Prions & Viroids

The Coming Plagues
Info you need:

• Prion and viroid structure
• What they attack?
• Why they are important—beneficial or detrimental?
• Examples of diseases they cause (some of each)
Viroids and Prions

• Viruses are not the simplest form of infectious particles

• Both viroids and prions are simpler & cause diseases
Viroids Vs. Prions

• Viroids only attack plants
• RNA but no protein coat
• Can be passed by pollen, farmers, insects
• Cause millions $ in damages to crops/year

• Prions attack animals
• Small infectious proteins
• Hereditary, and can be passed through certain medical procedures, food etc
• Cause degenerative nervous system diseases
Viroids & Prions

- Viroids cause crop damage
- Cucumber pale fruit disease, avocado sunblotch
- Nearly wiped out the Chrysanthemum industry in US in 1950’s
- Loss of 10 million coconut trees in the Phillipines

- Cause mad cow disease (BSE)
- Mad Mink
- Scrapie
- Kuru
- Creutzfeldt-Jakob disease
- vCJD
Viroids — about 33 species identified

Avocado sunblotch

Cucumber flowers (hop stunt viroid)

Red pepper mild mottle
Scrapie
Cause and Effect of Mad Cow

Normal prion structure and abnormal one

Diseased cow with affected walk/gait
More about Mad Cow and TSE

• Mad Cow -- aka BSE, or bovine spongiform encephalopathy -- is an infectious disease carried by an abnormal protein. BSE is one of the TSEs, which stands for "transmissible spongiform encephalopathy."

• Mad-cow epidemic has killed about 140 Britons since 1995. By 2010, 184,500 British cows were confirmed. Sharp drop from 1000/week in 1993 to only 11 cases in 2010.
Other TSE Diseases

Transmissible Mink Encephalopathy

Chronic Wasting Disease of Deer and Elk
More about TSEs

- TSEs cut holes in the brains of animals they attack, making them look like sponges.
- TSEs are incurable and always fatal.
Regions of the brain affected by TSE

Major Regions of the Human Brain Affected by TSE:
- Cerebrum
- Thalamus
- Spinal Cord
- Cerebellum

Affected Regions:
- CJD
- vCJD
- Kuru
- GSS

FFI
Diagnosis of Prion Disease

- Diagnosis of a prion disease can only be made upon autopsy.

CJD, with the characteristic spongiform appearance at arrows is shown on the right.
References

Great article on Mad Cow disease

- [http://whyfiles.org/193prion/](http://whyfiles.org/193prion/)
- [http://whyfiles.org/193prion/](http://whyfiles.org/193prion/)
- [http://www.hri.ac.uk/site2/research/path/virus/Tswv.jpg](http://www.hri.ac.uk/site2/research/path/virus/Tswv.jpg)
- [http://fred.cambridge.ma.us/~elg/TSE.html](http://fred.cambridge.ma.us/~elg/TSE.html)