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Week 1: Protozoans and Phylum Cnidaria INVERTEBRATES

General

- Form the basis of many food webs – after theplants
- They can decrease or increase their numbers to plague proportions – a cascade effect, which can impact toppredators

Taxonomic Classification ofAnimals

1. Kingdom
2. Phylum
    - Sub-Phylum
3. Class
    - Sub-Class
4. Order
5. Family
6. Genus
7. Species

REMEMBER:KEEP PONDCLEAN ORFROG GYGETSSICK

Conventions

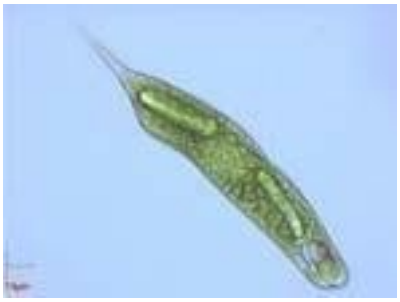
- **Family names** end in**'dae'**
- **Subfamily names** end in **'nae'**
- Each species has a Latin binomial (two words) – a **genus followed by a speciesname**
- The **genus** begins with a **capital (upper case)** letter and is in ***italics*** **or underlined**e.g. *Physalia, Obelia, Paramecium, Hydra*
- **Species** names begins with **a lower case letter** and are also in ***italics*** **orunderlined**
    - Species names are rarely used alone – always after the name of the genus e.g. *Homo sapiens* NOT*sapiens*
    - If a scientific name is used many times, the genus name can be abbreviated e.g. *H. sapiens* AFTER it has been spelt outonce
    - If a single species hasn't been formally described and named you can use the abbreviation 'sp.' e.g. *Paramecium* sp.
- If you aren't sure if there's just one species use 'spp.' E.g. *Parameciumspp.*
- Sp. And spp. Are NOT Latin words so they are NOT in italics orunderlined
- Genus is singular = 1genus
- Genera is plural = 2 or moregenera
- Species is used for one or more species; never use'specie'

PROTOZOANS

General Characteristics

General

- Maincharacteristics
  - Animal-likefeatures
  - **Uni-cellular**
  - Most aremicroscopic
  - **No cellwall**
  - Complexorganelles
  - No organs ortissues
  - Variableshape
  - Verydiverse

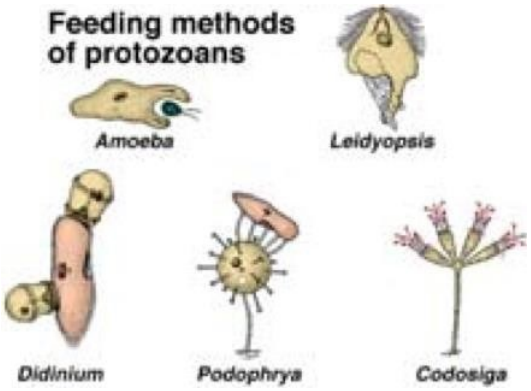


- Structures involved in locomotionare…
  - Cilia
  - Flagella
  - Pseudopodia
- They have structures involved in obtaining food andosmoregulation
  - Particularly Paramecium, which has a contractilevacuole
- There are various modes ofreproduction
  - **Asexual**
    - Fission
    - Budding
    - Cysts
  - **Sexual**
    - Conjugation
    - Syngamy

Nutrition

General

- **Autotrophic:** Able to synthesise their ownfood
- **Heterotrophic:** Obtain organic molecules synthesised by other organisms e.g. phagotrophs (ingest visibleparticles)
- **Saprozoic:** Ingests food in a solubleform



Reproduction

General

- **Asexual**
  - Fission
  - Budding
  - Cysts
- **Sexual**
  - Conjugation
  - Syngamy

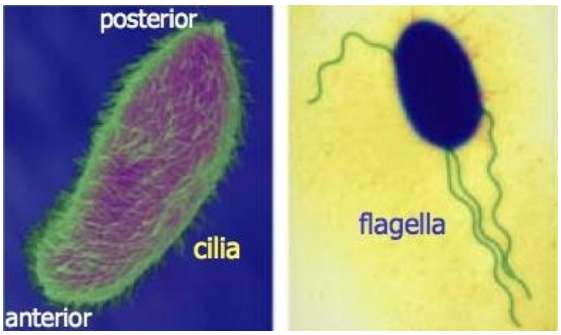
Sexual Reproduction

- Conjugation – the exchange of geneticmaterial
- Two Paramecium come into contact on the oralsurface
- Increases geneticvariation

Movement

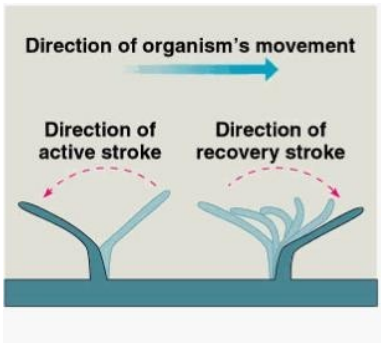
General

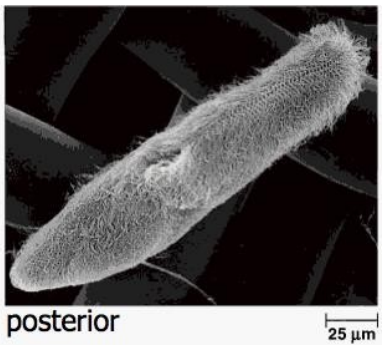
- Protozoans move **chiefly by cilia/flagella/pseudopodia**
- Cilia create water currents for feeding/respiration, and are also responsible for food handling/reproduction/excretion/osmoregulation
- There are **no morphological differences between cilia andflagella**
  - Cilia are **hair-like**
  - Flagella are**whip-like**

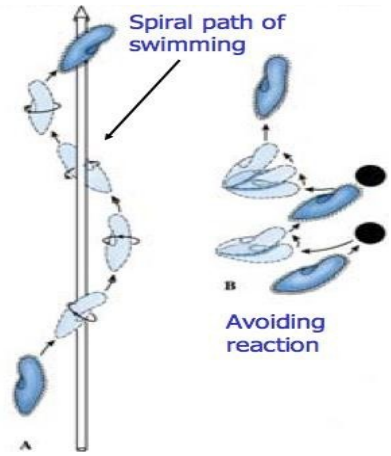


Movement of Cilia

- Consists of a **power stroke and returnstroke**
- A Paramecium will know when to change direction when the **electrical potential changes across itsmembrane**
  - Attraction – increases the rate of the forward ciliarybeat
  - Avoiding reaction – results in ciliary reversal and backwardswimming

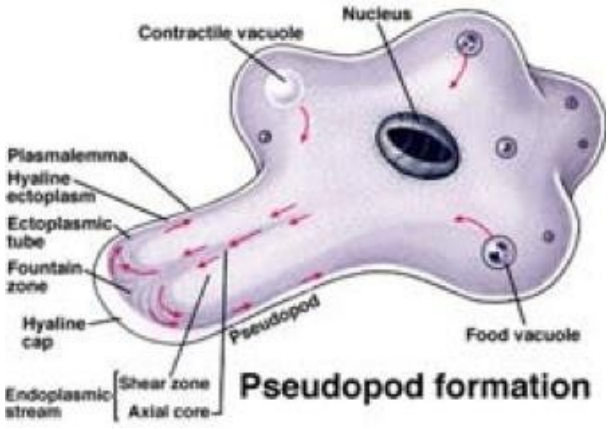


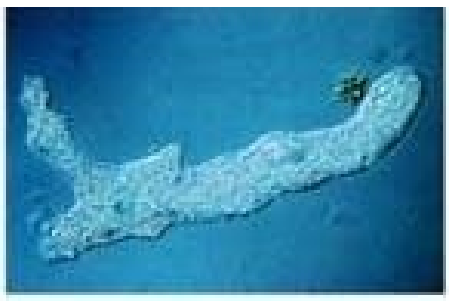




MovementofPseudopodia

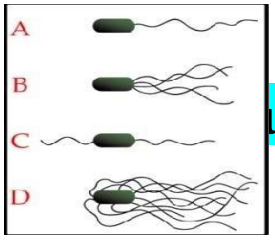
- "Pseudo" =False
- "Podia" =Foot
- How do pseudopodiawork?
  - **(1) Blunt extension** of cell body forms (lobopodia = broad thickpseudopodia)
  - **(2) Hyaline cap forms** (extension of theectoplasm)
  - **(3) Endoplasm then flows into the hyalinecap**
  - **(4) Hydrostatic pressure forces endoplasm towards the hyaline**cap





Movement of Flagella

- Simpleundulatio ns



ıum

General

- Representativeciliate

- **Slippershaped**
- **Anterior – blunt**
- **Posterior –pointed**
- Oral groove – depression on ventral side with cytostome(mouth)
- Trichocysts – thread like strands that can bedischarged
    - What is the function of atrichocyst?
    - May be a **defence mechanism or used for anchorage whilefeeding**

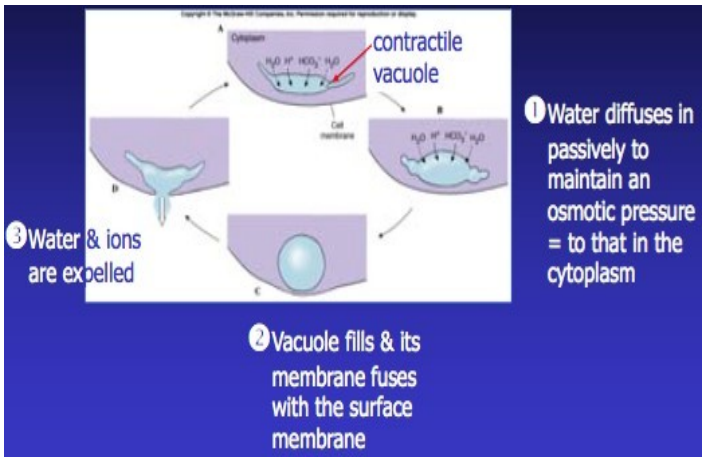
Osmoregulation

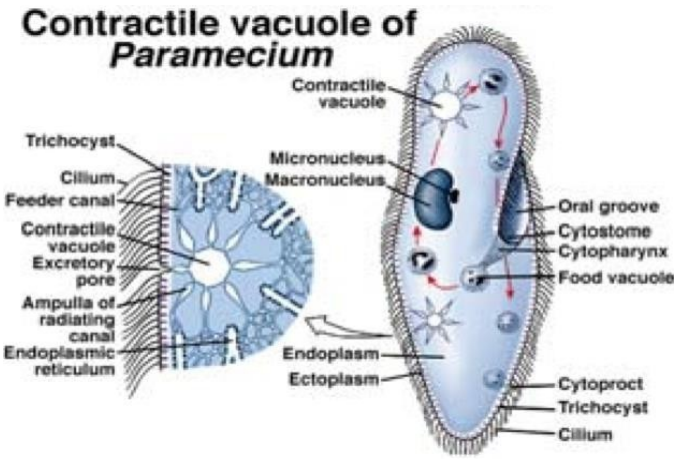
General

- Vacuoles observed incytoplasm
- **Contractile vacuoles function in osmoregulation** (water balance) – **mainly in freshwater protozoans**
- **Remove excess water** that's entered the cytoplasm byosmosis
- Vacuoles are made of a system of cisternae andtubules
- Proton pumps in their membranes transport hydrogen and co-transport bicarbonate into the vacuoles

Contractile vacuole work to remove excess water in a three-stage process

(1) **Water diffuses in passively to maintain an osmotic pressure** = to that in thecytoplasm
(2) Vacuole fills & its membrane fuses with the surfacemembrane
(3) Water & ions areexpelled





Digestion

General

- **Engulfed in a food vacuole** – intracellular membrane boundvesicle
- **Lysosomes – small vesicles containing digestive enzymes, fuse with foodvacuole**
- Undigested material released to outside – exocytosis Most ciliates / flagellates – a definite mouth structure(cytostome)
- Amoeba – release can occur across almost any point alongmembrane

Excretion

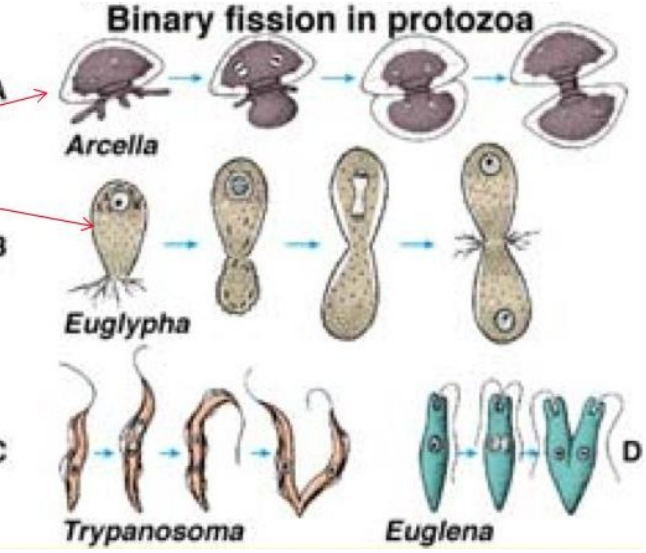
General

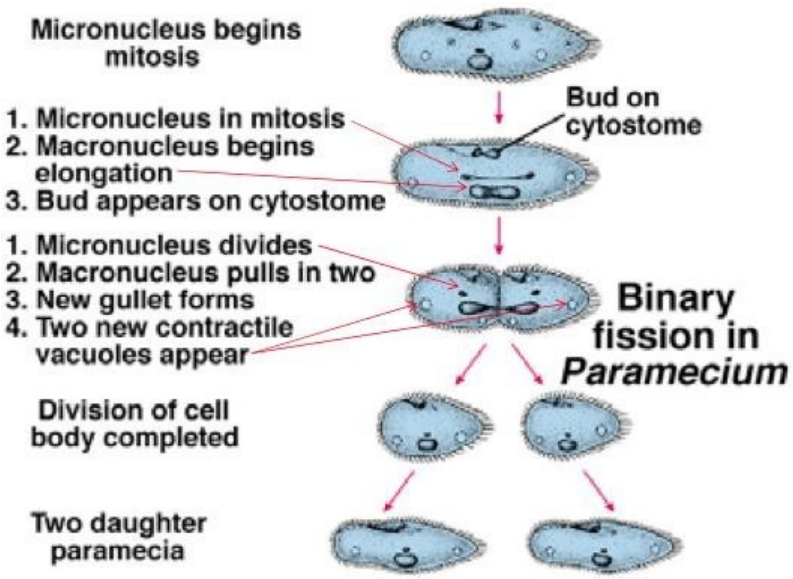
- Metabolic wastes – entirely bydiffusion
- Main end product of nitrogen metabolism is ammonia – readily diffuses across cellmembranes

Reproduction

Fission

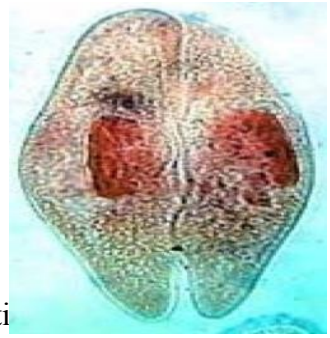
- Multiplication of cells that produces moreindividuals
- Most common is binary fission – produces 2 identicalindividuals
- Nucleidivide





Sexual Reproduction

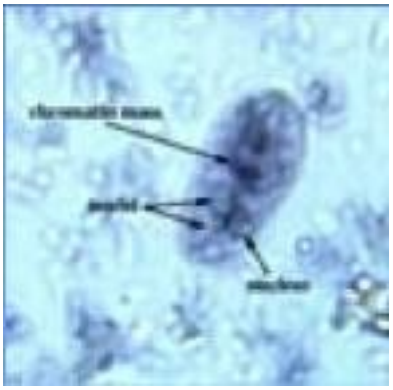
- No embryodevelopment
- **Sexual reproduction iscommon**
- Essential features of sexual reproductioninclude…
  - Reduction in chromosome number tohalf
  - Development of sex cells(gametes)
  - Fusion of gametenuclei



Encystment & Excystment

- Some protozoans form cysts to survive in harshconditi

- Parasitic forms – survival between hosts – produce a protective outer coatinge.g. Giardialamblia
- Common in soil and freshwater inhabiting species, rare to absent in marineenvironments



Giardia lamblia
Late cyst in freshwater, waiting for a host

Giardia lamblia
Trophozoite, feeding stage, in mammalian gut

Sub-Phylum Kinetoplasta

General

- Parasitic – most important protozoan parasites are**kinetoplastans**
- Some nonpathogenic others produce severe disease in humans and animalse.g. Trypanosoma
    - T. brucei rhodesiense – **causes African sleepingsickness**
        - Transmitted by Tsetsefly
        - Doesn't affect the antelope and other wild mammals that carry theparasites
    - Trypanosoma cruzi – Chagas disease in humans – 'An adult "kissing bug", the most common species (Triatoma rubida) – vector of Chagasdisease

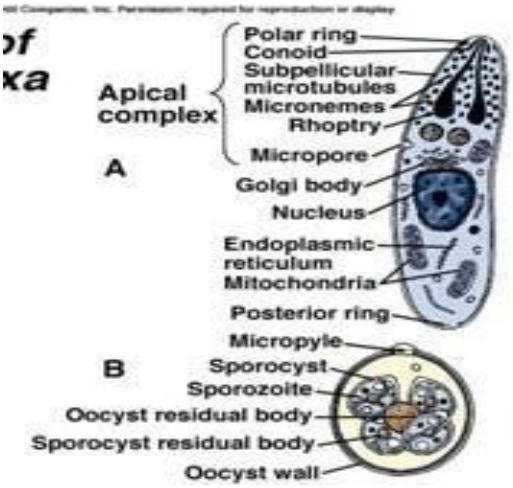
African Sleeping Sickness

- Wild game in Africa –trypanosomes
- Fly bites wild mammals then bites human – probably not the actual cause ofinfection
- Multiply in number inblood
- Invade tissue – fluid around spinal fluid andbrain
- Person losesconsciousness

Phylum Apicomplexa

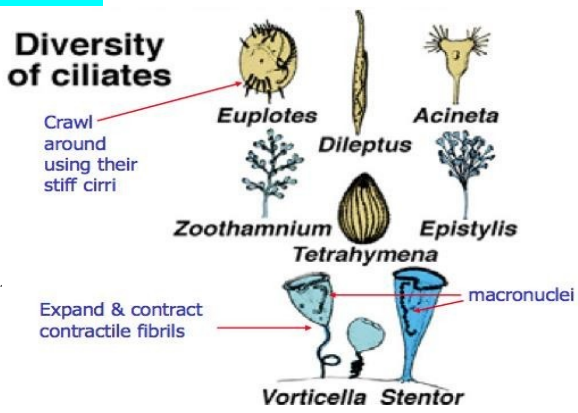
General

- Endoparasites
- Group of organelles, the apicalcomplex
- Locomotor organs lessobvious
- At some point in life cycle – sporedevelops
- Often life cycle with sexual and asexualstages
- Invertebrate intermediate host included incycle
    - Example: Plasmodium sporozoan parasite which causes malaria, vector is the mosquito



Female Anopheles injecting sporozoites of Plasmodium spp. that migrate to theliver

Phylum Ciliophora



General

- Have cilia
- Structurally complex anddiverse
- Free-living, commensal, orparasitic
- Have apellicle
- Multinucleate
- Macronucleus for metabolic, developmentalfunc
- Micronucleus for sexualreproduction

Reproduction

- Binaryfission
- Conjugation
- Self-fertilization (autogamy) – similar to conjugation but no exchange ofnuclei

Amoebas

General

- Locomotion and feeding **bypseudopodia**
- Inhabit diverse moistenvironments
- **Most areomnivores**
- Nucleus, contractile vacuole, food vacuoles easy tosee
- Few endoparasitic e.g. Entamoeba histolytica causes amoebicdysentry
- Not all are naked – some have protective tests(shell)