

PRIONS, VIROIDS & VIRUSOIDS

College Presentation

Topic: Microbiology / Virology

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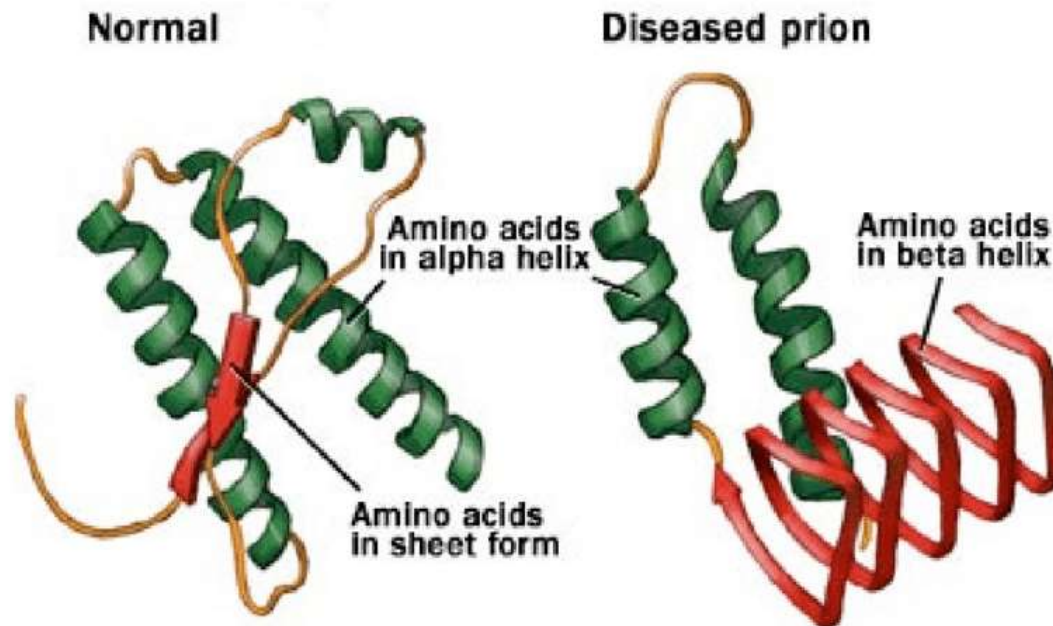
Semester: 1st

INTRODUCTION

- Prions, viroids, and virusoids are sub-viral infectious agents.
- They are simpler than viruses but can cause serious diseases.
- Understanding them is important in virology, medicine, and agriculture.

PRIONS

- Definition: Infectious proteins with no DNA/RNA.
- Discovered by Stanley B. Prusiner (1982, Nobel Prize).
- Nature: Abnormal folding of brain protein (PrP → PrPSc).
- Key Point: Protein-only hypothesis.



PROPERTIES OF PRIONS

- - No nucleic acids
- - Extremely resistant to heat, radiation, and chemicals
- - Cause slow neurodegenerative diseases

DISEASES CAUSED BY PRIONS

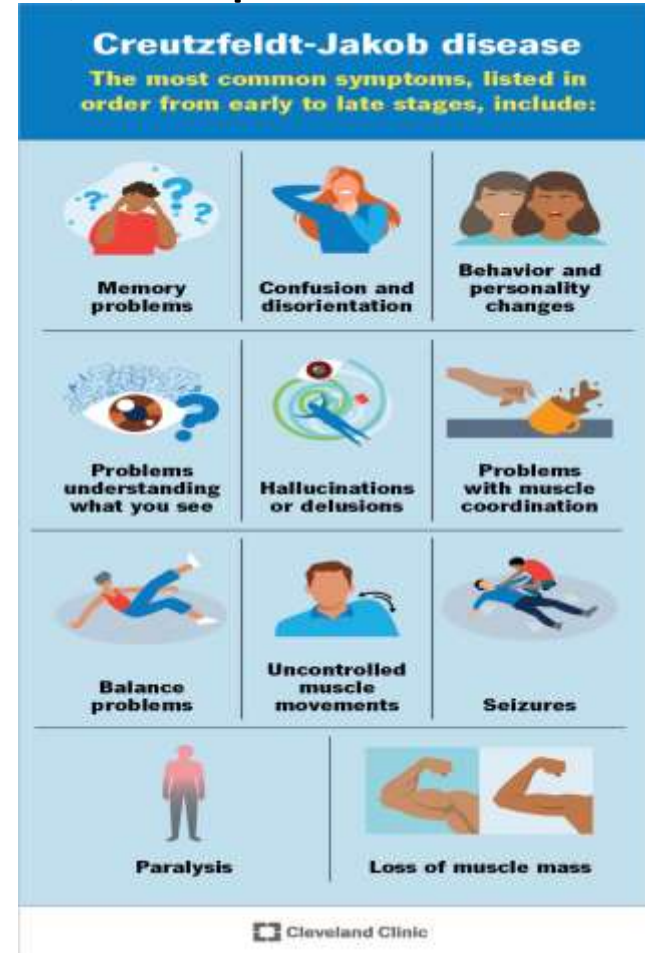
- In Humans: CJD, Kuru, Fatal Familial Insomnia
- In Animals: Mad Cow Disease, Scrapie



- Scrapie



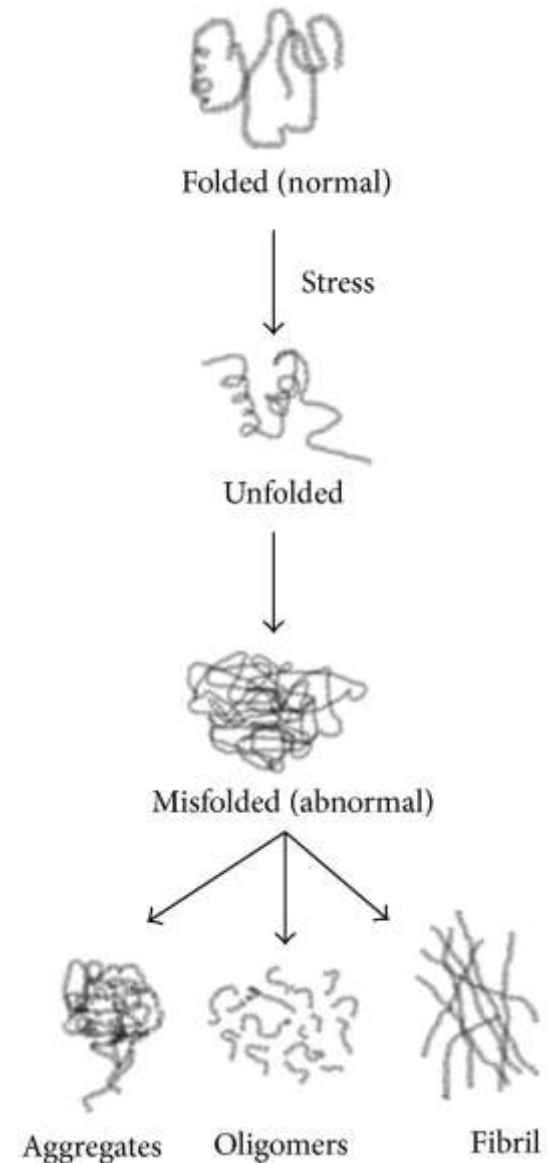
- Mad cow disease



CJD: Creutzfeldt-Jakob disease

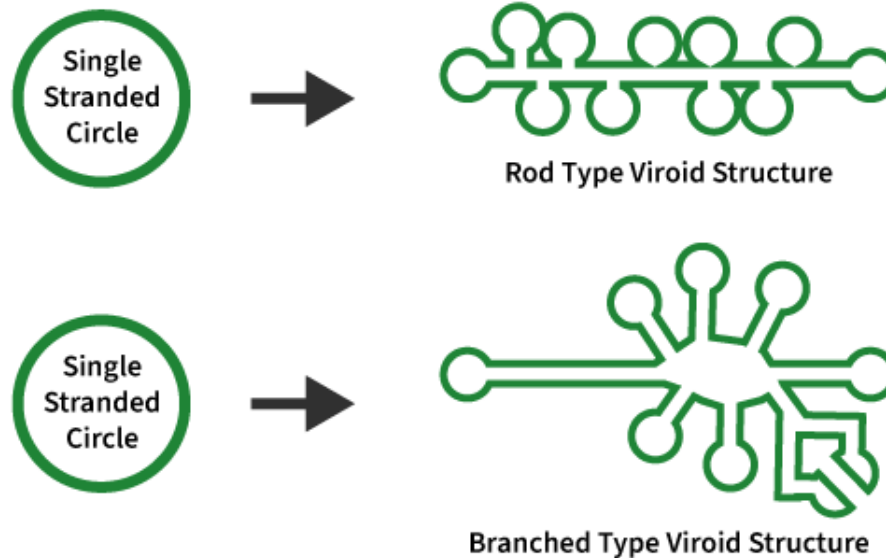
MECHANISM OF PRION INFECTION

- 1. Normal protein (PrPC) exists in the brain.
- 2. Misfolded prion (PrPSc) enters.
- 3. PrPSc induces misfolding of PrPC.
- 4. Accumulation leads to brain damage.



VIROIDS

- Definition: Infectious agents made of small, circular RNA molecules.
- Discovered in plants by Theodor Diener (1971).
- No protein coat, no proteins produced.
- Replicate inside host nucleus or chloroplast.



DISEASES CAUSED BY VIROIDS

- Potato Spindle Tuber, Citrus Exocortis, Coconut Cadang-Cadang, Tomato Apical Stunt

Potato spindle tuber viroid EC listed disease



Small, elongated, spindle or dumb-bell shaped tubers caused by *Potato spindle tuber viroid*.

VIRUSOIDS

- Definition: Circular ssRNA molecules similar to viroids, but dependent on a helper virus for replication.
- They are considered satellite RNAs.
- Example: Found in association with certain plant viruses.
- Cannot infect alone – require a helper virus.
- Disease caused by virusoids:
- In Humans:
- Hepatitis D(Needs Hepatitis B Virus.

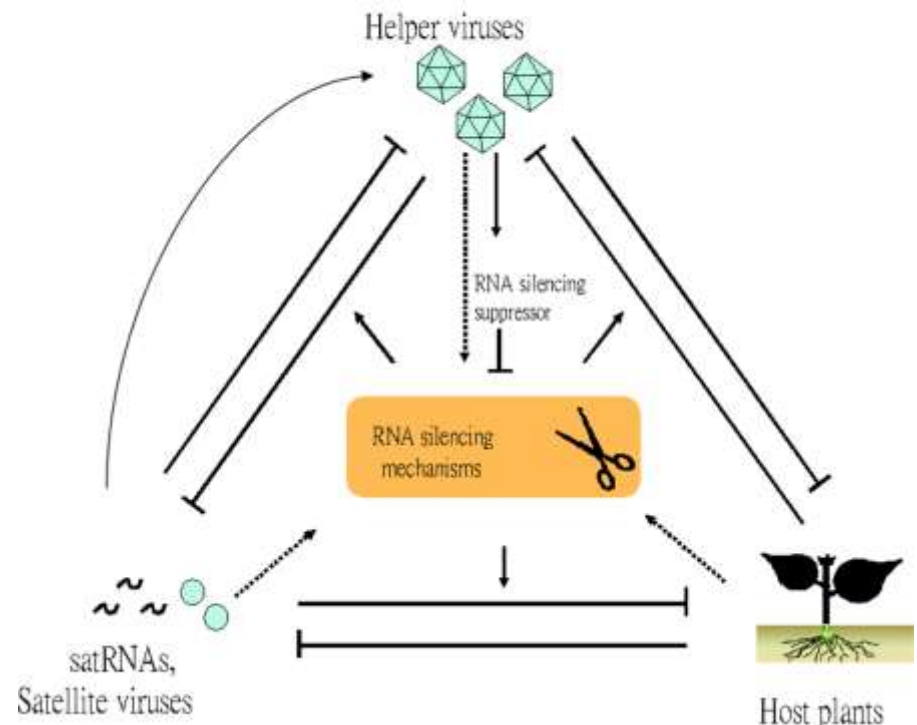
In Plants:

- Subterranean Clover Stunt

IN SHORT:-

Virusoids alone= no virus

With helper virus=can cause or worsen
Disease.



Differences Between Prions, Viroids & Virusoids

Feature	Prions	Viroids	Virusoids
Nature	Protein only	RNA only	RNA (satellite)
Nucleic acid	Absent	Present (ssRNA)	Present (ssRNA)
Protein coat	Absent	Absent	Need helper virus coat
Hosts	Animals/Humans	Plants	Plants (with helper virus)
Diseases	Neurodegenerative	Plant diseases	Plant diseases (with helper virus)

Conclusion

- Prions, viroids, and virusoids are the simplest infectious agents.
- They challenge our definition of life.
- Important in medicine (prions) and agriculture (viroids & virusoids).
- Show how misfolded proteins can spread by templating, important in understanding Alzheimer's & Parkinson's too.
- Taught us about protein folding and stability, and why misfolding is dangerous.[PRIONS]
- Useful in RNA biology research, like how RNA can fold and interfere with gene expression.[VIROIDS]
- May serve as tools in biotechnology (gene silencing, RNA interference studies).[VIRUSOIDS]

References

- - Textbook of Microbiology (Tortora et al.)
- - Nobel Lecture by Stanley Prusiner (1997)
- - Diener TO, Science (1971)



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