Bolkan states. Cases are also on record from Spain. Fully embryonated eggs are passed in stools and ingested by most suitable snails. After successful completion of a sporocyst generation and two radial generations vigorously moving cercariae emerge and ultimately penetrate through the scale, down into skin or flesh of a fresh water fish.

**Preventive Methods :** Ingesting of raw fresh water trout, containing encysted parasite, causes infection in definitive host. Eating of well cooked gold fish reduces chances of infection to bare minimum.

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3.7. **Salmon Poisoning Fluke** (*Nonophyetus* (= *Trogloremia*) *salmonicola*) lives in the intestines of fish-eating mammals. Dogs, foxes, raccoons are its common hosts. This fluke is a vector of a rickettsial body, which causes salmon poisoning in dog and other fish-eating animals. Human infection is incidental and has been recorded from Eastern Siberia and Northern America.

Eggs are passed in the excreta. An appropriate mollusc eats the eggs contained in the faecal matter. Ultimately, the active cercarias, on liberation rock and roll round the aquatic animals and attack salmons and trouts and encyst in their kidney. The infective organs, when eaten by the mammalian host, produce the dreadful infection in the definitive host. The adults may be found deeply embedded in the small and large intestines of the warm blooded host.

The salmon poisoning is due to the rickettsial bodies (*Neorickettsia helmintheca*) present in this fluke. Some of the severe symptoms due to this infection are fever, vomiting, dysentery and diarrhoea. Usually there is very high mortality in domestic dogs. The few, which recover, however, are immuned to further infections.

**Preventive Methods:** Human cases are absolutely rare. Adequate cooking however, renders the fish safe for human consumption. Fish-tanks may be cleared of mollusc by repeated use of hand nets. Some Molluscicides may also be of practical importance in combating this host. Better control of the disease however, may result from educational efforts.

3.8. **Oriental Lung Fluke** (*Paragonimus westermani*) is endemic in Far East. Its natural definitive hosts are numerous but it is a common infection in cat, dog, fox and mongoose and has been found in many other crab and cray fish eaters.

The adult worm occurs in the lung of the definitive host. In rare instances, because of circuit migration, however, the infection may also be recorded from ectopic foci. Cysts have been found in liver, intestinal wall, muscles, testes, brain, mesenteric lymph nodes, peritoneum and pleura. Slaty blue indolent ulcers and pseudo-tubercle like lesions are caused round the encapsulated worm cysts.

The eggs infiltrated in the host tissue, become rounded tubercles and nodules. From the lungs however, the eggs are discharged in the sputum or voided in the faeces if swallowed. Development in the water may occur for about 2-3 weeks. Miracidium ultimately penetrates a suitable mollusc, within which, after a lapse of several weeks, it transforms into sporocysts and produces a generation of rediae. The cercariae after emergence invade a cray fish or a crab and encyst. Encysted

metacercariae are pearly white and may be found in liver, gills, muscles and thoracic legs. When the infected crabs or cray-fish are eaten raw or partially cooked, the metacercariae excyst in the duodenum and migrate through the intestinal wall, pass the abdominal cavity and through the diaphragm penetrate the pleural cavity so as to enter the lung and get lodged in the tissue capsules of the bronchioles.

**Preventive Methods:** Infection in human being occurs when frankly raw cray fish or crabs harbouring the encysted metacercaria are eaten. Safe procedure, therefore is to consume well boiled, sufficiently fried and adequately cooked cray fish. Eradication of paragonimiasis can be definitely achieved if people in endemic areas completely abstain from eating raw, salted, wine dipped and vinegar soaked delicacies.

**Note:** *Paragonimus kellicotti* is closely allied fluke and has been recorded from North America.

### PSEUDOPHYLLIDEAN TAPEWORM

**3.9. Broad Tapeworm (*Diphyllobothrium latum*)** is common intestinal parasite of man, domestic dog, domestic cat, mongoose, seals, domestic pig and bears. It has also been recorded from other fish eating mammals. Man, however, is the host par excellence. It occurs in several parts of Europe, North America, Eastern Canada and Australia and has been recorded from Uganda, Angola and Madagascar. It is also endemic in Japan.

The eggs are passed in the faeces. Hatching occurs in water. Active coracidium develops further when ingested within 12 hours by an appropriate copepod (*Diaptomus Spp.* and *Cyclops Spp.*) and becomes proceroid larva in the humeral cavity 2-3 weeks after. When the infected copepod is eaten by a fresh water fish, the proceroid larva finds its way through the tissue and gets lodged free in between the muscle fibres of the fish. It grows, grows and grows, till it is transformed into a plerocercoid (*Sparganum larva*). The larger fish may get the infection after devouring the smaller fish. The proceroid do not develop further in the fish. The infection is usually spontaneously lost after several months. The man and other definitive hosts become infected on consuming raw or insufficiently cooked fresh-water-fish. The development in the definitive host may be completed within 5-6 weeks.

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It is interesting to know that a strictly marine fish is not infected. The fresh-water fishes of Chile, Argentina, Africa and Australia are also immune to *diphyllobothriosis*. The pike, and the perch, the salmon, the trout, the grayling, the ruff and the eel of Europe are highly susceptible to broad-tape worm infection.

**Preventive Methods:** Thoroughly cooked fish are safe for human consumption. Freezing of fish for 24—48 hours at 14°F is also recommended. Sterilization of sewage in endemic areas, before discharging into the river, renders it free from any danger. Maximum infection in fish may occur during summer. Fishing of the pike, the perch and other heavily infected fishes may be prohibited by Law during this period. These methods may be found effective in lowering the infection rate in endemic areas if practiced wisely and widely. Health education of the communities may, therefore, be started well in advance.

4. **Shell Fish Hazards:** Shell fish are nutritious savory. In recent years the digestible forms have become important additions to human dietary programmes. The shell fish are, rather poor source of fat and carbohydrates. However, iodine contents are of special significance. This category includes *Mollusks* (oysters, clams and mussels) and crustacea (lobsters, crabs and shrimps).

4.1. The Green Oysters are in considerable demand in some European countries. To develop natural green colour in gills and palps, the oysters are fed upon particular types of diatom (*Navicula ostraria*). In some cases the green colour is due to the presence of copper in the body.

Oysters contain vit. A, B and C. Vit B however, predominates. Liver excels in iron and copper. The proteins are comparable with beef and mutton.

Oysters grown in sewage beds are sometimes contaminated with typhoid bacilli. Floating oysters in contaminated water is dangerous. Who knows when it may become responsible for an out break of typhoid fevers. Such oysters, when transferred to fresh water, purge themselves of the typhoid bacterias and other injurious organisms and pollute the water supply and may play an important role in the spread of intestinal troubles.

Bacterial contents of oysters is usually seasonal. Since drinking occurs more during summer, the bacterial population is also at its highest during this season.

Some people do not tolerate oysters at all. This natural idiosyncrasy may also be confused with "food-poisoning". Allergy (atopy) to these foods is as common as in fish. Here it is not the food but the person who feeds upon.

**Preventive Methods:** Floating of oysters in clean water is one way of cleaning their intestinal tract and denuding them of bacterial infection. Such oysters become better for shipment as well as for home consumption. Use of oysters and shell fish, raised in waters certified to be fit for drinking, is safe.

4.2. The clams are more or less like oysters in their food value and commonly contain vitamins A, B and D. Vitamine D, however, is present in appreciable quantities. They are notorious for spreading enteric fevers in endemic places.

The clams collected from polluted beaches, are dangerous. Since clams are always cooked before eating, such of the hazard is comparatively reduced. Poisoning with clams may occur as in the mussels.

4.3. Mussels are also not tolerated by some, while others have good taste for them. Sometimes the dock-labourers suffer of allergy (Erythematous skin) and enteric troubles. Some types of mussels contain a thermo-stable toxin during spawning season. This poison may cause perepheral paralysis in the human beings. The trouble may vary from trembles and numbness about the lips to complete loss of power in the muscles of the extremities and neck in bad cases. Death may occur due to respiratory failures. Symptoms develop rapidly and are moderate and severe. Muscular weakness is extensive. Vomiting is inconsistant, pulse firm but is slightly quickened. Trouble occurs during certain seasons and has been recorded from California and Mexico.

The hazard occurs when cooked and raw mussels (*Mytelus californicus*, *M. edulis* and *Modiola medioles*) are eaten. The dangerous mussels are rich in Dino flagellates (*Gonylax catenella*), which multiply extensively. Dinoflagellates impart deep rust-red colour to water. It is one of the most luminescent spectacle at night and can be seen from miles during the day.

4.4. **Shell Fish Annoyance:** There is no disease of shell-fish which may be transmitted to man. Snails, however, are the intermediates hosts of flukes, which cannot be transmitted by ingestion. Man himself makes the snails

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dangerous, when he pollutes and contaminates the water collection in which they live.

Shell fish are good foods when fresh. They may become contaminated and injurious on keeping. Properly preserved shell fish however, are rendered safe for human consumption.

#### Preventive Methods

- (i) Use only clean water mussels, when handled with extreme sanitary care.
- (ii) Boiling does not destroy all the poisons, therefore cooking may not be taken in any way as prophylactic measure.
- (iii) If  $\frac{1}{4}$  oz of bicarbonate of soda is added for each quart of water used during the cooking, 25—30 per cent of the poisonous organisms contained in mussels; may be destroyed in 20—30 mts.

4.4. 1. **Garrison's Fluke** (*Echinostoma ilocanum*) occurs in the small intestines of man, dog and cat in Philippines. The eggs are passed in the faeces and mature 1—2 weeks after in water. Miracidia after emergence, lope about in water and searches a suitable snail host. (*Gyraulus convexiusculus* recorded from India) enter its body and develops into mother radiae, a generation of daughter radiae and then cercariae in 6-7 weeks. The cercariae have a very brief swimming existence, after which they may enter any fresh water mollusc and encyst. These mollusc are infective to mammals, and an infection in man may be initiated when such a mollusc is eaten raw.

**Preventive Methods:** As far as possible, avoid eating raw mollusc and bivalves in endemic areas and save yourself of intestinal colic and diarrhoeas, which may occur due to inflammatory reaction set up in the patient at the site of attachment.

**Note:** Mention may also be made of some other allied forms, which have been occasionally recorded from man.

- (i) *Echinostoma lindoense*: occurs commonly in Central Celebes, where the native generally have a heavy infection. Its first intermediate host is a small planorbid. The encysted metacercariae are found in

pulmonate snails. The mollusks, when eaten raw, pass the parasite to the definitive host.

- (ii) *Echinostoms mallayanum*: was reported from federal Malaya States, Sino-Tibetan border, Northern Sumatra and India. The first intermediate host in India is a mollusc (*Lymnaea leuteola*). The cercariae either encyst in it or in a fish. Man is an incidental host, and become infected after eating raw fish containing encysted metacercariae. Dogs are usually infected in endemic areas.
- (iii) *Echinostoma melis* was recorded from a diarrhoic stool of a Roumanian patient and also a Chinese after autopsy. The first intermediate host of this fluke is *Stagnicola e. emarginata*. Metacercariae however, are found in tadpoles. Man may acquire infection after a meal of raw infected tadpoles.
- (iv) *Echinostoma revolutum* is a normal parasite of several species of water fowls and ducks. The infection has also been reported from man. The first intermediate host is a mollusc. Metacercariae also encyst in a second mollusc. Human infection may be incriminated in those regions where salted mollusks are delicacies.
- (v) *Echinostoma cinetorchis* is recorded from Japan and Formosa. Human infection occurs when tadpoles and frogs containing encysted metacercariae in their tissue, are eaten raw or inadequately cooked.
- (vi) *Echinochasmus perfoliatus* is a common intestinal fluke of dog and cat in Hungary, Italy, Roumania, U. S. S. R and Far East. This fluke may also occur in fox and pig. Human infections however, have been recorded from Japan only. Its intermediate hosts are different species of mollusks. The metacercariae however, occur

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in fresh water fishes. Man may acquire infection after eating uncooked, fresh water fish.

4. 5. **Poisonous Coelentrates:** The sea-anemones (Polyp) and Jelly fish (Medusa) have been involved in serious and unpleasant stings.

The sponge hunters, quite frequently experience unpleasant stings of anemones. The sting gives marked itching, burning and erythema. The affected skin may become necrotic and ultimately slough off, leaving behind a scar.

Jelly fish is usually a harmless coelentrate but exception to the rule are there when certain people may be considerably annoyed. Certain species are notorious for causing local rashes after mere contact and causing profusely weeping eczema. The divers often encounter the jelly fish and experience severe, irritating urticarial eruption on contact. Intense itching and continual scratching may produce oedema, and cause lot of discomfort to the victim. The symptoms vary from person to person, from mild erythema to marked congestion of the respiratory tract. In certain cases, severe urticaria may be followed by general symptoms: shock, acute cardiac distress, dyspnoea and muscle pain. The victim may be ultimately emaciated. The general symptoms may appear within 10–60 minutes. Hysterical manifestation (Feeble heart action and semi conscious state) may be followed by incessant cough and corysal signs.

Immediately after contact, there is sensation of burning and about 15 minutes after, other symptoms may start appearing. Pain in loins and also in scrotal region is common in some cases. It is followed by curious distress, restlessness and weakness. Constriction in the throat and discomfort in the chest causes lot of worry. Later on continuous coryza with lachrymation is most harassing. These symptoms may start abating an hour after, but weakness and sore throat, bronchitis usually persists for some time. Skin rashes and urticaria may take 2–3 weeks to disappear.

## 5. SUMMARY

The population explosion has alerted the nations during recent years. Finding of food, for 2,500,000 mouths born every year, is world wide problem. The limitation of foods, which could be grown and harvested from the agricultural lands, is now an open secret. It has necessitated extensive exploitation of other sources. According to consensus of opinion the vast waters may come to our rescue. The poet found books in running brooks, the needy would find sauce in the sea and good luck in the lake.

Fishing has always remained a fascinating hobby of man. From a simple thrill it is now developing into an elaborate piscatorial art. Time is not far when this industry will become a corner stone of human prosperity.

Fishes are both friends and foes. Some constitute our fine foods. In rare instances, some fishes are cause of serious hazards. While others are known to be important intermediate hosts of several helminths. The man may acquire some of these infections after eating raw or inadequately cooked fishes. A brief note of these parasites is given in this note.

Apart from transmission of zooparasites, some fishes are capable of biting and inflicting serious wounds, while stings of others are irritating. Some fishes are poisonous and cause of violent gastro-intestinal disturbances in human victims.

Oysters, clams, mussels, crabs, shrimps and lobsters are also obtained from water collections. The shell fishes found in polluted beaches may some times cause serious hazards.

Short notes on the prevention of dangerous diseases, indiocyneracies and allergies caused from eating the aquatic animals, are given. "To warn is to fore arm" is our favourite theme.

## 6. ACKNOWLEDGMENTS

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# THE PUBLIC HEALTH ENGINEER AS A PARTNER IN HEALTH

By

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The age old maxim "Health is wealth" still holds good, and the Public Health Engineer does his bit to achieve this "Wealth" as a partner in Health Programmes, not only for an individual but for the public at large. The very name and designation as Public Health Engineer, confirms this.

Man's desecration of his physical environment is something that has pre-occupied philosophers, religious leaders and temporal powers throughout the ages. In the present century, when the need is greater than ever, the Public Health Engineering profession has emerged, whose exclusive duty is to mount guard over the air, water, food and shelter that are basic necessities to man's life.

The National Research Council Committee of America on Sanitary Engineering on December 14, 1954 approved the definition and activities of Public Health Engineers in the following words.

(a) To conceive, design, appraise, direct and manage engineering works and projects, developed as a whole or in part, for the promotion of protection of Public Health, particularly as it relates to the improvement of Man's environments and

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\*Paper read on the " World Health Day " celebrated on the 7th April 1967 at the I. H. P. M., Lahore.

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(b) To investigate and correct engineering works and other projects, that are capable of injury to the public health by being or becoming faulty in conception, design, direction or management.

The Public Health Engineer, whose role is to control man's environment so that it enhances rather than detracts from his health and comfort, is of necessity a member of the Health Team. The work he does may be less spectacular than that of a surgeon performing a delicate heart operation, but its steady, purposeful character is fundamental in making it possible for the human race to continue to live in the modern world.

These works of Public Health Engineering will include,

- (a) Water supply ; treatment and distribution.
- (b) The collection, treatment and disposal of community wastes.
- (c) Milk and food sanitation.
- (d) Housing and institutional Sanitation.
- (e) Control of atmospheric pollution.
- (f) Other factors that have as their objective the control of environmental factors affecting health.

"Whoever wishes to investigate medicine properly, should consider the season of the year, the winds and the water in relation to health and disease" is another well said maxim. This water is one of the exclusive fields of Public Health Engineering. The provision of pure water supply is an essential to the efficient developement of any country. Without this health of the inhabitants, and therefore their efficiency will be maintained at a low level. If pure water supplies are provided there is no doubt that with a healthier population, development can forge ahead much faster.