

Biological Diversity
BSCI 10110-1
MWRF 1:10-2:00
Dr. Mark Kershner

Week 6

10/5

Ebola – hemorrhagic fever

- fruit bats
- spread in saliva of fruit bats
- chimpanzee, mountain gorilla, duiker
- spread to humans due to poaching

Amoeba

- Acanthamoeba polyphaga*
- can be infected by largest know virus
 - mamavirus
 - creates virus factories
 - inside mamavirus were “Sputniks” (viruses inside the virus)

-Sputniks

- injected into an amoeba
 - had no effect on amoeba
 - did not replicate
- next tested whether Sputniks were replicating within mamavirus
 - yes → virophage
- Sputniks – harmed mamavirus
 - led to deformed viral particles
- amoeba growth increased with Sputniks
 - decreased energy use by mamavirus
- 3-fold decrease in amoeba lysis
- 70% fewer infective particles in amoeba cultures

Prions – simple proteins – misfolded

- much smaller than viruses
- have no genome
- Fig 27.10
 - normal prion protein and misfolded prion protein
 - the two prion proteins touch and produce only misfolded
 - accelerated rate of change in protein shape
 - accumulates on neurons, changes them
 - transmissible spongiform encephaliopathies
 - chronic wasting disease
 - deer, elk
 - cattle → mad cow disease
 - sheep → scrapie
 - can pass to humans . . .
 - Creutzfeldt-Jakob disease

Kuru – cannibalistic ritual

- Papuan New Guinea

- significant cluster of Creutzfeldt-Jakob disease

 - prions can lay dormant for decades

 - decline since 1950s – fewer people are partaking in ritual

- cattle/deer

 - deer get it from picking on carcasses

 - cattle were fed bonemeal

 - from bones, offal (innards)

 - grind it up

 - bonemeal → added to cattle feed

 - become infected → people consume this beef

 - infected – spongiform encephalopathy in humans

Prion (protein) → PrP^c (normal form) or PrP^{sc} (misfolded form)

Number of cattle infected increased from 1985, peaking in 1990, and dropping in 1995

- drop due to cattle death

 - disease

 - slaughtering

- became unlawful to feed cattle in this fashion in England

- by 1999 → 163 dead humans in England and 37 from elsewhere

 - approximately 460-480 thousand cattle (likely infected) that entered the human food chain

10/7

How are certain viral diseases transmitted?

- Ebola

 - gorillas, chimps, duikers → humans (through poaching/hunting)

 - sampled invertebrates and vertebrates to identify reservoir

 - fruit bats spread it through discarded fruits

- SARS (severe acute respiratory syndrome)

 - passed between people through respiratory passage

 - originally tracked to civets (cat-fox) → passed to humans through respiratory or bodily fluids

 - primary reservoir was nocturnal bats (passed to civets or passed directly to humans)

 - food source

- Hantavirus

 - rodents (deer mice, chipmunks) → humans (through feces, dried urine)

- Prion proteins

 - normal form and misfolded form

 - differ in shape

 - when misfolded touches a normal, the normal gets converted

 - misfolded accumulates along nerve cells and damages the cells

Prokaryotes (Chapter 28)

- domains bacteria and archaea
- simplest, oldest life forms
 - filaments, linked rods fossil
- approximately 3.5 billion years old
- 2 billion years ago – O₂ appears
- microfossils
 - evidence of lipid molecules
 - C fixation
 - inorganic C → organic C

Prokaryotes vs. Eukaryotes

-Prokaryotes

- “before nucleus”
- 1. all single-celled
 - filaments, colonies
- 2. small cells
 - 1µm – 1/1millionth of a meter
- 3. circular DNA
 - one large genome
 - few small plasmids
 - small rings of genetic information
 - not part of genome
 - horizontal gene transfer
- 4. cell division → binary fission
- 5. no nucleus
 - no membrane-bound organelles
 - no compartmentalization of internal area

-Eukaryotes

- “true nucleus”
- 1. multicellular, some unicellular organisms (protists)
- 2. larger cells
 - at least 10 times larger than prokaryotes
- 3. linear DNA
 - directly associated with the chromosomes
- 4. cell division → mitosis
 - complex process by which chromosomes are pulled to opposite sides (poles) of a cell prior to division occurs
- 5. nucleus
 - membrane-bound organelles
 - compartmentalization

10/8

Prokaryote vs. Eukaryotes (continued)

-Prokaryotes