t our website www.jaypeebrothers.com, for detailed information on community medicine books, visit our website www.jaypeebrothers.com

3rd Edition

Essentials of Community Medicine

Previously known as Short Textbook of Preventive and Social Medicine

As per the Competency-based Medical Education Curriculum (NMC)



GN Prabhakara

JAYPEE

CONTENTS

SECTION 1

1. Concept of Health and Disease 3

- Holistic Approach of Health (Multifactorial Causation, Web of Causation) 4
- Disease 5
- Triad of Epidemiology (Agent–Host–Environment) 8
- Effective Communication 10
- Health Indicators 11
- Estimates of Demographic Values of India 2019 11
- Role of Health Education in Health Programs 11
- Doctor–Patient Relationship 11
- International Classification of Diseases 12

2. Relationship of Social and Behavioral to Health and Disease 13

- Terminology Used 14
- Special Terms in Social Medicine 14
- Behavioral Change Communication 14
- Social Problems 15
- Social Area of Interest 15
- Group Behavior 15
- Social Factors in Health and Disease 16
- Clinico-Sociocultural and Demographic Assessment of Individual, Family and Community (Medicosocial Cases) 16
- Sociocultural Factors in Health and Disease 16
- Barrier to Good Health and Health-seeking Behavior 16
- Social and Behavior to Health and Disease (Family in Health and Disease) 16
- Socioeconomic Programs 20
- Present Grouping of the Community 20
- Social Agencies 21
- Interviewing Technique 21
- Medical Economics 21
- Geographic Pathology 21
- Hospital Sociology 21
- Knowledge, Attitude, and Practice 22
- Social Security and Health Care 22

3. Environmental Health Problems 25

- Evolution 25
- Major Components of Physical Environment 25
- Water and Other Components 25
- WHO Standard for Drinking Water (Bacteriological) 33
- Surveillance of Drinking Water Quality 33
- Swimming Pool Sanitation 33
- National Water Supply and Sanitation Program 34
- Water Pollution Law 34
- Air 34
- Ventilation 35
- Lighting 36
- Noise 36
- Radiation 36
- Meteorology 38
- Housing and Town Planning 39
- Waste Disposal 41
- Human Dead Body Disposal and Environmental Sanitation 48

4. Medical Entomology 49

- Classification 49
- Mode of Transmission 49
- Vector-borne Diseases 49
- Identifying Features 49
- Insecticides 62
- Zoonoses 64
- Integrated Vector Control 64

SECTION 2

5. Principles of Health Promotion and Education 67

- Information 67
- Education 68
- Communication 70
- Role of Health Education in Health Programs 70
- Population Education 71
- Cancer Education 71
- AIDS Education 71
- Nutrition Education 71
- Planning and Management of Health Education 71

6. Nutrition and Health 73

- Main Areas of Study 73
- Terminology 73
- Source of Nutrition 73
- Basal Metabolism 74
- Proximate Principles 74
- Important Nutritional Profile of Foodstuff 75
- Nutritive Value of Common Foods 76
- Nutritional Assessment 76
- Balanced Diet 77
- Nutritional Diseases 79
- Food Poisoning 83
- Food Toxins 83
- Food-borne Diseases 85
- Commercial and Processed Foods 85
- Therapeutic Diets 85
- Indications for Parenteral Nutrition (IV Feeding) 87
- Nutritional Surveillance 87
- Food Surveillance 87
- Food Additives, Food Adulteration, and Food Fortification 88
- Nutritional Program 88
- Nutrition Education 89
- Nutrition Rehabilitation 89
- Calorific Value of Cooked Preparations 90
- Population Nutrient Intake Goals 90
- Integrated Child Development Services Scheme or Integrated Mother and Child Development Services 90

7. Basic Statistics and its Application 91

- Common Terms 91
- Types 92
- Formulation of Research Question for a Study 92
- Sources of Statistics 101
- Scope of Statistics 101
- Data Collection, Classification, Analysis, Interpretation, and Presentation 101
- Measures of Central Tendency, Measures of Variability and Significance Tests 103
- Measures of Variability 104
- Normal Distribution 104
- Significance Tests 104
- Sampling 107
- Standard Error 107
- Sample Size 107

SECTION 3

8. Epidemiology 111

- Milestones in Epidemiology 111
- Terms Used in Epidemiology 112
- Types of Epidemiology 114
- Investigation of An Epidemic 117
- Quarantine 118
- Emporiatrics 118
- Desmotology 118
- Disinfection 118
- Dynamics of Disease Transmission 120
- Immunity (Host Defense) 121
- Adverse Event Following Immunization 122
- Prevention and Control of Disease in Man 123
- Epidemiometric Analysis 123
- Screening Tests 124

9. Epidemiology of Communicable Diseases 128

- Intestinal Infections 128
- Respiratory Infections 143
- Vector-borne Infections 160
- Surface Infections 173
- Zoonotic Infections 191
- Emerging and Re-Emerging Infections 200
- Hospital Acquired Infections (Nosocomial Infection) (Hospital Cross Infection) 202

10. Epidemiology of Noncommunicable Diseases 204

- Common Noncommunicable Diseases 204
- Epidemiological Findings in Noncommunicable Disease 204
- General Measures in Prevention of Noncommunicable Disease 205
- Selected Noncommunicable Diseases 205

SECTION 4

11. Demography and Vital Statistics 221

- Demography 221
- Terminology 221
- Process in Demography 221
- Estimates of Demographic Values of India 2019 223

- Demography and Genetics 223
- Demographic Cycle 224
- Major Sources of Demographic Data 224
- Population Estimation/Dynamics 224
- Improvident Maternity 224
- Family Planning (Family Welfare Planning) 224
- Population Education 227
- National Family Welfare Program 229
- National Population Policy—2000 229

12. Reproductive Maternal and Child Health 231

- Basic Elements of Reproductive and Child Health 232
- Child Survival and Safe Motherhood 232
- Delivery Service at Primary Health Care 233
- Emergency Care 234
- Eag (Empowered Action Group) of Health and Family Welfare Service, Government of India 234
- Safe Motherhood 235
- Maternal and Child Health Indicators (RCH Indicators) 238
- Handicapped Children 242
- The Growth 242
- Infant Feeding Practices 244
- Weaning and Supplementation (Addition of Semisolids) 246
- Social Welfare Schemes for Better RCH 247
- Integrated Child Development Services 247
- Key Indicators in Reproductive and Child Health 248

13. School Health 250

- Objectives 250
- Milestones 250
- Health Problems in School Children 250
- Activities 251
- Healthy School Environment 253

SECTION 5

14. Occupational Health Including Social Security 257

- Ergonomics 257
- Occupational Hazards 258
- Pneumoconiosis 260
- Occupational Hazards in Agriculture 260
- Occupational Cancer 260
- Sickness Absenteeism 261
- Industrialization 261
- Occupational Risks of Health Professionals and their Prevention 261
- Prevention of Occupational Diseases 262
- Employees State Insurance Scheme (1948) Amended (1975, 1984, 1989, 2010) 263

15. Geriatrics and Health 265

- Geriatric Health Problems 266
- Nutritional Requirement 266
- Social Welfare Measures 267
- Elderly Citizen Facility Concept 267

16. Genetics and Health 269

- Common Terms 269
- Genetic Basis 270
- Genetic Disorders 270
- Prevention of Genetic Disorders 271
- Population Genetics 272
- Gene Therapy 272
- Heritability 273

17. Mental Health 274

- Current Picture 274
- Common Defense Mechanisms 274
- Mentally Ill 275
- Mentally Well 275
- Mental Illness 275
- Psychophysiological Disorders (Psychosomatic) 275
- Alcohol and Substance Dependence 276
- Childhood Disorders 276
- Modern Therapy 276
- Prevention of Mental Illness 276
- Community Psychiatry 277
- National Mental Health Programme 277

SECTION 6

18. Disaster Management 281

- Terminology 281
- Classification of Disasters 282
- Public Health Tools Available in Disasters 282
- Challenges in Disaster Management 282
- Documentation and Tagging in Disaster Areas 282
- Effects of Inappropriate Humanitarian Assistance 282
- Vulnerability Reduction in Disaster Management 282
- Emergency Preparedness in Disaster 283

- Phases of Disasters 283
- Common Natural Disasters in India 284
- What to Do in An Earthquake 285
- Action Plans on Earthquake by Government of India 285
- Steps in Management of Natural Disasters 286
- Management of Cyclonic Storm Affecting PHC Area 286
- Hazard Description Scales 286

19. Hospital Waste Management 287

- Classification 288
- Hazards 288
- Waste Disposal Container Code at Hospital Waste Management 288
- Treatment Option for Hospital Waste Management 288
- Important Aspects of Hospital Waste Management 288
- Major and Important Instructions in Hospital Waste Management Through Pictures 290

SECTION 7

20. National Health Programs 293

- National Health Problems 293
- National Health Programs 293
- Major National Health Programs 296

21. Health Planning 309

- Elements of Health Planning 310
- Planning Cycle 310
- Health Committee Reports 311
- Goals of National Health Policy By 2005, 2007, 2010 and 2015 312

22. Health Management 313

- Gulick's POSDCORB in Health Management 313
- Inventory Management 314
- Financial Management 315
- Basic Activity of Health Management 316
- Span of Management 316
- Management Methods 316
- Health Policy 318
- Health System in India 320
- Rural Development 322
- Evaluation of Health Services 322
- Milestones in Public Health in India 322

23. Community Healthcare 324

- Concepts of Healthcare 324
- Primary Healthcare 325
- Community Development Program 327
- Essential Healthcare 327
- Health for All 328
- Millennium Development Goals Set By United Nations in 2000 329
- Health Programs 329
- Levels of Healthcare 330
- Healthcare Delivery Systems 330

SECTION 8

24. International Health Organizations 335

- History in Development of International Health 335
- Organizations 335

25. Voluntary Health Organizations 339

- Role of Voluntary Health Organization 339
- Functions of Voluntary Health Organizations 340
- Organizations 340

26. Nongovernmental Health Organizations 343

- Organizations 343

SECTION 9

27. Urban Health 347

- India: Trend in Growth of Urban Population 347
- Urban Health Problems 348
- History of Urban Health 348
- Process of Urban Life 348
- Suggested Education Activity 349
- Service on Urban Slum Areas and Services on Urban Area 349
- Agenda for Sustainable Ecological Balance 350
- Krishnan Committee Report (1982) on Urban Health 350

28. Medical Ethics 351

- Indian Legislations Related to Medical Ethics 352
- Heteronomous and Autonomous Ethics 352
- Major Principles of Medical/Bioethics 352

- Perspectives of Medical Ethics 352
- Ethics of the Individuals 352
- Organ Donation 353
- The Ethics of Human Life 354
- Cloning 354
- Recent Approaches in Gene Therapy 355
- Prolongation of Life 355
- Advanced Life Directives 355
- Death and Dying 356
- Professional Ethics 356
- Research Ethics 357
- Areas of Ethical Interest in Present Day Practice 358

29. Public Health Law 362

- Troubling Problems in Medical Ethics 363
- Legal Rights and Responsibilities in Modern Medicine 363
- Health Law in India 363
- Major Acts 363

SECTION 10

30. Essential Medicine 369

- Criteria for Inclusion of A Medicine in National List of Essential Medicine 369
- Criteria for Deletion of A Medicine From NLEM 370
- History 370
- Uses of Essential Medicine 370
- National List of Essential Medicines 2015 370

31. Rational Drug Management 372

- Types of Irrational Drug Use 373
- Drugs 373
- Prescription 374
- Compliance 374
- Self-Medication 374
- Irrational Use of Drugs 375
- National Drug Policy 375
- Drug Economics 376

32. Health Information System 377

- Qualities of Good Health Information System 377
- Components of Health Information System 377
- Uses of His 378
- Sources of Health Information System 378
- Recent Approach in Medical Informatics and Public Health Informatics 378

SECTION 11

33. Recent Area of Interest in Community Medicine 381

- Acute Flaccid Paralysis Surveillance 382
- Adverse Events Following Immunization 382
- Acquired Immunodeficiency Syndrome Day 384
- Aids Surveillance 389
- Anthrax—Bioterrorism 390
- Avian Influenza (Birds Flu, Avian Flu, or Fowl Plague) 391
- Ayushman Bharat Program 394
- Baby-Friendly Hospital Initiative 395
- Chikungunya Fever Epidemic 395
- Community Dentistry 397
- Community Ophthalmology 397
- Community Psychiatry 398
- Consumer Protection Act 399
- Dengue Burden in India: Recent Trends and Importance of Climatic Parameters 400
- Coronavirus Epidemic 2019–2020 401
- Vaccine Development Cycle 402
- Drastic Preventive Measures 402
- Desmotology 402
- Early Childhood Development 403
- Emporiatrics 403
- Essential Drugs 403
- Family Medicine 404
- Genetic Engineering 405
- Global Warming 405
- Guinea Worm Eradication: Indian Scenario 405
- Handigodu Syndrome (Endemic Familial Arthritis) 407
- Hospital Waste Management 407
- Hypothermia 407
- Intensive Pulse Polio Immunization (IPPI) 408
- Janani Suraksha Yojana 410
- Kangaroo Mother Care 410
- Leptospirosis: An Emerging Public Health Problem 410
- Medical Informatics 412
- Meta-Analysis 413
- The Millennium Development Goals 413
- National Days 413
- National Health Goals By 2015 415
- National Rural Health Mission 415
- National Sociodemographic Goals By 2010 417
- National Urban Health Mission 417

- National Health Policy 2017 418
- Nipah Viral Infection 418
- National Institution for Transforming India Aayog 2015 418
- Poison Control Information 418
- Partogram 419
- Postpartum Program 419
- Recent Global Tuberculosis Strategies 420
- Red Cross Day 420
- The Rights of Persons with Disability Bill 2016 420
- Re-Orientation of Medical Education 421
- Sanitation at Fair, Festival, Pilgrimage 422
- Severe Malaria 422
- Social Accountability of Hospitals and Medical Colleges 423
- Social Marketing 424
- Sociometric Analysis 425
- Substance Abuse 425
- Sulabh Shauchalaya 425
- The Prenatal Diagnostic Techniques and Preconception 426
- Trends in Recent Immunization 428
- Tribal Health 433
- Universal Declaration of Human Rights 433
- World Health Organization Day 436
- Women's Hygiene Kit 443
- Zika Viral Infection 444

Appendix **445**

Index ***449***

4 CHAPTER Medical Entomology

Chapter Outline

- Classification
- Identifying Features
- Insecticides
- Zoonoses
- Integrated Vector Control

DEFINITION

The study of insects of public health (PH) importance.

CLASSIFICATION

1. *Insects:* Winged, have biting instruments, e.g., mosquitoes, flies, lice.
2. *Arachnida*
   - No antennae
   - No wings
   - Terrestrial

   For example, ticks (hard and soft), mite (trombiculid and itch)
3. *Crustacea*
   - No wing
   - Aquatic

   For example, cyclops.

MODE OF TRANSMISSION

- *Direct contact*, e.g., scabies, pediculosis
- *Mechanical*, e.g., flies
- *Biological*:
  - Propagative, e.g., plague
  - Cyclopropagative, e.g., malaria
  - Cyclodevelopment, e.g., filaria

VECTOR-BORNE DISEASES

Mosquitoes: Malaria, filaria, dengue

Flies: Typhoid, dysentery, trachoma, kala-azar, oriental sore, sandfly fever, sleeping sickness

Flea: Plague, endemic typhus

Lice: Epidemic typhus, relapsing fever, trench fever

Ticks and mites: Typhus, encephalitis, relapsing fever, scrub typhus, scabies

Cyclops: Guinea worm, *Diphyllobothrium latum*.

IDENTIFYING FEATURES

Mosquitoes

Anopheles Eggs (Fig. 4.1)

Habitat

Clean water, wells, streams, tanks, etc.

Identification

- Found singly
- Both ends tapering
- Boat-shaped

Float and frill on either side: The floats are seen as bulge on each side of the egg and they show striations called *float ridges* form patterns.

JAYPEE BROTHERS

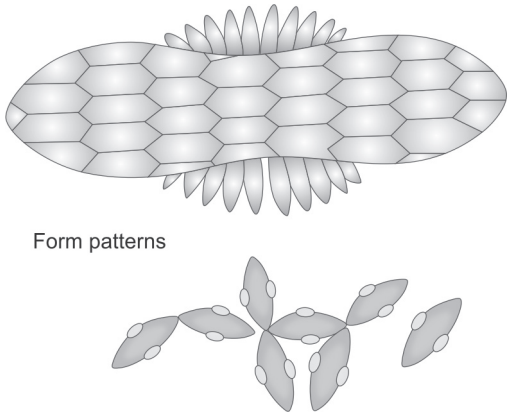

Fig. 4.1: Anopheles eggs.

Anopheles Larva (Fig. 4.2)

- Consists of a head
- It has a segmented body—body covered with hair.
- Lies parallel with and just below the surface of the water.
- Respiratory opening on the dorsum of the 8th segment.
- Siphon tube absent.
- Presence of palmate hair on abdomen.
  PH importance: Adults transmit malaria.

Anopheles Adult Male (Fig. 4.3)

- Palpi are as long as the proboscis and clubbed at its end.
- Antennae long and feathery.
- Proboscis not adapted for piercing and sucking blood.
- Of no PH importance as they do not bite and live on vegetables and fruit juice.
- Wings spotted
- While resting proboscis, head, thorax and abdomen make an angle with the surface.
- Breeds in clear water and slow-running streams.

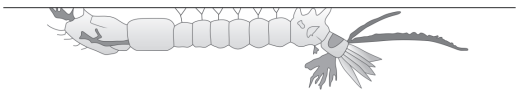

Fig. 4.2: Anopheles larva.

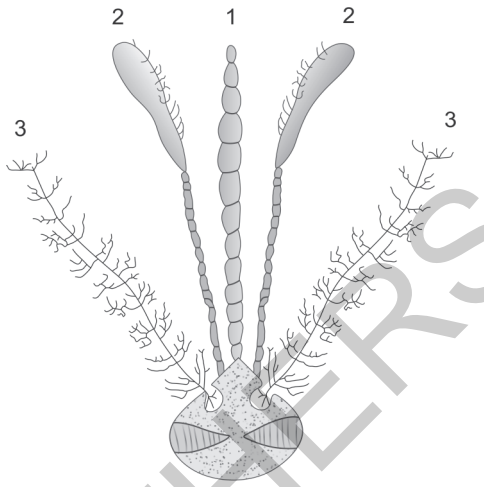

Fig. 4.3: Anopheles adult male—(1) Proboscis, (2) Palpi, (3) Antennae.

Anopheles Adult Female (Fig. 4.4)

Salient Features

- Wings spotted.
- Head has a proboscis and a pair of compound eyes, antennae and palpi.
- Proboscis specially adapted for piercing the skin and sucking the blood.
- Antennae with hairs are short and scanty.

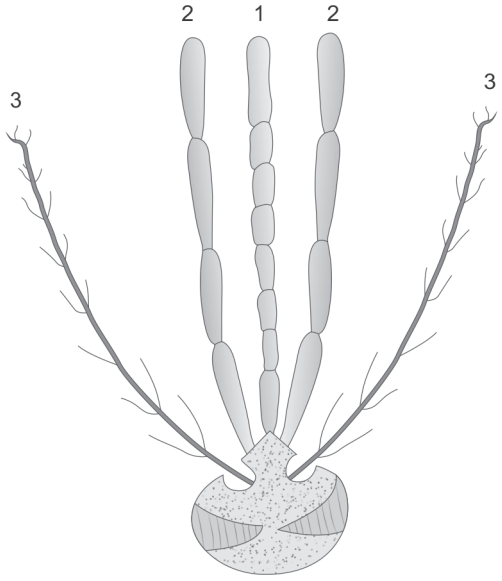

Fig. 4.4: Anopheles adult female—(1) Proboscis, (2) Palpi, (3) Antennae.

JAYPEE BROTHERS

- Palpi has almost the same length that of proboscis.
- Proboscis in straight line with body.
- While resting, proboscis, head, thorax and abdomen in straight line make an angle with the surface.
- Breeds in clean water and slow-running streams.

PH importance: Vector of malaria.

Prevention

Antilarval and antiadult measures.

- Insecticide with DDT residual spray, pyrethrum space spray for adult
- Insecticide with Paris green and mineral oils for larvae
- Mosquito net
- Antimosquito cream (repellants).

Culex Eggs (Fig. 4.6)

Habitat

Sullage water collections and sewage contaminated water drains and cesspools.

Identification

Eggs are cemented together in the form of ovate shape in rafts.

Individual eggs are cigar-shaped prominent micropillar process. The upper end being narrower—each raft consists of 200–500 eggs.

PH importance: Female adults—filariasis and encephalitis.

Control

Remove breeding places—drainage—oiling for larval stage.

Culex Larva (Fig. 4.7)

- Lies with an angle with the surface of the water.
- It has a head and segmented body.
- Has a conspicuous siphon tube (long and slender)
- Body is covered with hairs.

PH importance: Adults transmit filariasis and virus encephalitis.

Control

Drainage—oiling—fill up hollows.

Culex Pupa (Fig. 4.8)

- Comma-shaped—large eyes.
- Two breathing trumpets—long and narrow.

PH importance: Adults transmit filariasis and virus encephalitis.

Control

Same as in larva.

Culex Male (Fig. 4.9)

- Antennae feathery
- Palpi long and tapering
- Proboscis bent at an angle with the body.
- Abdomen, head and thorax make an angle with the proboscis which is parallel to the surface.
- Breeds in dirty water like cesspools, stagnant drains containing organic materials and polluted water.

No PH importance.

Culex Female (Fig. 4.10)

- Palpi shorter than proboscis—1/3.
- Antennae—short with some hair.
- Proboscis adapted for piercing the skin and sucking the blood.
- Abdomen, head and thorax make an angle with the proboscis which is parallel to the surface.
- Breeds in dirty water like cesspools, stagnant drains containing organic materials and polluted water.

PH importance: Vector of urban filariasis and virus encephalitis.

Control

- *Adult:* Spraying with pyrethrum extract (space spray).
- Use mosquito curtain—use of antimosquito cream.
- Drainage for larval control.

Difference between *Anopheles* and *Culex* is depicted in **Figure 4.5 and Table 4.1**.

***Mansonia Eggs* (Fig. 4.11)**

- Laid under leaves in cluster.
- One end is conical and projecting (attached to the undersurface of leaf).

JAYPEE BROTHERS

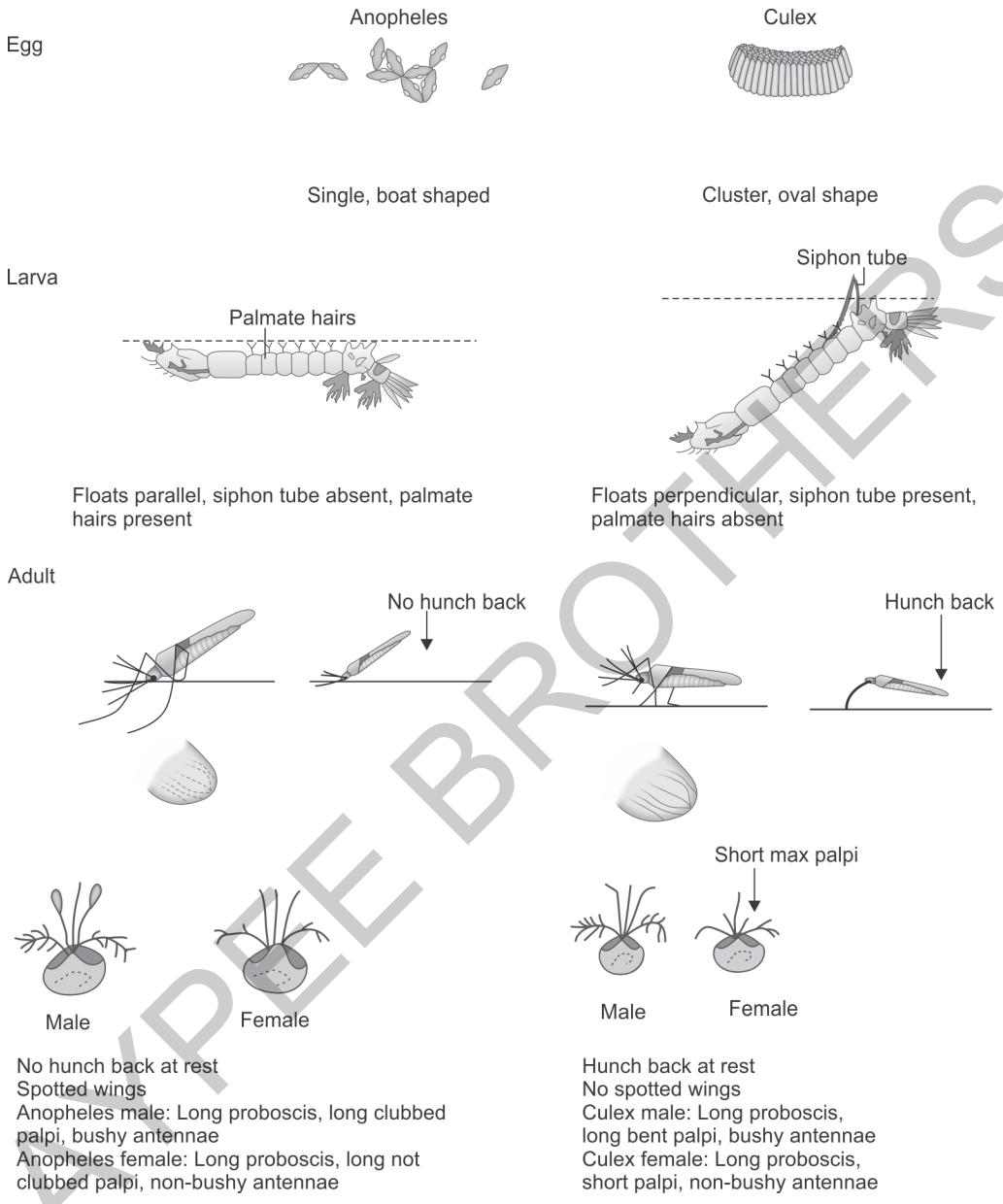

Fig. 4.5: Difference between *Anopheles* and *Culex* mosquitoes.

PH importance: Female adults transmit *Brugia malayi.*

Control

Removal of water plants (*Pistia* plants and water hyacinth).

Species of Mosquitoes

Anopheles

- *Anopheles annularis*
- *Anopheles culicifacies*
- *Anopheles fluviatilis*

JAYPEE BROTHERS

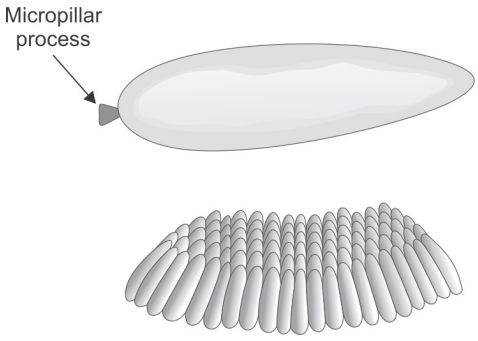

Fig. 4.6: *Culex* eggs.

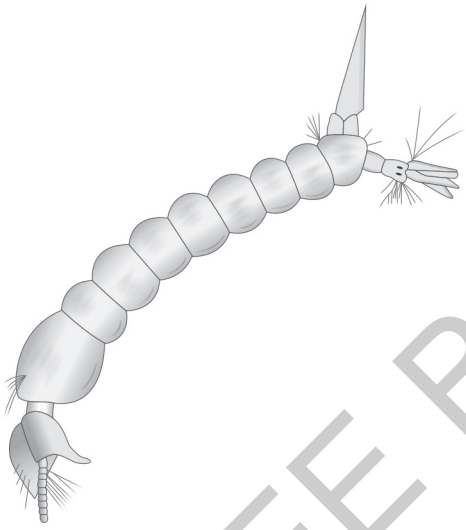

Fig. 4.7: *Culex* larva.

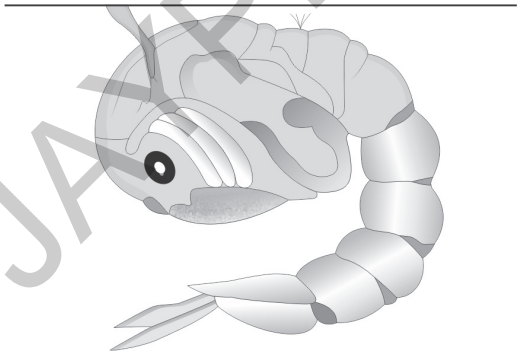

Fig. 4.8: *Culex* pupa.

- *Anopheles minimus*
- *Anopheles philippinensis*
- *Anopheles stephensi*

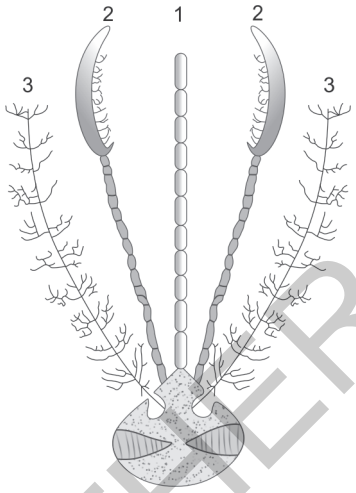

Fig. 4.9: *Culex* male—(1) Proboscis, (2) Palpi, (3) Antennae.

Table 4.1: Distinguishing features of *Anopheles* and *Culex*.

	Anopheles	***Culex***
Egg	Boat-shaped, single dust-like	• Cigar-shaped in rafts • Easily seen
Larva	• Floats parallel to the surface • Palmate hair present • No siphon tube	• Makes an angle with surface • Palmate hair absent • Siphon tube present
Adult	• Head, thorax, abdomen in a straight line • Spotted wings • Breeds in clean, fresh water	• Not spotted wings • Breeds in cesspool drain, dirty water

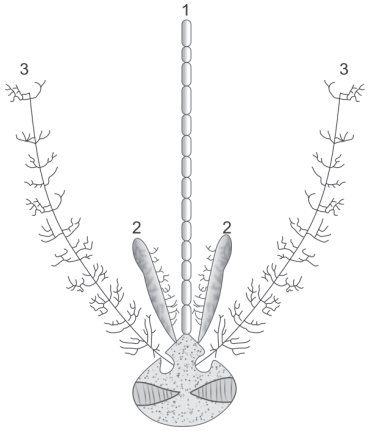

Fig. 4.10: *Culex* female—(1) Proboscis, (2) Palpi, (3) Antennae.

JAYPEE BROTHERS

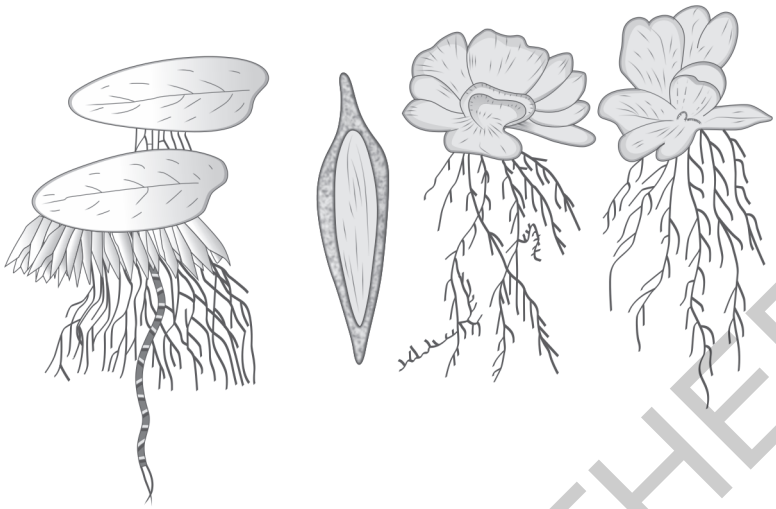

Fig. 4.11: *Mansonia* eggs.

- *Anopheles subpictus*
- *Anopheles sundaicus*
- *Anopheles umbrosus*
- *Anopheles varuna*

Culex

- *Culex fatigans*

Aedes

- *Aedes aegypti*
- *Aedes vittatus*
- *Aedes albopictus*

Mansonia

- *Mansonia annularis*
- *Mansonia uniformis*
- *Mansonia indiana*
- *Mansonia longipalpis*

Diseases Transmitted

- *Anopheles*: Malaria
- *Culex:*
  - Filaria
  - Japanese encephalitis
- *Aedes*
  - Dengue
  - Chikungunya
- *Mansonoides*: Rural filaria

Habit

- Anthropophilic
- Zoophilic
  - Others bite at night except Aedes.
  - They rest at dark place.
  - Breed in:
    - *Anopheles*—clean water.
    - *Culex*—dirty water.
    - *Aedes*—artificial collection of water.
    - *Mansonia*—vegetation (Water plant).

Control measures are depicted in **Figure 4.12**.

Flies

The Housefly

- Phylum: Arthropoda
- Class: Insecta
- Order: Diptera
- Family: Muscidae
- Genus: *Musca*
- Species: *Musca domestica*

The importance is that it is mechanical transmitter of diseases by its habit.

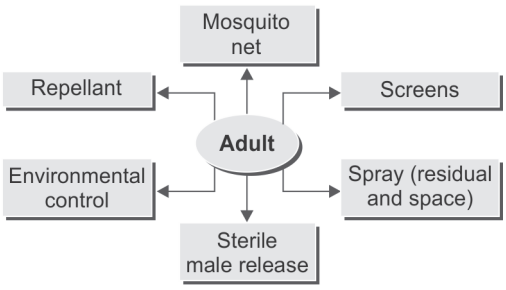

Fig. 4.12: Mosquito control measures.

JAYPEE BROTHERS

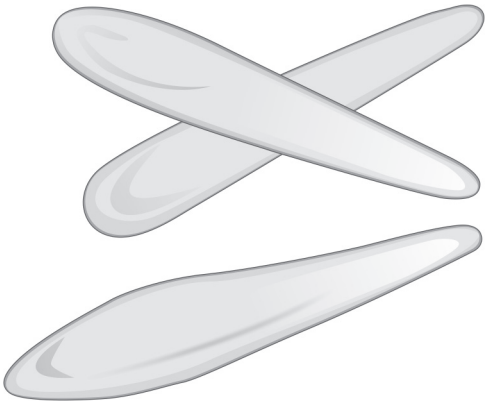

Fig. 4.13: Housefly—eggs.

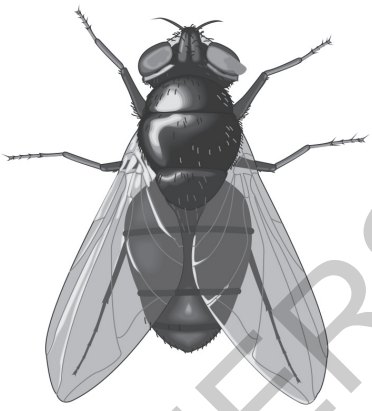

Fig. 4.15: Housefly—adult.

Musca Domestica

Housefly—Egg (Fig. 4.13)

- Measures: 1 mm in length.
- Resembles polished rice grains—found in fresh manure or refuse collections.
  PH importance: Adults transmit cholera, dysentery, poliomyelitis, conjunctivitis.

Control Sanitation

Proper disposal of rubbish and excreta fly traps, fly baits, pyrethrum spraying.

Housefly—Larva (Fig. 4.14)

Measures: ½ in length, hairless maggot, very active, found in fresh manure or refuse.

Identification: Cylindrical—anterior end narrow and tapering. Note the single oral hook and dark spot seen through translucent skin at the anterior end.

PH importance and control: Similar to the mentioning in egg.

Housefly—Adult (Fig. 4.15)

1. Large insect, dark in color, body divided into head, thorax and abdomen.
2. A pair of compound eyes.
3. Mouth parts are kept bent in a groove.
4. It has a pair of wings and three pairs of legs, profuse hair on the legs.



Fig. 4.14: Housefly—larva.

5. On the dorsal aspect of thorax are four broad bands.

PH Importance and Control

Similar to the mentioning in housefly—egg.

Morphology

Body is divided into head, thorax and abdomen. Head consists of compound eyes and a hidden retractile proboscis. Abdomen is segmented. Thorax consists of wings and three pairs of legs. Numerous bristles are found over legs and body.

Lifecycle

Passes through egg, maggot, pupa and adult. Eggs are laid on decaying manure, cow-dung, 300 at a time. Hatches to larva in 24 hours which is eyeless, hairless, feetless maggot. Voracious eating for 5 days, it transforms to pupa which is pale yellow, green or brown at a later period. Pupa transforms to adult in 7 days.

Disease Transmitted

Cholera, typhoid, paratyphoid, dysentery (amebic and bacillary), ascariasis, polio and hepatitis.

Control

- Larvicide
  - 5% cresol
  - 5% Borax, Gammexane
- Adult
  - Formalin water
  - Breeding place elimination
  - Baits (cheap is formalin + milk + sugar or water)

JAYPEE BROTHERS

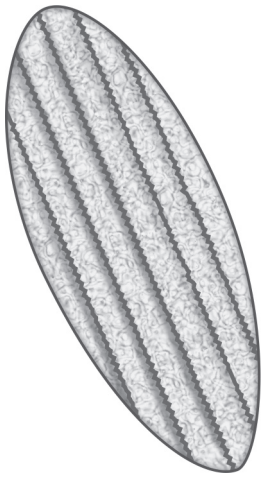

Fig. 4.16: Sandfly—egg.

- Sprays
- Fly paper (Resin and castor oil) (2 pounds/pint)
- Metal screen to kitchen windows.
- Health education on food sanitation.

Sandfly

Sandfly—Egg (Fig. 4.16)

- Size 0.4 mm × 0.12 mm, torpedo in shape, convex dorsally and concave ventrally.
- Dark yellow in color.
- Laid in moist aerated soil with contaminated organic material.

PH importance: Adult female transmits kala-azar, sandfly fever and oriental sore.

Control

- Removal of poultry and cattle from dwelling houses.
- Cracks and crevices to be plastered.
- Sulfur fumigation or formalin cresol or DDT (Dichlorodiphenyltrichloroethane) spray to kill adult fly.
  - 5% DDT in kerosene oil.
  - Repellants like demethyl-phthalate 1–5%
  - Sandfly nets 45 mesh per inch.
  - Adult male does not transmit any disease.

Sandfly—Larva (Fig. 4.17)

- Consists of a head, neck and 12 body segments—elongated.

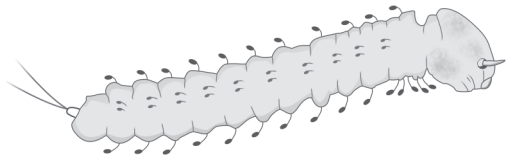

Fig. 4.17: Sandfly—larva.

- Head highly chitinous and conspicuous.
- Four hairs are seen at the head end.
- Body segments have hairy spines.
- Posterior end carries two pairs of very long caudal hairs.
- Inner pair longer.
- Yellow in color and covered with fine hairs.

Sandfly—Male (Fig. 4.18)

- Smaller than mosquito.
- Whole body covered with profuse hairs.
- Abdomen is short and spindle shaped.
- Legs are thin and long. Eyes are very prominent.
- Proboscis starts from a projecting snout.
- Palpi are longer than proboscis and curved downward.
- Wings are kept vertically at rest.
- Posterior end of abdomen resembles the tail of an airplane (because of external genitalia). Sandfly male does not transmit any disease.

Phlebotomus Sandfly—Female (Fig. 4.19)

- Smaller than mosquito.
- Whole body covered with profuse hairs.
- Abdomen is short and spindle-shaped.
- Legs are thin and long. Eyes are very prominent.



Fig. 4.18: Sandfly—male.

JAYPEE BROTHERS

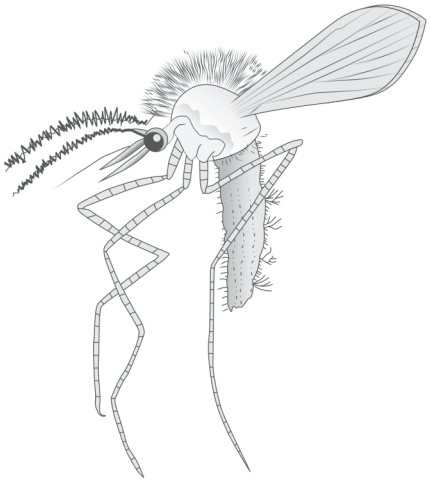

Fig. 4.19: Sandfly—female.

- Proboscis starts from a projecting snout.
- Palpi are longer than proboscis and curved.
- Wings are kept vertically at rest (Downward) (Only the females bite and suck blood).

Diseases: Vector of kala azar; tropical sore and sandfly fever.

Control

- Keep the places clean especially the cow sheds and surroundings.
- DDT sprays of the building, cow sheds, etc.
- Sleep under sandfly net.
- Repellents use.
- Cracks and crevices to be plastered.
- Sulfur fumigation, formalin, cresol or DDT.

Species: *Phlebotomus papatasi*
Phlebotomus sergenti
Sergentomyia punjabensis.

Adults: Smaller, lanceolate-shaped wings, disproportionate legs, hairs all over.

Diseases: Kala azar, Sand fly fever, and oriental sore.

Control: Control of breeding place
Insecticide
Clear the vegetations and shrubs.

Tsetse Fly

Species: *Glossina palpalis*
Glossina tachinoides
Glossina morsitans
Glossina pallidipes

No egg stage. It has a lifespan of 100 days with larva, pupa and adult stage.

Disease: Sleeping sickness

Control: Insecticide
Clear the vegetation
Biological sterile male release.

Black Fly

Species: *Simulium indicum*—
It is robust, broad wings, short proboscis.
Vector of *Onchocerca volvulus*

Control: DDT

Flea

They are temporary ectoparasites, bilaterally compressed with chitinized body. They belong to order Siphonaptera. Their host specificity is not rigid. Among them, rat fleas are medically important being the transmitter of plague.

Rat Flea (Fig. 4.20)

Xenopsylla cheopis female

Body

- Flattened laterally and well-segmented
- Body covered with bristles
- No wings
- Both sexes bite

Mesopleuron has a vertical thickening at the center.

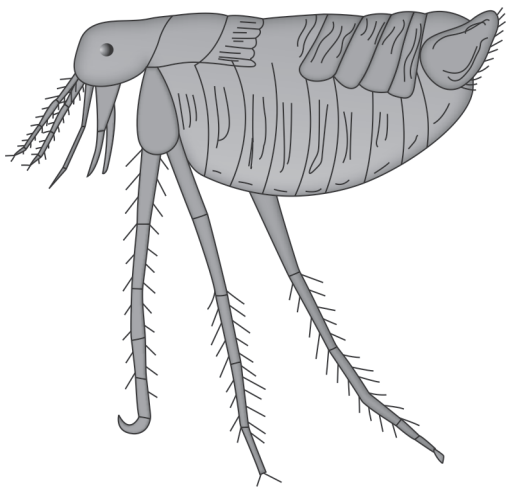

Fig. 4.20: Rat flea—female.

JAYPEE BROTHERS

Female: Spermatheca is well marked and semicircular. The head, body and tail of spermatheca are of the same width.

Morphology: Body is divided into head, thorax and abdomen covered by sclerites. Spermatheca in female and aedeagus (coiled penis) in male are distinguishable points. Pygidium and antepygidial bristles are distinguishable to *Xenopsylla* genus.

PH importance: Transmits plague, endemic typhus (Murine typhus).

$$\text{Flea index} = \frac{\text{Number of fleas}}{\text{Number of rats}}$$

Types

1. *Rat flea:*
   - *Xenopsylla astia*
   - *Xenopsylla brasiliensis*
   - *Xenopsylla cheopis*
   - *Nosopsyllus fasciatus*
2. *Human flea: Pulex irritants*
3. *Dog flea: Ctenocephalides canis*
4. *Cat flea: Ctenocephalides felis*
5. *Sand flea: Tunga penetrans*

Diseases transmitted

- Bubonic plague
- Endemic murine typhus
- Sometimes tapeworm (*Hymenolepis diminuta*)
- Partially blocked fleas are dangerous.

Life cycle: Pass through egg, larva, pupa and adult.

Flea index: Ratio obtained by considering number of rats examined and number of fleas found out (Number of flea per rat).

Specific flea index: Number of a particular flea found out. This index if below one, there will be no danger at all. If above one, endemicity can be expected.

If above five, definitely it will be epidemic.

Control of flea: DDT, benzene hexachloride (BHC), malathion, repellents; rodent control.

Control of Rats and Rat Flea

- Fumigation of burrows with cyanogas.
- Insufflation of rat burrows and rat harborages with 10% DDT suspension.

Lice

- *Class:* Anoplura
- *Family:* Pediculicide

They are wingless, dorsoventrally compressed permanent ectoparasite of man. Both male and female are responsible for disease transmission. Entire life cycle takes place on the body of the host.

Pediculus Humanus: Male

Body Louse: Ectoparasite

Entire life history takes place on the human body.

- Wingless insect living on mammalian blood.
- Long and narrow body—well-segmented abdomen.
- Conical head—A proboscis, a pair of jointed antennae and a compound eye.
- Male smaller than female.
- Claws on legs.

PH importance: Vector of typhus, relapsing fever and trench fever.

Prophylaxis: Personal cleanliness and avoidance of contact with verminous person.

Control: Apply DDT powder 10% after washing and drying hair. Dust, DDT in between the skin and clothes, and in between the layers of clothing. Steam the clothes **(Fig. 4.21)**.

Pediculus Humanus: Female

- Larger than male.
- Has a deep notch at the apex of the last abdominal segment. Deposits 300 eggs on hair or cloth.

Phthirus Pubis: Pubic Louse (Fig. 4.22)

Crab Louse

Small size—square body, blunt and truncated head.

Strongly developed legs with claws at the end of the legs.

PH importance: Does not transmit any disease but produces irritation. They are found in the pubic region.

Control: Dust DDT 10%.

JAYPEE BROTHERS

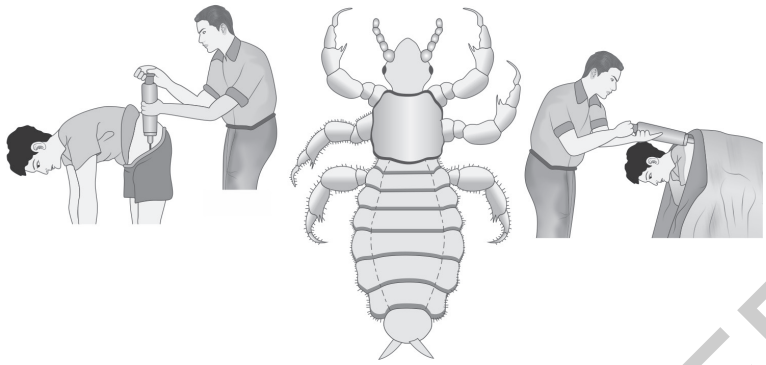

Fig. 4.21: Pediculus humanus: male.

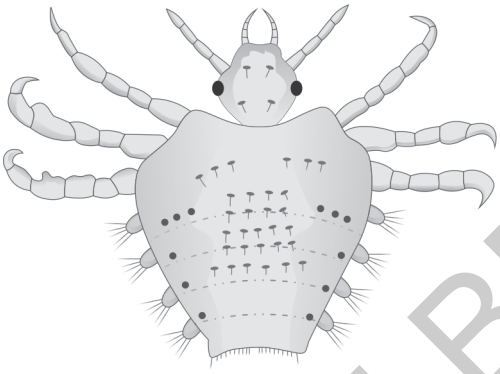

Fig. 4.22: Pthirus pubis—pubic louse.

Morphology

Body is divided into head, thorax and abdomen. The body is dorsoventrally compressed. Body is covered by shiny covering (kitenous plate). Head possesses five jointed antennae, thorax with three pairs of legs.

Life Cycle

Eggs transforms to nit in 8 days. Larva and nymph stages pass on to adult. It takes 14 days for one life cycle.

Species

- *Pediculus humanus capitis* (head louse)
- *Pediculus humanus corporis* (body louse)
- *Phthirus pubis* (pubic louse)

Diseases

Epidemic typhus, relapsing fever, trench fever, Vagabond's disease

Control

- Use of 5% DDT, shaving of hairs, burning the combed hair, 25% benzyl benzoate emulsion
  - NBIN emulsion
  - 68% benzyl benzoate
  - 6% DDT
  - 12% benzocaine
  - 14% TWEEN 80
  - Dilute in water (1:5)

Ticks

Class: Arachnida

They are temporary ectoparasite of warm-blooded animals, including man. Their vector potentiality is greater. The entire body looks like a fused saccular mass. It possesses four pairs of legs.

Hard and Soft Ticks (Fig. 4.23)

- Body compressed dorsoventrally consisting of the thorax and abdomen—body oval and elongated.
- Provided with four pairs of legs.
- Hard ticks provided with a chitinous shield on the dorsal surface.

Hard tick possesses hard structure scutum. It possesses a false head and feeds frequently when compared to soft tick.

PH importance: Hard ticks vector of:

- Tick paralysis
- Tick typhus
- Q fever
- Tularemia

JAYPEE BROTHERS

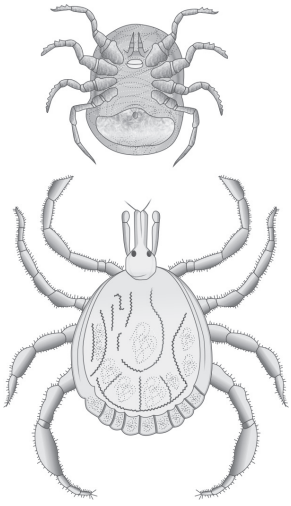

Fig. 4.23: Hard and soft ticks.

- Encephalitis
- Hemorrhagic fever

Soft ticks—vectors of relapsing fevers.

Species

- *Dermacentor andersoni* (typhus)
- *Haemaphysalis spinigera* (KFD)
- *Ornithodoros moubata* (relapsing fever)

Control in Man

- Avoid sleeping in endemic areas
- Wear long pants and over boots
- Use tick repellants—dimethyl phthalate
- Use of insecticides 5% DDT or 0.5% lindane

Control in Animals

Arsenic dip* to infected animals like cattle, horse, dog.
Use of repellents: 10% of DDT
Arsenic trioxide: 8.0 lb; Pine tar 1 gallon; Water 500 gallon)

Mites

They are very small organisms with the size of pin head. Owing to their appearance, they are called *velvet mites.*

Life Cycle

Passes through stages of egg, larva, nymph and adult. Larva possesses three pairs of legs. Adults have four pairs of legs **(Fig. 4.24)**.

*Sodium bicarbonate 24.0 lb.

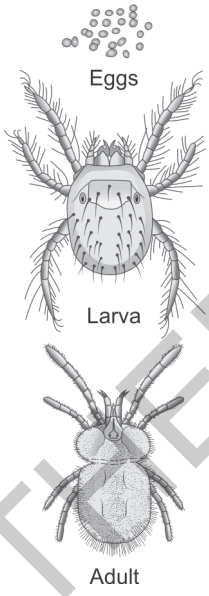

Fig. 4.24: Morphology of mites.

Species

- *Trombicula deliensis* (scrub typhus)
- *Trombicula akamushi* (relapsing orientalis)

In mites, except larval stage, other forms are free living forms.

Sarcoptes Scabiei

Morphology (Fig. 4.25)

Itch mites are minute globular parasites; these are visible to naked eyes. They are worldwide in distribution, more in overcrowded areas. Male measures 2.5–3.0 mm and female 3.5–4.0 mm. Adults possess four pairs of legs. They form permanent ectoparasites of man, with their entire life span on the skin of the host. For the disease to spread, contact is essential. The larva after entering the hair follicle grows into adult. Entire cycle completes in 10–14 days.

Public Health Importance

It is not a vector. It directly causes scabies (itch). If secondary infection occurs, they cannot thrive and cannot be seen in scrapings.

Control: Isolation, treatment of all members of the family.

- Hygienic measures (daily bath)

JAYPEE BROTHERS

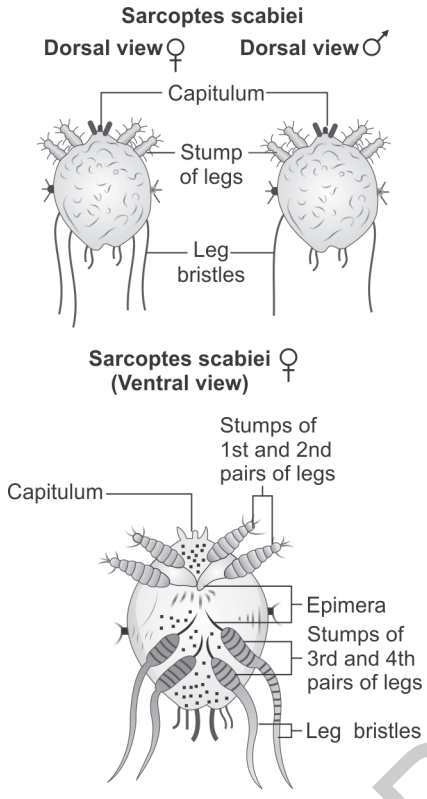

Fig. 4.25: Morphology of itch mite.

- 25% benzyl benzoate (applied to all parts of body below chin and allowed to dry. Later repeated after 12 hours. Further 12 hours later thorough bath is given, all clothing are immersed in boiling water and washed with detergent powder. Application is limited to 2 per week).
- 10% sulfur ointment
- 1% HCH (lindane)
- 5% tetmasol

Cyclops

Morphology (Fig. 4.26)

Salient Features

They are pear-shaped, semi-transparent, and of 1 mm length.

Types: Mesocyclops
Paracyclops
Microcyclops

1. A freshwater crustacean 1/20 inch × 1/8 inch

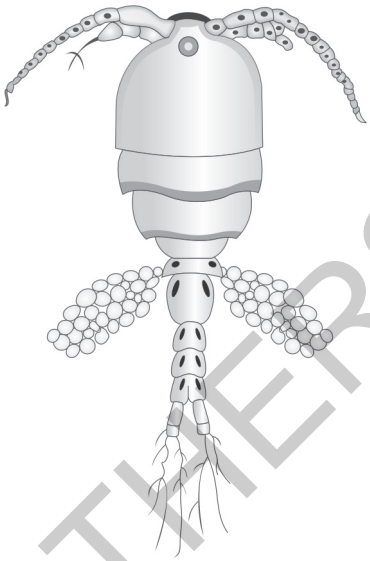

Fig. 4.26: Morphology of cyclops.

2. Has pear-shaped symmetrical body, forked tail, three pairs of antennae, five pairs of swimming legs and one eye
3. Lifespan about 3 months.

PH importance: They are the intermediate hosts for *Dracunculus medinensis* and *D. latum*.

Cyclops Female

- It has a pair of egg sacs.
- *Diseases transmitted:*
  - *D. medinensis*
  - *D. latum*

Prophylaxis

Cyclops can be destroyed by:

- Superchlorination of the water.
- Drinking filtered or boiled water only.
- Cyclopicidal fish—*Barbus puckelli.*
- 50% DDT, once in 6 weeks—in 6 ppm
- Convert step wells into draw wells.

Control

- *Physical:*
  - Straining of water (Muslin cloth)
  - Boiling water
- *Chemical:*
  - 5 ppm chlorine
  - 1 g/gallon lime

JAYPEE BROTHERS

- *Biological:*
  - Barbel fish
  - Gambusia fish
- *Others:*
  - Tube well provision
  - Controlled water supply
  - Abolishing step well
  - Provision of sanitary wells.

INSECTICIDES (FIG. 4.27)

DDT—Dichlorodiphenyltrichlorethane

Pure DDT or its solution or emulsions are not used nowadays. Chlorinated hydrocarbon DDT is commonly used now as 10% DDT powder and 50% DDT wettable powder.

Uses

- 10% DDT powder is used on a large scale; has an antiplague measure by insufflating into rat burrows and dusting of runs and rat harborages and also for control of lice infestation.
- 50% DDT wettable powder is used to prepare 2½ or 5% DDT *Suspension*: For spraying the floor, wall and roof for plague control, for indoor residual spraying, for malaria control to kill adult mosquitoes.

Action

Acts as a residual contact poison.

Advantages

- DDT is extremely stable and has a prolonged residual action.
- Minute doses are enough to kill the insects.
- It resists wind, rain and sun.
- It needs to be applied only once in 3–6 months.
- Ordinarily not toxic to animals or man.
- Does not spoil water.
- Effective against all insects.

Disadvantages

Some insects like bugs, fleas, flies, etc., become resistant to DDT.

BHC—Benzene Hexachloride (Gammexane)

- It is a residual insecticide.
- Used for the destruction of insects especially houseflies.

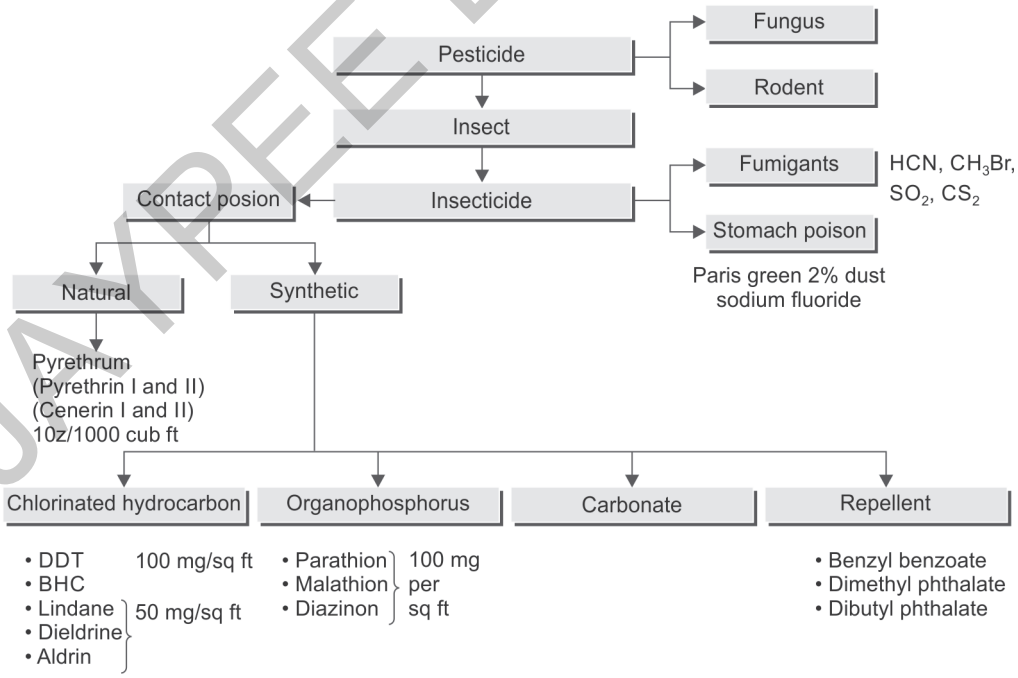

Fig. 4.27: Classification of insecticides.

JAYPEE BROTHERS

- It is a white crystalline substance insoluble in water but soluble in inorganic solvents.
- It is a contact poison.

Pyrethrum Extract

- Petroleum extract from pyrethrum flowers.
- Contains alkaloids pyrethrum I and pyrethrum II.
- Used as 1% spray in kerosine 2 ounces per 1,000 cubic feet.
- Immediate knock-down effect.
- It is an insecticide.
- Contact poison.
- Used as space spray.

Malariol

Resembles coal tar disinfectant in color and consistency.

Use

As a larvicide against all mosquitoes except *Mansonia*.

Action

By choking the siphon tubes and suffocating the larvae—also acts as a direct poison. It should form a thin layer over the entire water surface.

Disadvantages

- Weeds should be removed.
- Cannot be used in drinking water or in paddy fields.

Paris Green

Composition

Acetoarsenite of copper, green in color, should be in fine powder so that it may float on water and add through larval mouth (stomach poison).

Application

Applied once in a week—as a dust diluted with road dust, or fine ash—1% dust is used over water collections where mosquito larvae (anopheline are found)—used as larvicide for anopheline mosquito control—on water surface.

Apparatus

- Hand duster: 1%
- Aeroplane spray: 2.5%

Advantages

Weeds removal not necessary.

Disadvantages

- Larvae of *Culex*—are not killed.
- Not useful to destroy pupae.

Commonly used Insecticides

- DDT
- BHC
- Lindane
- Pyrethrum
- Malariol
- Paris green

Rodents (Figs. 4.28A and B)

Disease: Typhoid, leptospirosis, amebiasis, ringworm.

Difference between domestic and norvegicus is depicted in **Table 4.2**.

Anti-rodent Measures

1. *Sanitary*: Houses, food, garbage
2. Trapping



Figs. 4.28A and B: (A) *Rattus rattus* and (B) *Rattus norvegicus*.

JAYPEE BROTHERS

Table 4.2: Difference between *Rattus rattus* and *Rattus norvegicus*.

R. rattus		*R. norvegicus*
Slim, slender	Body	Heavy, large
Sharp	Muzzle	Blunt
Larger	Tail	Shorter
Large	Ear	Small
Big	Eye	Small

3. Poisons:
   $BaCO_3$ (white tasteless)
   Zinc phosphide (black)
   Na Fluoroacetate-alpha-naphthylthiourea (ANTU)
   Arsenous oxide
   Warfarin (anticoagulant)—Multidose
4. Fumigation: CaCN, CS_2, CH_3 Br, SO_2

ZOONOSES

Diseases of vertebrate animals to man.

Bacterial: Tuberculosis—cattle, goat
Brucellosis—cattle, goat, swine
Plague—rat
Typhoid—mammals, birds
Light induced hypertrichosis (LIH)—rodents
Rat bite fever—rat
Anthrax—sheep, goat, horse
Glanders—horse
Tularemia—sheep, rabbit
Relapsing fever—rodents

Fungal: Dermatophytosis—cat, dog, horse
Ringworm—poultry

Viral: Rabies—dog, wolf
Kyasanur forest disease (KFD)—monkey, cattle

Rickettsial: Endemic typhus—rat
Rickettsial pox—mice
Scrub typhus—rodent
Q fever—cattle, sheep
Psittacosis (ornithosis)—parrot, pigeon

Protozoa: Amebiasis—lower primates
Leishmania—dog
T. gondii—mammal
Trypanosoma—dog

Helminthic: Hydatid—dog
Taenia—swine, cattle
Trichinella—swine
Fasciola—dog, swine
Ankylostoma—dog

Arthopod: Scabies—domestic animals
Tunga—mammals

INTEGRATED VECTOR CONTROL

In case of mosquitoes, "integrated approach" is advocated which allows the combination of one or more methods with a view to obtain maximum results with minimum input. This will disallow excessive use of any one method. Integrated vector control prevents environmental pollution with toxic chemicals.

Integrated Approach to the Environmental Problems

All aspects of a health problem are considered from all angles. This suggests the cooperation between different health care services and many disciplines. For the promotion of health in human environment United Nations, World Health Organization and UNESCO are providing an unprecedented cooperation.

SUMMARY

Effort is made for identifying features of insects of medical importance. Zoonoses and insecticide are described. A note on integrated vector control is given.

VIVA VOCE

1. Mention types of biological transmission.
2. Mention fly borne diseases.
3. Give identifying points of anopheles female mosquito.
4. Differentiate egg of anopheles and culex.
5. Define specific flea index.
6. What is the public health importance of Cyclops?
7. Differentiate domestic rat and Norwegian rat.
8. Give examples of zoonoses.
9. Define integrated vector control.

JAYPEE BROTHERS

for detailed information on community medicine books, visit our website www.jaypeebrothers.com, for detailed information on community

Essentials of Community Medicine

This book is an outcome of a teacher's personal teaching experience over a period of 50 years in Central Government Medical Colleges, Karnataka State Government Medical Colleges and SDM College of Medical Sciences and Hospital, Karnataka, India. The changes in affiliations of medical colleges from traditional local university affiliations are kept in mind while the revision. NMC new curriculum has been followed thoroughly for Community Medicine.

New chapters/new additions in chapters included are Essential Medicine, Hospital Waste Management, Social Security, Disaster Management, Medical Informatics, Rational Drug Management, Urban Health, Medical Ethics and PH Law.

Earlier edition has 48 recent areas of interest in Community Medicine. Now another 13 areas included. They are—Ayushman Bharat Programme, Dengue Burden, Janani Suraksha Yojana, Millennium Development Goals, Nipah Virus Infection, NITI Aayog 2017-2020, NHP 2017, NUHM, Recent Global TB Strategy, Right of Persons with Disability Bill 2016, Trends in Recent Immunization, Tribal Health and Zika Viral Infection.

Relevant items are indexed to facilitate cross references.

Since Community Medicine involves many disciplines, the book can be useful for the students of Medical, Dental, Pharmacy, Home Science, Public Health Engineering, Health Administration, Health Programmes and Paramedical Science.

The book provides a comprehensive knowledge on the subject to all Medical Science and Health Sciences Professionals and Students.

GN Prabhakara MD MAPHA MIPHA was Principal and Professor, Department of Community Medicine at SDM College of Medical Sciences and Hospital, Manjushree Nagar, Sattur, Dharwad, Karnataka, India. He has been a teacher for more than 50 years (1972 to till date) involving teaching and training UG, PG, Research Fellows in Medical and Health Sciences. He has served in Central Government Medical College till 1974, later in Karnataka State Government Medical Colleges till 2004 and at SDM College of Medical Sciences and Hospital since 2004. He has many scientific papers to his credit which have been published in various journals. He also has wide experience in training Doctors, Medical Officers, City Health Officers, CDPOs, Paramedical Workers, Nurses, Home Science Graduates, Lab Technicians, Public Health Engineers, District Health Officers and District Medical Officers. Apart from expertise in giving Public Health Consultancy, he is the Member of various committees and Board of Studies of Health Science University.

Printed in India

Available at all medical bookstores
or buy online at www.jaypeebrothers.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers

Shelving Recommendation
COMMUNITY MEDICINE

ISBN 978-93-5465-124-3