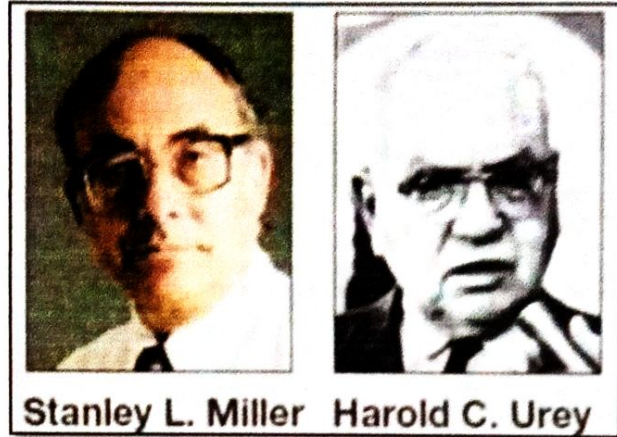


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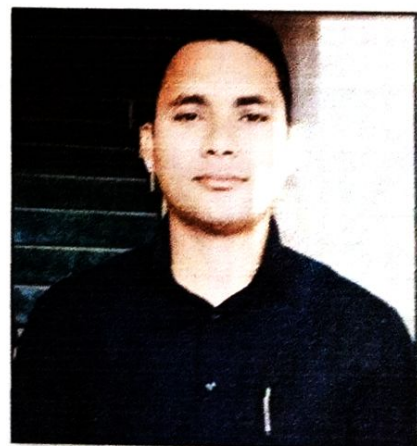
Project Work

Group - Miller & Urey

Session - 2021-22 BSc III bio

Topic - Human health parasite, study warms,
at data collection from Govt. Hospita Pussore

Submission date - 30/03/2022



Guided by - Vijay kumar Kante Sir

(Assist. Professor of Zoology)

30/03/2022



SONAM SINGH
RAJPUT

Singh



SARITA
BHUMIYAN



SEEMA PATEL



SAPNA SIDAR



SUNTA SIDAR

Sidar



SANJANA NISHAD



SUSHMA SINGH

msingh



SANTOSKI YADAV

Yadav



RUPESH CHOUHAN



DEV NISHAD



HARIBANDHU
CHHATTAR

HUMAN HEALTH PARASITE , STUDY WARMS, AT DATA COLLECTION FROM GOVERNMENT HOSPITAL PUSSORE

PARASITE - A PARASITE IS AN ORGANISM THAT LIVES ON OR IN A HOST ORGANISM AND GETS ITS FOOD FROM OR AT THE EXPENSE OF ITS HOST. THERE ARE THREE MAIN CLASSES OF PARASITES THAT CAN CAUSE DISEASE IN HUMANS: PROTOZOA, HELMINTHS, AND ECTOPARASITES.

Parasitology is the study of parasites, their hosts, and the relationship between them. As a biological discipline, the scope of parasitology is not determined by the organism or environment in question but by their way of life.

- THERE ARE THREE MAIN CLASSES OF PARASITES THAT CAN CAUSE DISEASE IN HUMANS: PROTOZOA, HELMINTHS, AND ECTOPARASITES.
- INFECTIONS OF HUMANS CAUSED BY PARASITES NUMBER IN THE BILLIONS AND RANGE FROM RELATIVELY INNOCUOUS TO FATAL.
- THE DISEASES CAUSED BY THESE PARASITES CONSTITUTE MAJOR HUMAN HEALTH PROBLEMS THROUGHOUT THE WORLD. (FOR EXAMPLE, APPROXIMATELY 30 PERCENT OF THE WORLD'S POPULATION IS INFECTED WITH THE NEMATODE ASCARIS LUMBRICOIDES.)
- THE INCIDENCE OF MANY PARASITIC DISEASES (E.G., SCHISTOSOMIASIS, MALARIA) HAVE INCREASED RATHER THAN DECREASED IN RECENT YEARS. OTHER PARASITIC ILLNESSES HAVE INCREASED IN IMPORTANCE AS A RESULT OF THE AIDS EPIDEMIC (E.G., CRYPTOSPORIDIOSIS, PNEUMOCYSTIS CARINII PNEUMONIA, AND STRONGYLOIDIASIS). THE MIGRATION OF PARASITE-INFECTED PEOPLE, INCLUDING REFUGEES, FROM AREAS WITH HIGH PREVALENCE RATES OF PARASITIC INFECTION ALSO HAS ADDED TO THE HEALTH PROBLEMS OF CERTAIN COUNTRIES.

ASCARIS LUMBRICOIDES

SYSTEMATIC POSITION

PHYLUM - NEMETODA
CLASS - PHASMIDIA
ORDER - ASCARODIEA
SUB ORDER - ASCARINAE

FAMILY - ASCARIDAE
 GENUS - ASCARIS
 SPECIES - LUMBRICOIDES

DISTRIBUTION, HABITS AND HABITAT

ASCARIS HUMBRICOIDES IS ONE OF THE MOST FAMIL ENDOPARASITES OF MAN. IT HAS ALSO BEEN REPORT FROM PIGS, CATTLE, SHEEP AND SQUIRRELS (GOO 1936). IT INHABITS THE SMALL INTESTINE, FREQUENTLY OF CHILDREN THAN OF ADULTS. IT H COSMOPOLITAN DISTRIBUTION BUT CHIEFLY FOUND INDIA, CHINA, KOREA, PHILIPPINES AND PAK ISLANDS. ITS INCIDENCE VARIES IN DIFFERENT PARTSE GLOBE. STOLL (1947) ESTIMATED THAT THERE ARE 4 MILLION HUMAN INFECTIONS IN THE WORLD, OF VICH 3 MILLION ARE FOUND IN NORTH AMERICA, MILLION IN TROPICAL AMERICA, 59 MILLION IN MICA, 488 MILLION IN ASIA, 32 MILLION IN EUROPE, 39 MILLION IN U.S.S.R. AND 500,000 IN THE SPECIFIC ISLANDS.

EXTERNAL MORPHOLOGY

L SHAPE AND SIZE - BODY IS ELONGATE, E ANTERIOR END BEING MORE SLENDER THAN THE ERIOR. SEXES ARE SEPARATE (DIOECIOUS) WITH A AND SEXUAL M IN LENGTH AND 4 TO 6 MM. IN DIAMETER. THE A STRAIGHT TAIL. WHILE MALE IS SMALLER, UPTO MORPHISM.

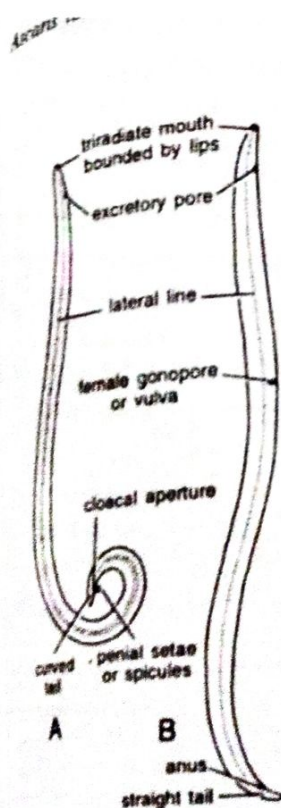


Fig 1. *Ascaris lumbricoides*. Adult worms in anal view. A - Male. B - Female.

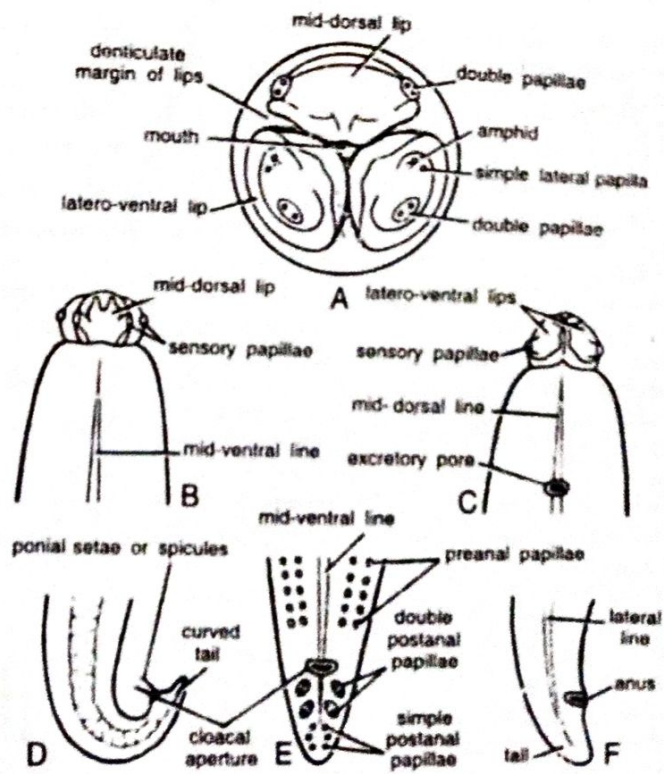


Fig 2. *Ascaris lumbricoides*. A - En face view of mouth and lips. B - Anterior end in dorsal view. C - Anterior end in ventral view. D - Posterior end of male in side view. E - Posterior end of male in ventral view. F - Posterior end of female in side view.

➤ CAUSES

- PEOPLE GET ASCARIASIS BY CONSUMING FOOD OR DRINK THAT IS CONTAMINATED WITH ROUNDWORM EGGS. ASCARIASIS IS THE MOST COMMON INTESTINAL WORM INFECTION. IT IS RELATED TO POOR SANITATION. PEOPLE WHO LIVE IN PLACES WHERE HUMAN FECES (STOOL) ARE USED AS FERTILIZER ARE ALSO AT RISK FOR THIS DISEASE.
- ONCE CONSUMED, THE EGGS HATCH AND RELEASE IMMATURE ROUNDWORMS CALLED LARVAE INSIDE THE SMALL INTESTINE. WITHIN A FEW DAYS, THE LARVAE MOVE THROUGH THE BLOODSTREAM TO THE LUNGS. THEY TRAVEL UP THROUGH THE LARGE AIRWAYS OF THE LUNGS AND ARE SWALLOWED BACK INTO THE STOMACH AND SMALL INTESTINE.
- AS THE LARVAE MOVE THROUGH THE LUNGS THEY MAY CAUSE AN UNCOMMON FORM OF PNEUMONIA CALLED EOSINOPHILIC PNEUMONIA. EOSINOPHILS ARE A TYPE OF WHITE BLOOD CELL. ONCE THE LARVAE ARE BACK IN THE SMALL INTESTINE, THEY MATURE INTO ADULT ROUNDWORMS. ADULT WORMS LIVE IN THE SMALL INTESTINE, WHERE THEY LAY EGGS THAT ARE PRESENT IN FECES. THEY CAN LIVE 10 TO 24 MONTHS.

AN ESTIMATED 1 BILLION PEOPLE ARE INFECTED WORLDWIDE. ASCARIASIS OCCURS IN PEOPLE OF ALL AGES, THOUGH CHILDREN ARE AFFECTED MORE SEVERELY.

- (1) ASCARIS LUMBRICOIDES, THE COMMON ROUNDWORM BELONG TO THE CLASS RHABDITEA OF THE PHYLUM NEMATHELMINTHES. IT IS THE MOST COMMON ENDOPARASITE IN THE SMALL INTESTINE OF HUMAN BEINGS. IT IS MONOGENETIC, I.E., WITHOUT ANY SECONDARY HOST. THE WORM IS MORE COMMON IN CHILDREN.
- (2) THE BODY IS ELONGATED, UNSEGMENTED, CYLINDRICAL WITH TAPERING ENDS AND FOUR STREAKS TWO LATERAL, ONE VENTRAL AND ONE DORSAL.
- (3) SEXES ARE SEPARATE WITH SEXUAL DIMORPHISM. MALE IS SMALLER THAN FEMALE WITH CURVED TAIL, TWO PENIAL SETAE (COPULATORY ORGANS) AND CLOACA. FEMALE IS WITH STRAIGHT POSTERIOR END OF THE BODY AND POSTERIOR TRANSVERSE ANUS AND SEPARATE GONOPORE SITUATED VENTRALLY $\frac{1}{3}$ FROM THE ANTERIOR END. IN BOTH THE EXCRETORY PORE IS SITUATED MID VENTRALLY, A LITTLE BEHIND THE MOUTH. VENTRAL SURFACE OF MALE BEARS FIFTY PAIRS PREANAL AND FIVE PAIRS SENSORY PAPILLAE ARE ABSENT IN FEMALE.
- (4) MOUTH BOTH IN MALE AND FEMALE IS TERMINAL, TRIRADIATE SURROUNDED BY THREE DENTICULATE LIPS. ONE MEDIAN DORSAL AND TWO VENTROLETERAL. DORSAL LIPS BEARS TWO SENSORY DOUBLE PAPILLAE AND AMPHIDS ARE PRESENT ON VENTROLETERAL LIPS.
- (5) BODY WALL CONSIST OF OUTER CUTICLE, MIDDLE EPIDERMIS AND INNER LONGITUDINAL MUSCLE LAYER. CIRCULAR LAYER IS ABSENT. CUTICLE IS THICK WHICH PROTECT BODY OF THE PARASITE FROM MECHANICAL INJURY AND ALSO RESISTANCE TO ACTION THE DIGESTIVE ENZYMES OF THE HOST. THE EPIDERMIS IS SYNCYTIAL (COENOCYTTIC) WITH SCATTERED NUCLEI AND WITHOUT PARTITION WALLS.
- (6) THE BODY CAVITY OF ASCARIS IS PSEUDOCOEL FORMED BY COELES ORIGINATED FROM PERSISTENT EMBRYONIC BLASTOCOEL.

(7) THERE IS NO ALIMENTARY CANAL AND DIGESTIVE GLAND. THE JARTE ABSORBS DIGESTED FOOD OF THE HOST SO THERE IS NO NEED OF APESTIVE ORGANS ABSORPTION OCCURS THROUGH THE GENERAL BODY SERFACE. SALIVARY.

(8) RESPECTORY SYSTEM IS ABSENT, RESPIRATION IS ANAEROBIC.

(9) EXCRETORY SYSTEM IS H-SHAPED. IT IS CONSISTS OF A SINGLE TORY CELL OR RENETTE CELL. EXCRETORY PRODUCTS ARE AMMONIA AND

(10) SENSE ORGANS ARE SIMPLE LIKE LABIAL PAPILLAE, CERVICAL ANE, ANAL PAPILLAC, AMPHIDS AND PHASMIDS.

(11) ASCARIS IS DIOECIOUS OR UNISEXUAL. TESTES IS SINGLE AND NDAN, SO MALE ASCARIS IS MONARCHIC (MONODELPHIC). ONLY ERIOR PART OF TESTIS IS FUNCTIONAL, SO TESTIS (ALSO OVARY) IS TELOGONIC.

(12) ASCARIS SPERM IS PECULIAR WITHOUT FLAGELLUM, TAIL LESS, YMMETRICAL AND AMOEBOIDAL.

(13) FEMALE ASCARIS HAS PAIRED OVARIES SO FEMALE ASCARIS IS DELPHIC.

(14) COPULATION OCCURS IN THE INTESTINE OF HOST FERTILIZATION IN THE LOWER PART OF UTERI. THE EGG IS MAMMILATED, OVAL, M-SHAPE WITH PROTECTIVE COVERING-OUTER PROTEIN LAYER, MIDDLE CHITINOUS SHELL AND INNER MEMBRANE MADE OF ESTERIFIED GLYCOSIDES.

(15) EMBRYONIC DEVELOPMENT TAKES PLACE ONLY OUTSIDE THE BODY OF HUMAN HOST IN SOIL BECAUSE IT REQUIRES LOW TEMPERATURE. MORE OXYGEN AND SUITABLE MOISTURE. (16) INSIDE THE SHELL THE ZYGOTE DEVELOPS INTO RHABDITIFORM VOR FIRST TAGE JUVENILE IN 10-14 DAYS.

(17) THE LARVA OF FIRST STAGE IS NOT INFECTIVE. IT RESTS FOR A WEEK AND COMPLETES FIRST MOULT WITHIN EGG AND BECOMES SECOND STAGE ABDITFORM LARVA WHICH IS INFECTIVE

(18) THE TRANSMISSION OF INFECTIVE STAGE THROUGH EMBRYONATED KES PLACE BY CONTAMINATED FOOD AND WATER.

(19) THE EMBRYONATED EGG PASSES INTO THE INTESTINE OF MAN ND SECOND STAGE LARVA HATCHES OUT FROM THE EGG

(20) THREE TYPES OF MIGRATION BY ASCARIS LARVA ARE – PRIMARY PON, SECONDARY MIGRATION AND ABERRANT MIGRATION

(21) PRIMARY MIGRATION IS FROM INTESTINAL WALL →HEPATIC PORTAL →LIVER →HEPATIC VEIN →HEART → PULMONARY ARTERY →LUNGS.

(22) SECONDARY MIGRATION IS FROM LUNGS BACK TO INTESTINE OF THE HOST LUNGS -BRANCHI - TRACHEATRACHEA- PHARYNX - GULLET - OESOPHAGUS - STOMACH- INTESTINE.

(23) IN LUNGS, LARVA COMPLETE ITS SECOND AND THIRD MOULTING (BECOMES THIRD AND FOURTH STAGE LARVA). IN SMALL INTESTINE .COMPLETES FOURTH OR FINAL MOULTING AND BECOMES FIFTH STAGE OF LARVA (24) DURATION OF WANDERING JOURNEY FROM INTESTINE TO INTESTINE IS ABOUT THREE WEEKS. WITHIN 8-10 WEEKS ADULTS ASCARIS STARTS REPRODUCTION.

(25) ABERRANT MIGRATION IS THE MIGRATION FROM LUNGS TO BRAIN, SPINAL CORD, EYES, ETC.

(26) ASCARIS IS PATHOGENIC. IT CAUSE THE DISEASE, ASCARIASIS. MOST PATHOGENIC LARVA OF ASCARIS IS FOURTH STAGE LARVA.

(27) MAIN SYMPTOMS OF ASCARIASIS ARE-ABDOMINAL DISCOMFORT, NAUSEA, VOMITING, DIARRHOEA AND COLIC PAIN.

(28) TOXIN PRODUCED BY ASCARIS MAY INTERFERE WITH PROTEIN DIGESTION.

(29) ASCARIASIS CAN BE TREATED BY ANTIHELMINTHETIC DRUGS SUCH AS OIL OF CHENOPODIUM, SANTONIN, ANTIPAR, TETRACHLOROETHYLENE, ALCOPAR, DECARIS, DIETHYLCARBAMAZINE, ETC.

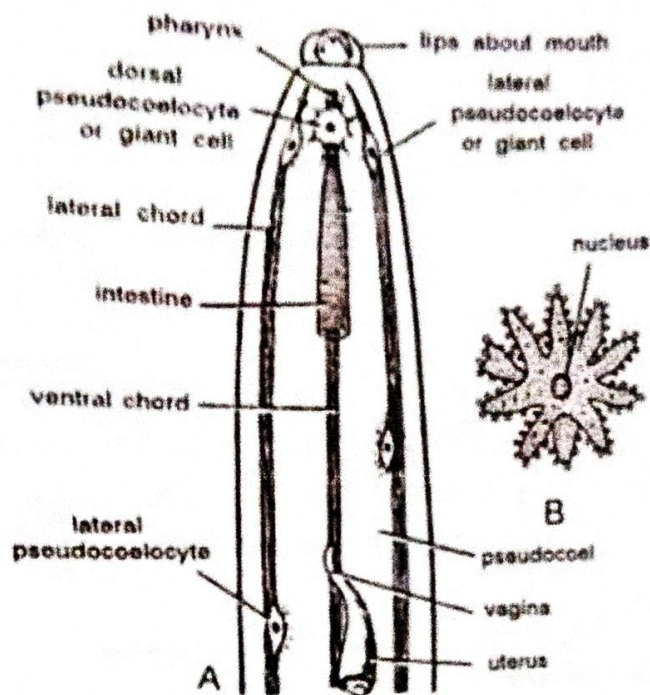


Fig. 5. *Ascaris* A-Position of giant cells in anterior region of pseudocoel. B- Single giant cell or pseudocoelocyte.

BODY WALL

BODY WALL OF ASCARIS IS MADE UP OF 3 LAYERS: (1) AN OUTER CUTICLE, (II) A MIDDLE EPIDERMIS, (III) AN INNER LAYER OF LONGITUDINAL MUSCLES LINING THE BODY CAVITY.

1. CUTICLE. IT IS A THICK, TOUGH, TRANSP AND GLOSSY LAYER SECRETED BY THE UNDERLY EPIDERMIS AND CONTINUOUS WITH THE CUTICULA LINING OF PHARYNX AND RECTUM. IN THE YOUNG WOR IT IS SHED OFF (MOULTED) TO PERMIT GROWTH, UNDE LIGHT MICRO-SCOPE, FOUR DISTINCT LAYERS OF DIFFERS CHEMICAL COMPOSITION AND DIFFERENT STRUCT ARRANGEMENTS CAN BE IDENTIFIED IN THE CUTICK. A FIFTH LIPID LAYER HAS ALSO BEEN REVEALED UNDE ELECTRON MICROSCOPE.

THE FIVE LAYERS OF CUTICLE, ALONG WITH THEIR SUB-DIVISIONS AS REVEALED BY ELECTRON MICROSCOPE ARE AS FOLLOWS -

(A) LIPOID LAYER. IT IS IN THE FORM OF A THIN

OSMOPHILIC MEMBRANE, ABOUT 1000 Å THICK. **(B) CORTICAL OR CORTEX LAYER.** IT CONSISTS OF DENSE MATERIAL, OR KERATIN, RESISTANT TO DIGESTIVE JUICES OF HOST. IT INCLUDES: (i) AN

CORTICAL LAYER WHICH LIES AS DISCONTINUOUS STRIPS RINGS AROUND BODY AND (ii) AN INNER CORTICAL LAYER. **(C) MATRIX LAYER.** IT CONSISTS OF MATRICES AND CONSISTS OF (i) AN OUTER FIBRILLAR LAYER CONTAINS SULPHUR TRAVERSED BY BRANCHING CANALS, (ii) A HOMOGENEOUS LAYER WHICH SHOWS SEVERAL RADIAL STRIATIONS, A BOUNDARY LAYER RESEMBLING THE CORTICAL LAYER.

(D) FIBRE LAYER. IT CONSISTS OF COLLAGEN FIBRES CROSSING EACH OTHER AND ARRANGED IN THREE STRATA. **(E) BASEMENT MEMBRANE.** IT IS A THIN LAYER FORMING THE INNER LIMIT OF CUTICLE.

(E) BASEMENT MEMBRANE - IT IS A THIN LAYER FORMING THE INNER LIMIT OF CUTICLE.

CUTICLE IS PERMEABLE TO SALTS, WATER PRODUCTS OF METABOLISM. IT IS BELIEVED THAT CARYOPHORES ARE PRESENT IN CUTICLE OF ASCARIS WHICH CONTROL THE PASSAGE OF DIFFERENT METABOLITES. SOME ANTI-ENZYMES ARE ALSO SECRETED BY CUTICLE OF ASCARIS, WHICH NEUTRALIZE THE EFFECT OF DIGESTIVE JUICES OF HOST UPON THE PARASITE.

(2) EPIDERMIS OR HYPODERMIS. IT FORMS A CYTIAL LAYER BELOW CUTICLE. ALONG THE ENTIRE LENGTH OF BODY, AT MEDIAN DORSAL, MEDIAN VENTRAL AND TWO LATERAL POSITIONS, IT IS MUCH THICKENED TO FORM THE DORSAL, VENTRAL AND LATERAL LINES OR CHORDS, RESPECTIVELY, BULGING INTO BODY CAVITY. LATERAL CHORDS ARE MORE CONSPICUOUS AND SEEN IN THE SURFACE AS YELLOW LINES. RUNNING THROUGH EACH OF THESE IS A LATERAL EXCRETORY CANAL AND A LATERAL NERVE. THROUGH LESS PROMINENT DORSAL AND VENTRAL CHORDS EXTEND THE DORSAL AND VENTRAL OF RELATIVELY FEW CELLS, THE NUCLEI OF WHICH LIE IN ROWS, RESPECTIVELY. EPIDERMIS IS COMPOSED OF THE CHORDS IN LONGITUDINAL ROWS, OFTEN OCCURRING IN GROUPS. FAT AND GLYCOGEN RESERVES ABUNDANTLY PRESENT IN EPIDERMIS. **3. LONGITUDINAL MUSCLES.** CIRCULAR MUSCLES ARE TOGETHER ABSENT, LONGITUDINAL MUSCLES FORM A SINGLE LAYER OF SPINDLE-SHAPED CELLS BENEATH EPIDERMIS AND LINING THE BODY CAVITY. BEING INTERRUPTED AT FOUR PLACES BY LONGITUDINAL EPIDERMAL CHORDS, THE MUSCLE LAYER IS DIVIDED INTO FOUR LONGITUDINAL COLUMNS OR STRIPS TWO DORSO LATERAL AND TWO VENTRO-LATERAL. EACH COLUMN CONTAINS ABOUT 150 MUSCLE CELLS. NUMBER AND DISPOSITION OF MUSCLE CELLS IN NEMATODES FORMS A BASIS FOR IDENTIFICATION OF SPECIES.

EACH MUSCLE CELL POSSESSES TWO DISTINCT PORTIONS (i) A FIBRILLAR, CONTRACTILE MUSCULAR PORTION, LYING LENGTHWISE AGAINST THE EPIDERMIS, AND (ii) A GRANULAR NON-CONTRACTILE PROTOPLASMIC PORTION PROJECTING INTO BODY CAVITY. MUSCULAR PORTION CONTAINS LONGITUDINAL CONTRACTILE FIBRES ARRANGED AT INTERVALS. IT ALSO HAS FIBRES FOR ATTACHMENT TO CUTICLE. NON-CONTRACTILE PROTOPLASMIC PORTION CONTAINS NON-CONTRACTILE SUPPORTING FIBRES AND A NUCLEUS AND GIVES OUT AT ITS FREE SURFACE ONE OR MORE NEUROMUSCULAR PROCESSES OR MUSCLE TAILS. MUSCLE TAILS OF ALL THE CELLS OF TWO DORSO-LATERAL COLUMNS ARE ULTIMATELY CONNECTED WITH DORSAL NERVE CORD, WHILE THOSE OF TWO VENTRO-LATERAL COLUMNS ARE CONNECTED WITH VENTRAL NERVE CORD. ELECTRON MICROSCOPY HAS SHOWN THAT MUSCLE TAILS ARE CELLULAR EXTENSIONS WHICH FORM SYNAPSES ON THE MOTOR NERVES OF DORSAL AND VENTRAL NERVE CORDS (DEBELL, 1965)

MOVEMENTS

CHANGE IN BODY LENGTH IS RESTRICTED DUE TO ABSENCE OF CIRCULAR MUSCLES IN BODY WALL. HOWEVER, CHANGES IN LENGTH TO ABOUT 15% ARE MADE POSSIBLE BY THE FIBRES OF CUTICLE. THESE FIBRES, THOUGH THEMSELVES INELASTIC, ARE DISPOSED IN A SPIRAL AND MESH-LIKE ARRANGEMENT WHICH PERMITS LIMITED CHANGE OF LENGTH.

UNDULATING MOVEMENTS, IN DORSO-VENTRAL WAVES, CAN BE PERFORMED BY ALTERNATE CONTRACTIONS OF DORSO-LATERAL AND VENTRO-LATERAL MUSCLES IN THE ANTERIOR END OF BODY. THESE MOVEMENTS HELP THE PARASITE TO COUNTERACT THE PERISTALTIC ACTIVITY OF THE HOST'S INTESTINE.

BODY CAVITY OR PSEUDOCOEL

BETWEEN BODY WALL AND VISCERAL ORGANS IS A SPACIOUS FLUID-FILLED CAVITY. THIS CAVITY IS NOT TRUE COELOM AS (i) IT IS NOT LINED BY COELOMIC EPITHELIUM, (ii) IT HAS NO RELATION WITH REPRODUCTIVE AND EXCRETORY ORGANS, AND (iii) IT DEVELOPS FROM BLASTOCOEL, I.E., BETWEEN MESODERM AND ENDODERM OF EMBRYO. THIS BODY CAVITY IS REFERRED TO AS PSEUDOCOEL OR FALSE COELOM. PSEUDOCOEL OF ASCARIS CONTAINS FIVE GIANT STELLATE MESENCHYMAL CELLS, KNOWN AS PSEUDOCOELOMOCYTES, OCCUPYING FIXED POSITIONS. OUT OF THESE, THE LARGEST CELL LIES ON THE DORSAL SIDE. PHARYNX, AND FROM IT EXTEND NUMEROUS THIN CYTOPLASMIC STRANDS IN THE FORM OF FENESTRATED MEMBRANES. THESE MEMBRANES CROSS THE CAVITY AT VARIOUS PLACES AND FORM DELICATE LAYERS OVER THE VISCERAL ORGANS AND MUSCLES OF BODY WALL. REMAINING STELLATE GIANT CELLS OCCUR IN THE ANTERIOR THIRD OF THE BODY, TWO IN

RELATION WITH EACH LATERAL EPIDERMAL CHORD. PSEUDOCOELOM IS A LARGE INTRACELLULAR SPACE FORMED BY THE UNION OF THESE COELOMOCYTES.

PSEUDOCOEL IS FILLED WITH AN ODOROUS PROTEIN RICH FLUID, THE PERIENTERIC OR PSEUDOCOELOMIC FLUID, WHICH SERVES FOR TRANSPORTATION OF METABOLITES AND KEEPS THE BODY DISTENDED. IT IS COMPOSED OF ABOUT 93 PER CENT WATER AND THE REST OF IT IS IN THE FORM OF SOLIDS INCLUDING PROTEIN GLUCOSE, NON-PROTEIN NITROGENOUS SUBSTANCES, SODIUM CHLORIDE AND PHOSPHATE.

DIGESTIVE SYSTEM

[1] ALIMENTARY CANAL

ALIMENTARY CANAL IS A STRAIGHT AND COMPLETE TUBE EXTENDING FROM MOUTH AT ONE END TO ANUS ON OTHER END OF BODY. IT COMPRISES A SHORT PHARYNX OR OESOPHAGUS REPRESENTING THE FOREGUT, A LONG INTESTINE OR MID-GUT, AND A SHORT RECTUM OR HIND GUT.

1. MOUTH. IT IS A TRIRADIATE APERTURE, SITUATED AT THE ANTERIOR TIP GUARDED BY THREE LIPS OR LABIA (ALREADY DESCRIBED).

2. PHARYNX. MOUTH OPENS INTO A SHORT, CHARACTERISTIC, CYLINDRICAL, THICK-WALLED AND MUSCULAR PHARYNX. WALL OF PHARYNX, CONSISTS OF A SYNCYTIAL EPITHELIUM TRAVERSED BY RADIAL MUSCLE

FIBRES AND CONTAINING GLANDS. IT IS BOUNDED EXTERNALLY BY A MEMBRANE. INTERNALLY IT IS LINED BY CUTICLE WHICH, AT THE MARGIN OF MOUTH, IS CONTINUOUS WITH THE CUTICLE OF BODY WALL. LUMEN OF PHARYNX IS TRI-RADIATE. RAYS ARE IN THE FORM OF DEEP GROOVES WHICH DEMARCATHE THE PHARYNGEAL WALL INTO THREE SECTORS-ONE DORSAL AND SUB-VENTRAL. DORSAL SECTOR CONTAINS A PINNATELY BRANCHED PHARYNGEAL OR OESOPHAGEAL GLAND, WHILE EACH SUB-VENTRAL SECTOR PALMATELY BRANCHED GLAND. NUMEROUS GROUPS OF RADIAL MUSCLE FIBRES EXTEND BETWEEN CUTICULAR LINING AND OUTER BOUNDING MEMBRANE.

3. INTESTINE. PHARYNX IS FOLLOWED BY INTESTINE WHICH EXTENDS ALMOST ALONG THE ENTIRE BODY LENGTH. A SMALL VALVE IS PRESENT AT THE JUNCTION OF PHARYNX AND INTESTINE WHICH STOPS THE FOOD FROM GING BACK INTO PHARYNX. INTESTINE IS DERSOVENTRALLY FLATTENED AND ITS WALL CONSISTS OF A SINGLE LAYER OF TALL COLUMNAR CELLS, LINED EXTERNALLY BY A BASEMENT MEMBRANE AND A THIN LAYER OF CUTICLE. INNER FREE MARGIN OF EACH CELL IS PRODUCED INTO SEVERAL HAIR-LIKE PROJECTIONS, THE MICROVILLI, FORMING A SORT OF BRUSH BORDER, TO INCREASE THE ABSORPTIVE SURFACE AREA. THE MICROVILLI, IN FACT, ARE FORMED BY A BACILLARY LAYER. MUSCLE FIBRES ARE WANTING IN INTESTINE.

4. RECTUM. INTESTINE IS FOLLOWED BY A SHORT RECUM WHICH TOO IS DORSO-VENTRALLY FLATTENED. WALL OF RECTUM CONSISTS OF TALL COLUMNAR CELLS AND IS LINED INTERNALLY BY CUTICLE AND EXTERNALLY BY MUSCLE TISSUE. IN MALE, RECTUM OPENT INTO CLOACE WHICH ALSO RECEIVES THE EJACULATORY DUC WHILE IN FEMALE, RECTUM OPENS OUT THROUGH AUT WHICH IS A TRANSVERSE SLIT GUARDED BY ANTERIOR AND POSTERIOR LIPS AND IS PROVIDED WITH A SPECIAL MUSCLE, THE DEPRESSOR ANI. ANUS OR CLOACE FISSAT A DISTANCE OF ABOUT 2 MM. FROM TAIL END.

• [II] FOOD, FEEDING AND DIGESTION

FOOD OF ASCARIS LUMBRICOIDES CONSISTS OF BLOOD AND FULLY OR PARTIALLY DIGESTED FOOD OCCURRING IN FLUID FORM IN THE HOST'S GUT. IT IS SUCKED BY THE RHYTHMIC PUMPING ACTION OF PHARYNX. DIGESTION COMPLETELY EXTRACELLULAR IN INTESTINE AND IS AIDED BY THE ENZYMES PROTEASES, AMYLASE, AND LIPASE. DIGESTED FOOD IS ABSORBED BY THE INTESTINAL CELLS AND DISTRIBUTED BY THE PSEUDOCOELOMIC FLUID. EXCESS OF FOOD IS STORED MAINLY AS GLYCOGEN AND A LITTLE FAT IN SYNCYTIAL EPIDERMIS. SOME INTESTINAL CELLS ALSO ENGULF SMALL SOLID PARTICLES BY PHAGOCYTOSIS, AND DIGEST THEM INTRACELLULARLY. DEFAECATION OF UNDIGESTED FOOD WHENEVER IT OCCURS, IS FACILITATED BY THE DEPRESSOR AND MUSCLE WHICH RAISES THE DORSAL WALL OF RECTUM AND POSTERIOR LIP OF ANUS OR CLOACA

RESPIRATION

ASCARIS LUMBRICOIDES, LIKE MOST OTHER ENDO PARASITES, RESPIRE ANAEROBICALLY OR ANAEROBICALLY BECAUSE THE OXYGEN CONTENT IN HOST'S INTESTINE IS USUALLY POOR. IN THIS PROCESS, GLYCOGEN UNDERGOES GLYCOLYSIS AND FINALLY YIELDS CARBON DIOXIDE, FATTY ACIDS AND ENERGY. DETAILS OF THE PROCESS ARE THE SAME AS DESCRIBED FOR *FASCIOLA HEPATICA* AND *TAENIA SOLIUM*. MAIN FATTY ACIDS PRODUCED ARE VALERIANIC BUTYRIC AND CAPROIC ACIDS. THESE ARE EXCRETED THROUGH CUTICLE AND IMPART A CHARACTERISTIC SMELL LIKE THAT OF CANNED PINEAPPLE.

AEROBIC RESPIRATION PROBABLY OCCURS WHENEVER FREE OXYGEN IS AVAILABLE IN HOST'S INTESTINE. THIS IS INDICATED BY THE PRESENCE OF A SMALL AMOUNT OF CYTOCHROME IN PARASITE. ACCORDING TO SOME WORKERS (HYMAN), HAEMOGLOBIN PRESENT IN SMALL AMOUNTS IN THE PSEUDOCOCLOMIC FLUID AND BODY WALL, SERVES TO TRANSPORT OXYGEN.

EXCRETORY SYSTEM

- 1. EXCRETORY ORGANS.** EXCRETORY SYSTEM IS QUITE SIMPLE DUE TO ABSENCE OF FLAME CELLS OF PROTONEPHRIDIA. THERE IS A H-SHAPED TUBULAR EXCRETORY SYSTEM. IT IS SUPPOSED TO BE FORMED BY A HUGE EXCRETORY RENETTE CELL AT THE JUVENILE STAGE. INTO ITS CYTOPLASM TUNNEL-LIKE STRUCTURES FORM CANALS OF THE EXCRETORY SYSTEM. IT CONSISTS OF TWO LATERAL LONGITUDINAL EXCRETORY CANALS, RIGHT AND LEFT, CONNECTED ANTERIORLY, BELOW PHARYNX, BY A TRANSVERSE CANALICULAR NETWORK. EACH LONGITUDINAL CANAL EXTENDS POSTERIORLY, ALONG THE ENTIRE BODY LENGTH THROUGH A LATERAL EPIDERMAL CHORD AND IS CLOSED AT BOTH ENDS. EXTERNALLY, THEIR LOCATION IS MARKED BY THE TWO LATERAL LINES. LEFT CANAL IS SLIGHTLY WIDER THAN THE RIGHT. ANTERIOR LIMBS OF H ARE REDUCED. LUMEN OF CANALS IS DEVOID OF CILIA. A SHORT TERMINAL EXCRETORY DUCT EXTENDS FROM LEFT SIDE OF TRANSVERSE CANALICULAR NETWORK TO THE EXCRETORY PORE SITUATED MID-VENTRALLY, A LITTLE BEHIND THE ANTERIOR TIP. THE NUCLEUS OF THE EXCRETORY CELL LIES ANTERIORLY

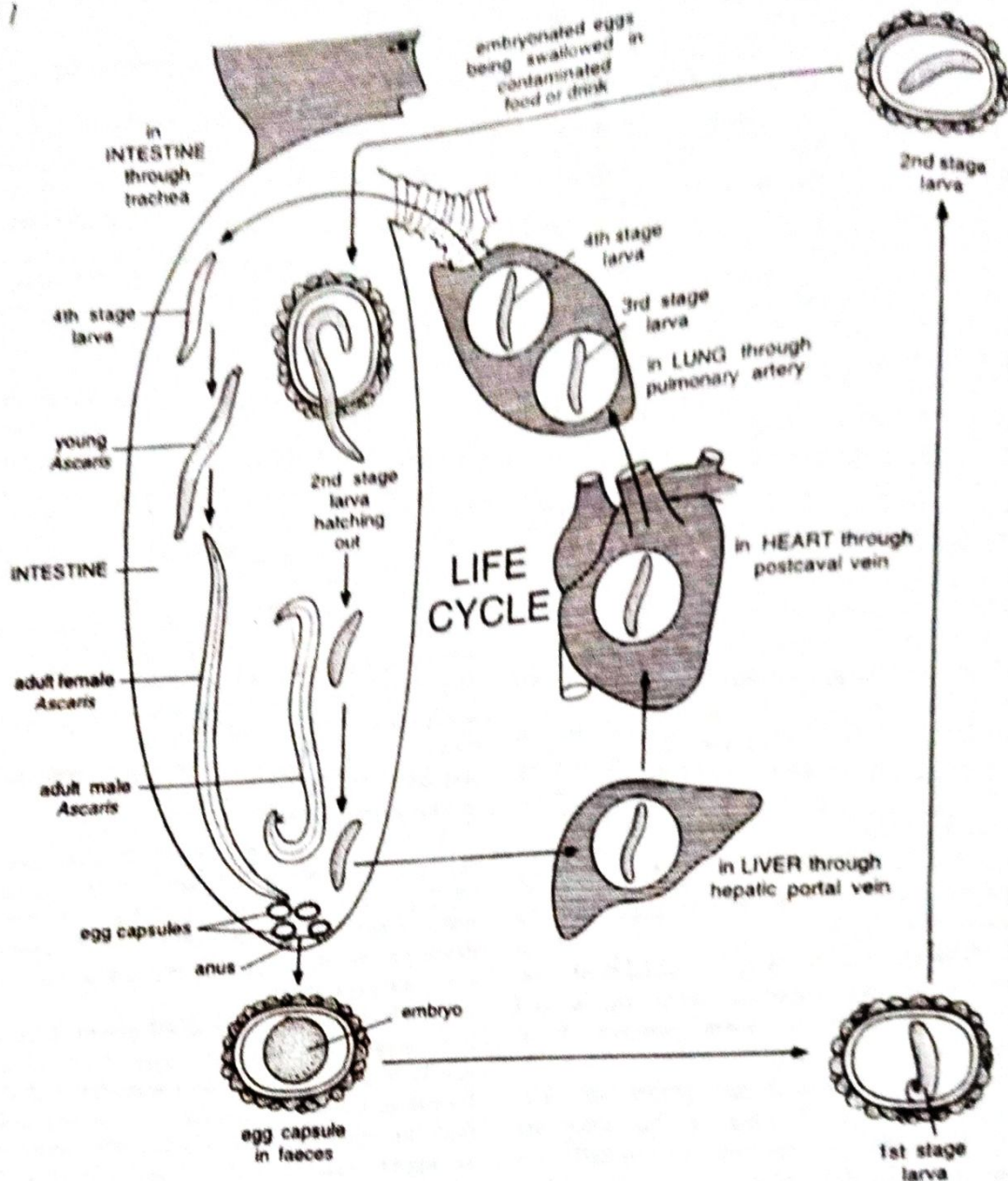
ON THE LEFT LONGITUDINAL CANAL, TWO MORE SMALLER NUCLEI HAVE ALSO BEEN LOCATED, ONE ON THE TERMINAL DUCT AND ONE ON THE TRANSVERSE CANALICULAR NETWORK, INDICATING THAT THE CANAL SYSTEM IS EVOLVED PROBABLY BY MORE THAN ONE CELL.

2. **PHYSIOLOGY.** AVAILABLE DATA SUGGESTS THAT EXCRETORY PRODUCT OF ASCARIS IS MAINLY UREA, THUS IT IS A UREOTELIC ANIMAL. EXCRETORY CANALS COLLECT THE EXCRETORY PRODUCTS FROM DIFFERENT PARTS OF BODY. PRESSURE OF PSEUDOCOELOMIC FLUID HELPS IN AND WORK ULTRAFILTRATION. EXCRETORY PRODUCTS ARE ELIMINATED THROUGH THE EXCRETORY PORE. SOME AMMONIA AND URIC ACID ARE ALSO PASSED OUT WITH FACCES THROUGH ANUS.

3. **NERVOUS SYSTEM** - NERVOUS SYSTEM OF ASCARIS WAS STUDIED BY GOLDSCHMIDT (1908-1910). ACCORDING TO HIS FINDINGS, CONFIRMED BY OTHER WORKERS, NERVE CELLS FORMING THE SYSTEM ARE CONSTANT IN NUMBER, POSITION, FORM AND COURSE OF FIBRES. EXHAUSTIVE

1. **CENTRAL NERVOUS SYSTEM.** IT COMPRISES OF RICHLY GANGLIONATED NERVE RING OR ENCIRCLING PHARYNX. THE GANGLIA LOCATED ON NERVE RING ARE (i) A SINGLE DORSAL GANGLION, (ii) A PAIR OF SUB-DORSAL GANGLIA, ONE ON EACH SIDE OF DORSAL GANGLION, (iii) A PAIR OF LATERAL GANGLIA, EACH SUBDIVIDED TO FORM SIX LATERAL GANGLIA, AND (iv) PAIR OF LARGE VENTRAL GANGLIA. CIRCUMENTERIC

2. **PERIPHERAL NERVES.** FROM THE NERVE RING 8 NERVES RUN ANTERIORLY. OUT OF THESE, 6 SUPPLY THE 6 LABIAL PAPILLAE AND EACH BEARS A PAPILLA GANGLION, NEAR ITS BASE. REMAINING 2 NERVES KNOWN AS AMPHIDIAL NERVES, SUPPLY THE AMPHIDIAL NERVE. EACH AMPHIDIAL NERVE ARISES FROM ONE OF THE 6 LATERAL GANGLIA, CALLED AMPHIDIAL GANGLION, OF ITS SIDE. POSTERIOR PART OF BODY IS SUPPLIED BY NERVES. A DORSAL NERVE CORD (MOTOR) RUNS THROUGH THE DORSAL EPIDERMAL CHORD. A VENTRAL GANGLIONATED NERVE CORD RUNS THROUGH THE VENTRAL EPIDERMAL CHORD. IT TERMINATES AT THE POSTERIOR END OF BODY AFTER FORMING AN ANAL GANGLION. THERE ARE 2 THIN DELICATE LATERAL NERVE CHORDS (SENSORY), EACH EXTENDING THROUGH A LATERAL EPIDERMAL CHORD BESIDES 2 DORSO-LATERAL AND 2 VENTRO LATERAL NERVE CORDS ARE PRESENT, ONE ABOVE AND ONE BELOW THE LATERAL NERVE CORD, ON EITHER

Fig. 15. *Ascaris*. Life cycle.

2. ZYGOTE. UNFERTILIZED EGG CONTAINS GLOBULES OF GLYCOGEN AND FAT. IMMEDIATELY AFTER FERTILIZATION, GLYCOGEN GLOBULES MIGRATE TO THE SURFACE AND FORM A FERTILIZATION MEMBRANE, WHICH HARDENS INTO A THICK, CLEAR AND CHITINOUS SHELL. NEXT, THE FAT GLOBULES FORM A THIN LIPOID LAYER BELOW SHELL. AS THE FERTILIZED EGG OR ZYGOTE MOVES DOWN THE UTERUS, THE UTERINE WALL SECRETES AROUND IT A THICK HARD, YELLOW OR BROWN ALBUMINOUS (PROTEINOUS) COAT HAVING A TYPICAL WAVY SURFACE (RIPPLING). FERTILIZED EGG AT THIS STAGE IS ELLIPTICAL, MEASURING 60-70U BY 40-50U.

2. UTERI OF A SINGLE MATURE FEMALE MAY CONTAIN AS MANY AS 27 MILLION EGGS (CRAM, 1925) WITH AN AVERAGE DAILY PRODUCTION OF SOME 2,00,000 EGGS. THESE LEAVE MOTHER'S BODY THROUGH GONOPORE INTO HOST'S INTESTINE AND FINALLY PASS OUT WITH THE HOST'S FAECES. SHELLED EGGS ARE REMARKABLY RESISTANT AND REMAIN ALIVE IN MOIST SOIL FOR SEVERAL YEARS UNDER ADVERSE CONDITIONS.

3. UNDER SUITABLE CONDITIONS OF TEMPERATURE, MOISTURE AND OXYGEN, EGGS UNDERGO CLEAVAGE AND DEVELOP INTO THE INFECTIVE STAGE. OPTIMUM TEMPERATURE FOR DEVELOPMENT IS 85°F. BELOW 60°F DEVELOPMENT STOPS AND ABOVE 100°F THE EGGS GRADUALLY DEGENERATE.

3. **CLEAVAGE AND EARLY DEVELOPMENT.** CLEAVAGE IS OF SPIRAL AND DETERMINATE TYPE. FIRST DIVISION RESULTS IN A DORSAL (AB) AND A VENTRAL CELL (P₁). DORSAL CELL DIVIDES INTO AN ANTERIOR (A) AND A POSTERIOR CELL (B), WHILE VENTRAL CELL DIVIDES INTO AN UPPER (EMST) AND A LOWER CELL (P₂). THE FOUR-CELLED EMBRYO, THUS FORMED, IS FIRST T-SHAPED, BUT SOON BECOMES RHOMBOIDAL AS P₂ COMES TO LIE POSTERIOR TO EMST.

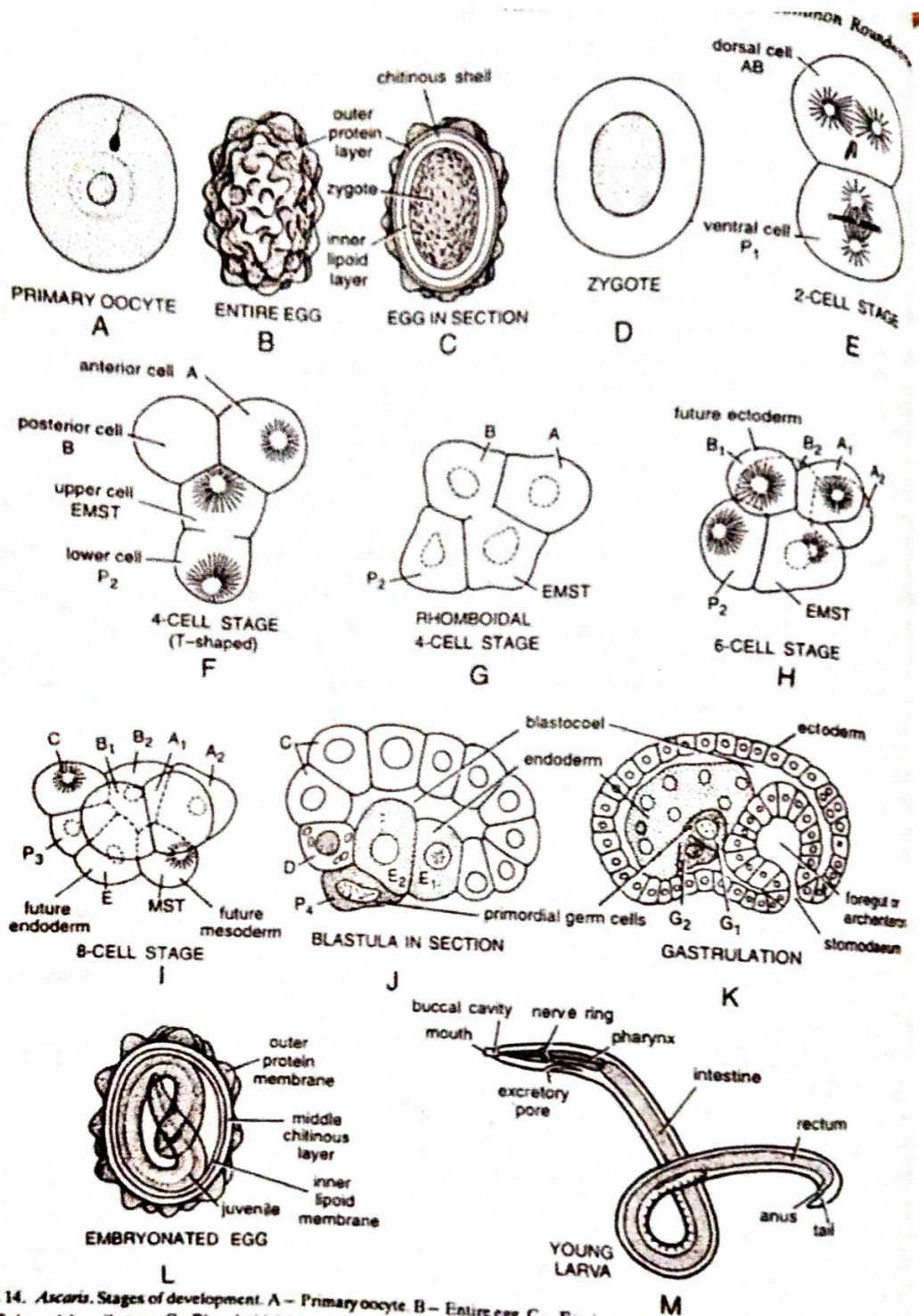


Fig. 14. *Ascaris*. Stages of development. A - Primary oocyte B - Entire egg C - Egg in section D - Zygote without shell E - 2-cell stage F - T shaped 4-cell stage. G - Rhomboidal 4-cell stage. H - 6-cell stage. I - 8-cell stage. J - Blastula in median sagittal section. K - Gastrulation embryo in median sagittal section. L - Embryonated egg with first stage larva. M - second Free stage larva.

4. IN THE NEXT CLEAVAGE, A AND B DIVIDE INTO RIGHT AND LEFT CELLS (A1, A2 AND B1, B2), EMST INTO MST AND E, AND P2 INTO P3 AND C. FURTHER, E DIVIDES INTO E1 AND E2 AND P3 DIVIDES INTO P4 AND D. P4 FURTHER DIVIDES INTO G₁ AND G₂. FATE OF VARIOUS CELLS AT THIS STAGE IS FIXED. (i) DESCENDANTS OF A AND B GIVE RISE TO THE

HUMAN FACCES, THE JUVENILE IS ALSO TERMED RHABDITIFORM LARVA OF FIRST STAGE. IT IS NOT INFECTIVE. IN ANOTHER WEEK'S TIME, IT MOULTS HADBITOID OR WITHIN THE EGG SHELL AND BECOMES THE SECOND STAGE RHABDITOID, WHICH IS CAPABLE OF INFECTING THE HOST. UNDER SUITABLE CONDITIONS OF MOISTURE, OXYGEN AND TEMPERATURE, INFECTIVE EGGS OF ASCARIS LUMBRICOIDES ARE KNOWN TO REMAIN VIABLE FOR ABOUT SIX YEARS.

5. **INFECTION OF NEW HOST.** THERE BEING NO INTERMEDIATE HOST, MAN ACQUIRES INFECTION BY DIRECTLY INGESTING ASCARIS EGGS, CONTAINING THE INFECTIVE SECOND STAGE RHABDITOID LARVA, WITH CONTAMINATED FOOD OR WATER. IN THE SMALL INTESTINE, BY THE ACTION OF HOST'S DIGESTIVE JUICES, THE EGG SHELLS DISSOLVE AND THE JUVENILES (SECOND STAGE LARVAE) HATCH OUT.

6. **LATER DEVELOPMENT AND MIGRATION.** AT BATCHING, A JUVENILE MEASURES 0.25 TO 0.3 MM IN LENGTH AND 13U TO 15U IN DIAMETER. IT PERFORMS ACTIVE THRASHING MOVEMENTS AND BORES THROUGH THE EPITHELIUM OF HOST'S INTESTINE AND STARTS ITS MIGRATION IN HOST'S BODY.

A) **PRIMARY MIGRATION.** LARVA ENTERS THE HEPATIC PORTAL CIRCULATION WHICH CARRIES IT TO THE LIVER. FROM LIVER IT FINALLY REACHES THE HEART THROUGH POST-CAVAL VEIN. FROM HEART IT IS TRANSPORTED TO THE LUNG VIA PULMONARY ARTERY. LARVA GENERALLY REMAINS IN LUNG FOR A FEW DAYS AND INCREASES IN SIZE. THEN IT RUPTURES OUT OF BLOOD CAPILLARY AND FINALLY BORES ITS WAY INTO ALVEOLI. AFTER ABOUT 6 DAY'S STAY THERE, THE SECOND STAGE LARVA MOULTS TO BECOME THE THIRD STAGE LARVA. ANOTHER MOULT AFTER 4 DAYS RESULTS INFOURTH STAGE LARVA, WHICH HAS BY THIS TIME GROWN TO A LENGTH OF 2 TO 3 MM.

B SECONDARY MIGRATION. FOURTH STAGE LARVA LEAVES ITS TEMPORARY HOME IN LUNG ALVEOLI AND THROUGH TRACHEA REACHES THE PHARYNX, FROM WHERE IT IS COUGHED UP AND THEN SWALLOWED FOR THE SECOND TIME INTO GUT. IN THE INTESTINE, IT MOULTS FOR THE FOURTH AND THE LAST TIME TO BECOME AN ADULT. **13** ADULT ATTAINS SEXUAL MATURITY WITHIN **8-10** WEEKS. THE AVERAGE LIFE-SPAN OF *ASCARIS LUMBRICOIDES* IN THE HOST IS **9-12** MONTHS.

© **ABERRANT MIGRATION.** SOMETIMES LARVA OF *ASCARIS* DOES NOT FOLLOW ITS USUAL MIGRATION PATH BUT REACHES THE BRAIN OR SPINAL CORD OR ANY SUCH ORGAN. LARVA IS NOT ABLE TO SURVIVE IN THESE ORGANS AND A CALCAREOUS CYST IS FORMED AROUND IT. **PARASITIC ADAPTATIONS OF ASCARIS**

SHOWS SEVERAL ADAPTATIONS TO ITS PARASITIC MODE OF LIFE IN HUMAN INTESTINE.

(1) TOUGH, THICK AND RESISTANT CUTICLE, COVERING THE BODY, SHIELDS AGAINST THE ACTION OF HOSTS DIGESTIVE ENZYMES AND ANTITOXINS. *ASCARIS* ALSO SECRETES ANTI-ENZYMES THAT PROTECT IT FROM HOSTS DIGESTIVE ENZYMES.

(2) POWER OF LOCOMOTION COUNTERACTS PERISTALSIS OF HOST'S INTESTINE AND COMPENSATES FOR THE ABSENCE OF ADHESIVE SUCKERS AND SPINES. THIS HELPS THE WORM FROM GETTING DISLOGED AND REMAIN IN HOST'S INTESTINE.

(3) MUSCULAR PHARYNX FACILITATES INGESTION OF FOOD BY SUCKING ACTION.

(4) THERE IS A CONTINUOUS SUPPLY OF FOOD, AS A RESULT THE ALIMENTARY TRACT IS SIMPLE WITHOUT PROVISION FOR STORAGE.

5.INGESTED FOOD IS PRE-DIGESTED, SO THAT THERE ARE NO ELABORATE DIGESTIVE GLANDS.

(6) PSEUDOCOELOMIC FLUID SERVES FOR ABSORPTION, TRANSPORT AND DISTRIBUTION OF FOOD, OXYGEN AND WASTES, SO THAT THERE IS NO CIRCULATORY SYSTEM. **(7)** EXTREMELY LOW METABOLIC RATE AND ANAEROBIC RESPIRATION ENABLES THE WORM TO LIVE INSIDE THE HOST'S INTESTINE, WHERE FREE OXYGEN IS NEGLIGIBLE.

7.ARASITE REMAINS WELL PROTECTED INSIDE THE HOST'S INTESTINE, FROM PREDATORS, SO THAT THERE IS NO NEED FOR COMPLICATED SENSORY ORGANS WHICH ARE QUITE SIMPLE.

8.REPRODUCTION IS WASTEFUL IN THE EXTREME AS TRANSFER TO A NEW HOST IS FULL OF MANY HAZARDS. FIRSTLY, THE TRANSFER TO A NEW HOST IS AN ENTIRELY PASSIVE PROCESS DEPENDING

ON AN ACCIDENTAL INGESTION OF EMBRYONATED EGGS BY SOME UNSUSPECTING HOST. CHANCES BECOME ALL THE MORE DIFFICULT BECAUSE THE HOST MUST BE A SPECIFIC ONE. EGGS LAID BY A PIG ASCARIS MUST BE INGESTED BY ANOTHER PIG, AND SIMILARLY, THE EGGS LAID BY A HUMAN ASCARIS MUST BE PICKED UP BY ANOTHER HUMAN. MOREOVER, THE EGGS MUST HAVE UNDERGONE SOME EMBRYOLOGICAL DEVELOPMENT BEFORE INGESTION BY ANOTHER HOST. IF AN EGG IS NOT EMBRYONATED AND INGESTED PREMATURELY, IT WILL NOT DEVELOP INTO A NEW WORM. FURTHER, ONLY A WARM, SHADY AND MOIST ENVIRONMENT IS SUITABLE FOR PROPER DEVELOPMENT OF THE EGGS. DEHYDRATION AND VERY HIGH (ABOVE 100°F) OR LOW TEMPERATURES (BELOW 60°F) ARE USUALLY FATAL TO THE DEVELOPING EMBRYOS. THESE AND MANY OTHER HAZARDS ARE OVERCOME BY THESE PARASITES BY PRODUCING ENORMOUS QUANTITY OF EGGS TO ENSURE GREATER CHANCES FOR SURVIVAL. THUS, A SINGLE MATURE FEMALE MAY CONTAIN AS MANY AS 27 MILLIONS OF EGGS WITH A DAILY PRODUCTION OF 234,000 EGGS OR ABOUT 162 EGGS PER MINUTE, WHICH ALSO COMPENSATES FOR THE LACK OF ASEQUAL MULTIPLICATION AND HERMAPHRODITISM.

(10) RESISTANT COVERING OR SHELL PROVIDES SAFETY TO THE ZYGOTES AND EMBRYONATED EGGS FROM UNFAVOURABLE ENVIRONMENTAL FACTORS. THEY REMAIN VIABLE FOR YEARS.

(11) MINUTE SIZE AND RESISTANT NATURE OF EGGS AFFORDS FAR AND WIDE DISPERSAL OF THE PARASITE. (12) INFECTION OF A NEW HUMAN IS DIRECT, WITHOUT AN HOST, WHICH MAKES TRANSFER FROM ONE HOST TO ANOTHER EASIER AND SAFER.

ASCARIASIS

1. INFECTION. DISEASE CAUSED BY ASCARIS IS

COMMONLY CALLED ASCARIASIS. MAN GETS INFECTION BY CONSUMING FOOD AND WATER CONTAMINATED WITH INFECTIVE EGGS. INCIDENCE OF ASCARIASIS IS GREATER IN CHILDREN THAN IN ADULTS.

2. **PATHOGENESIS.** LARVAE OFTEN PROVE MORE INJURIOUS THAN ADULT WORMS BY CAUSING HAEMORRHAGES. THEY SOMETIMES BORE THROUGH INTESTINAL EPITHELIUM AND ENTER GENERAL CIRCULATION, WHICH MAY LAND THEM IN SOME VITAL ORGAN STRUCTURES LIKE KIDNEYS, SPINAL CORD, BRAIN OR MUSCLES, WHERE THEY MAY CAUSE SERIOUS INJURIES. SEVERE HAEMORRHAGIC CONDITIONS DEVELOP IN LUNGS WHERE THEY CAUSE PETECHIAL HAEMORRHAGES AND INFLAMMATION OF ALVEOLAR TISSUE FOLLOWED BY OEDEMA. IN SEVERE INFECTION, THEY MAY CAUSE ACUTE PNEUMONIA WITH FATAL CONSEQUENCES. FREQUENTLY, INFECTION IS IMMEDIATELY FOLLOWED BY TEMPERATURE, ANAEMIA, LEUCOCYTOSIS AND EOSINOPHILIA.

ADULTS USUALLY CAUSE ENTERITIS AND THROUGH THEIR MIGRATION INTO VERMIFORM APPENDIX, GALL BLADDER AND COMMON BILE DUCT, MAY CAUSE INFLAMMATION OF THESE STRUCTURES. (Z-1)

ADULTS DRAW THEIR NOURISHMENT FROM CONTENTS OF INTESTINE AND MAY SUCK BLOOD FROM ITS WALLS, WORM PRODUCES TOXINS WHICH MAY CAUSE IRRITATION OF MUCOUS MEMBRANE, NERVOUS SYMPTOMS LIKE CONVULSIONS (INVOLUNTARY CONTRACTION OF VOLUNTARY MUSCLES), DELIRIUM (LIGHT HEADEDNESS), COMA GROWTH (DEEP SLEEP), AND NERVOUSNESS. A SUBSTANCE PRODUCED BY PARASITE COMBINES WITH TRYPSIN, THUS INTERFERING WITH PROTEIN DIGESTION WHICH LEADS TO PROTEIN DEFICIENCY AND HENCE STUNTED ESPECIALLY AMONG CHILDREN. PRESENCE OF EVEN A FEW PARASITES IN INTESTINE MAY RESULT IN INTENSE COLIC PAINS, ABDOMINAL DISCOMFORTS, DIARRHOEA, VOMITING AND MILD TEMPERATURE. ADMINISTRATION OF DRUGS OFTEN IRRITATES THE PARASITES, WHICH CONSEQUENTLY GET ENTANGLED IN MASSES TO BLOCK THE LUMEN. ABOUT A HUNDRED TO A THOUSAND OR EVEN MORE (UP TO 5,000 HAVE BEEN RECORDED) WORMS MAY BE INVOLVED AND MAY PROVE FATAL, IF NOT PROMPTLY REMOVED BY SURGERY.

3. **THERAPY.** INFECTION MAY BE DIAGNOSED BY EXAMINING THE STOOL FOR ASCARIS EGGS. INFECTION CAN BE TREATED WITH A DOSE OF HEXYLRESORCINOL CRYSTALS IN A GELATIN CAPSULE AFTER ABOUT 12 HOURS FASTING. THE DOSE, FOLLOWED BY A FAST OF ANOTHER FOUR HOURS, KILLS THE WORMS, WHICH CAN BE FINALLY EXPELLED BY A PURGATIVE LIKE SODIUM SULPHATE SOME ANTI-HELMINTH DRUGS, LIKE OIL OF CHENOPODIUM, ARE VERY

Characteristic	n	%	95% CI	
			Lower	Upper
Intestinal Parasitic Infection	115	52.8	46.1	59.4
Multiple [‡]	21	9.6	5.7	13.5
Single [†]	94	43.1	36.5	49.7
Nil	103	47.2	40.6	53.9
<i>Giardia lamblia</i>	63	28.9	22.9	34.9
Mono parasitism [¶]	52	23.9	18.2	29.5
Poly parasitism [*]	11	5.0	2.1	8.0
<i>Ascaris lumbricoides</i>	36	16.5	11.6	21.4
Mono parasitism [¶]	25	11.5	7.2	15.7
Poly parasitism [*]	11	5.0	2.1	8.0
<i>Blastocystis hominis</i>	22	10.1	6.1	14.1
Mono parasitism [¶]	15	6.9	3.5	10.2
Poly parasitism [*]	7	3.2	0.9	5.6
<i>Hymenolepis nana</i>	2	0.9	-	-
Mono parasitism [¶]	0	0	0.0	0.0
Poly parasitism [*]	2	0.9	-	-

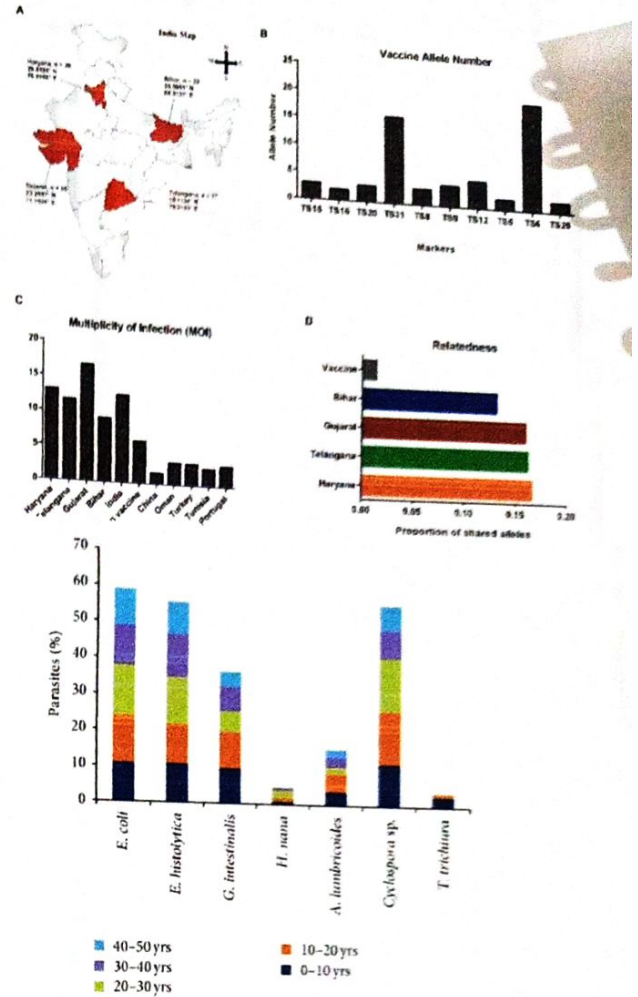
[‡]If more than one intestinal parasite is identified in a sample, it is a multiple parasitic infection.

[†]If only one intestinal parasite is identified in a sample, it is a single parasitic infection.

[¶]Infection with the labeled parasite only.

^{*}Infection with multiple parasites including the labeled one.

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Thank You

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