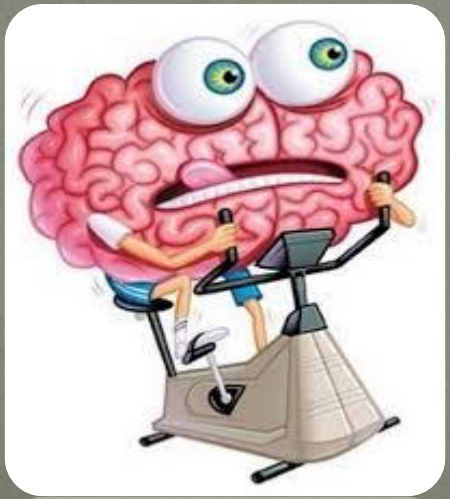
The Brain Eater



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What is Creutzfeldt-Jakob disease?

- Creutzfeldt-Jakob disease is a degenerative brain disorder that leads to dementia and, ultimately, death.
- Symptoms of Creutzfeldt-Jakob disease (CJD) sometimes resemble those of other dementia-like brain disorders.
- Creutzfeldt-Jakob is rapidly progressive.

CJD vs. Control

History of CJD

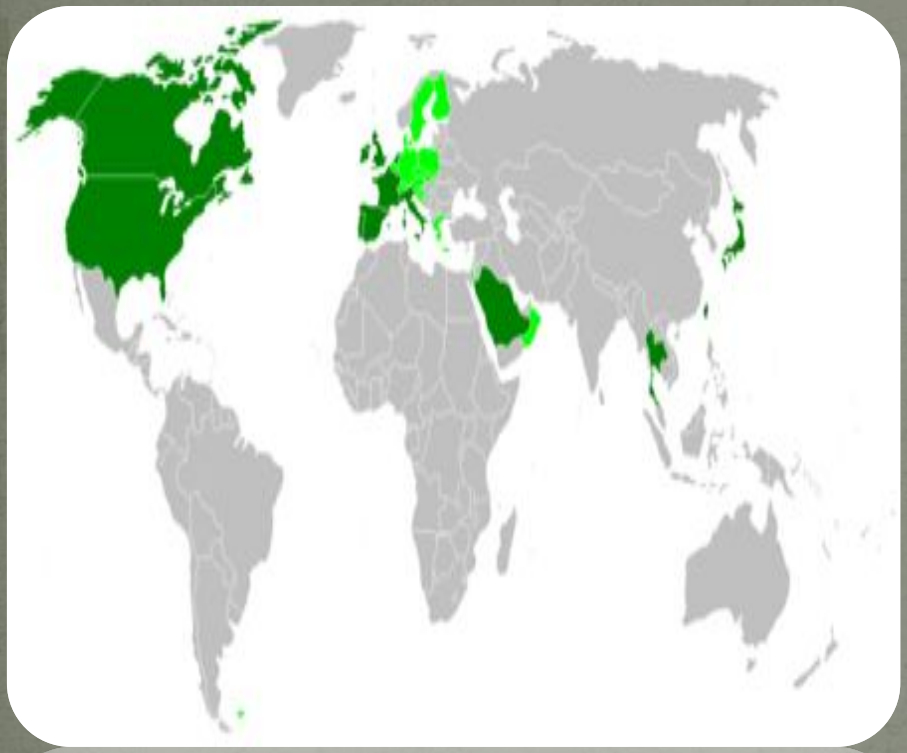
- Hans .G Creutzfeldt first described the disorder in 1920.
- In 1921 Alfons M. Jakob described 4 cases with 2 resembling what today is referred to as CJD.

- In 1974, a case iatrogenic CJD was reported via corneal transplantation.

History of CJD

- In 1985 there were reported cases of spread through contaminated human derived growth hormone.

Epidemiology



- Annual incidence rate of Creutzfeldt-Jakob disease (CJD) is approximately equal to one per million
- May be underestimated.
- More common in individuals above 60 years.
- vCJD is more prevalent in younger individuals.
- Average life span after onset of symptoms is 4 months.

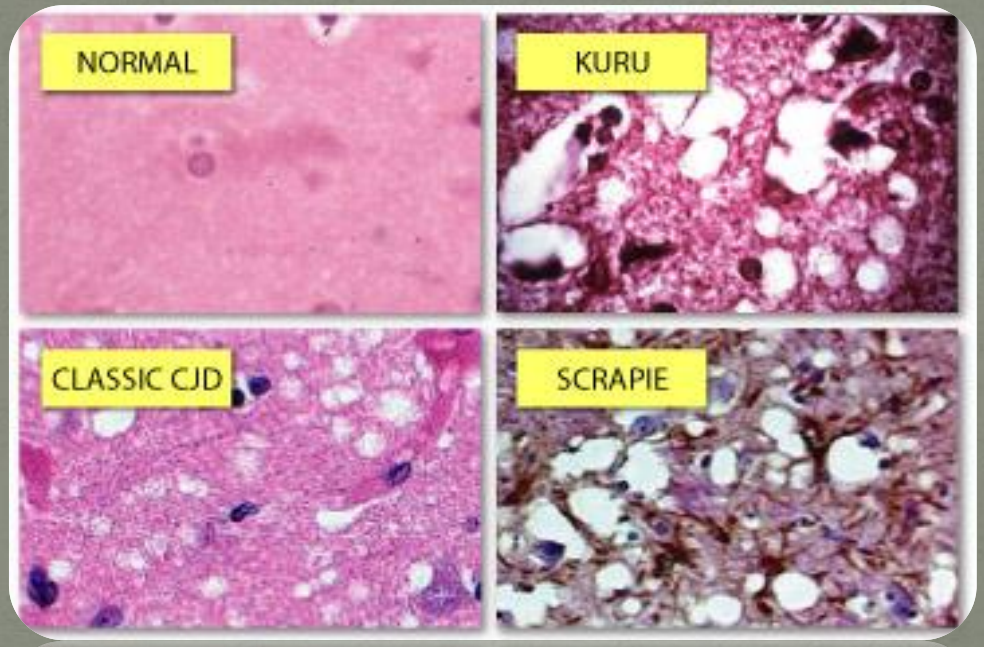
Classification

Forms of CJD

Form	Cause	Distinguishing Features
Sporadic/ Classical	Unknown	Affects mainly over 50s. S/S: Ataxia, dementia, spongiform changes, rarely plaques. Short course.
Familial/ Infectious	Inherited mutation in the PrP gene	Younger age of onset than sCJD, symptoms similar to sCJD, longer course.
Iatrogenic	Contamination during brain surgery, corneal transplant, dura mater grafts	Age dependant on the exposure source. Clinical and pathological symptoms indistinguishable from sCJD.
Variant	Exposure to BSE	Younger age of onset, longer duration of symptoms. Psychiatric signs present. Distinctive daisy plaques seen.

Etiology

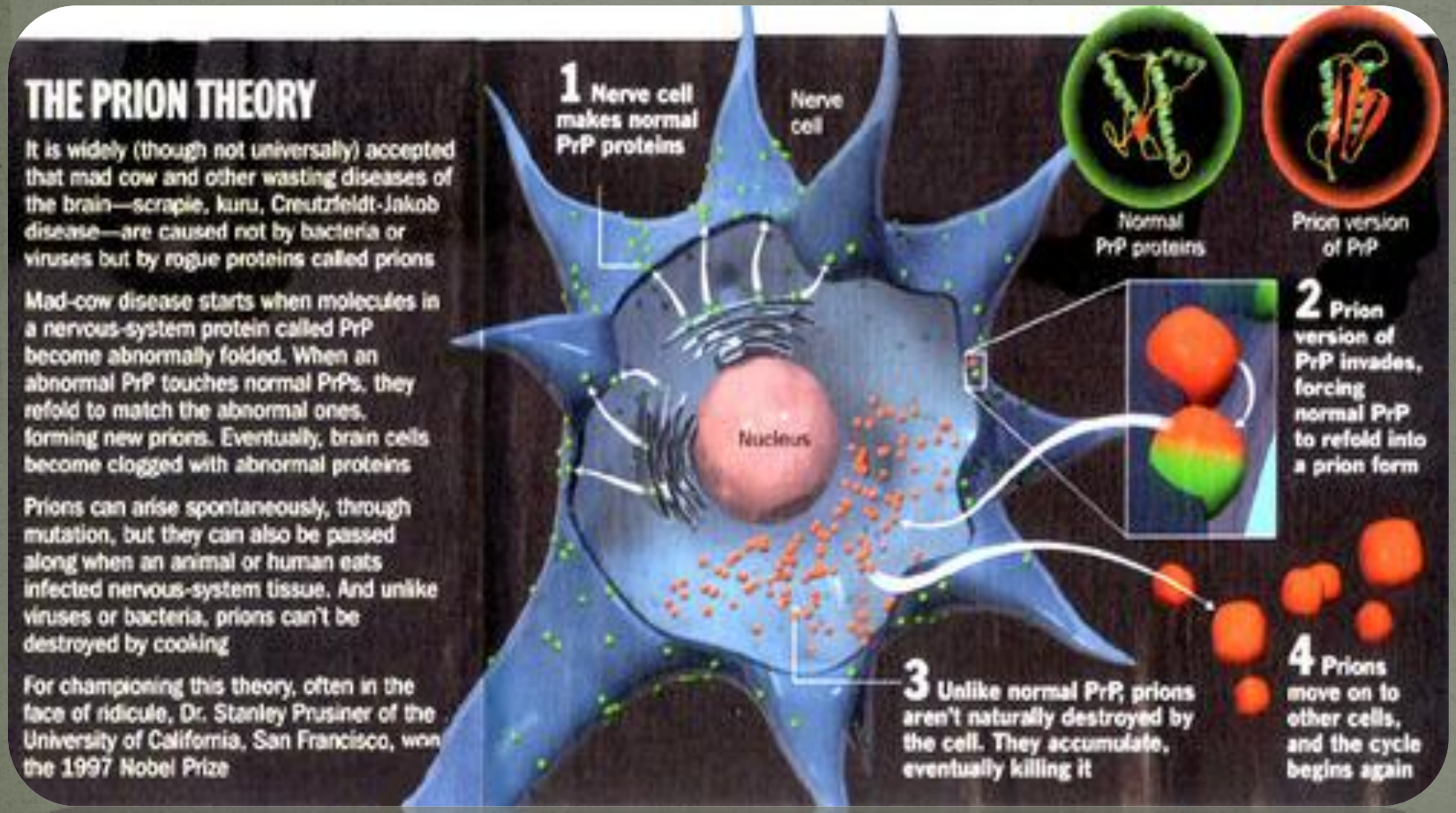
- CJD belongs to a broad group of human and animal diseases known as transmissible spongiform encephalopathies (TSEs).



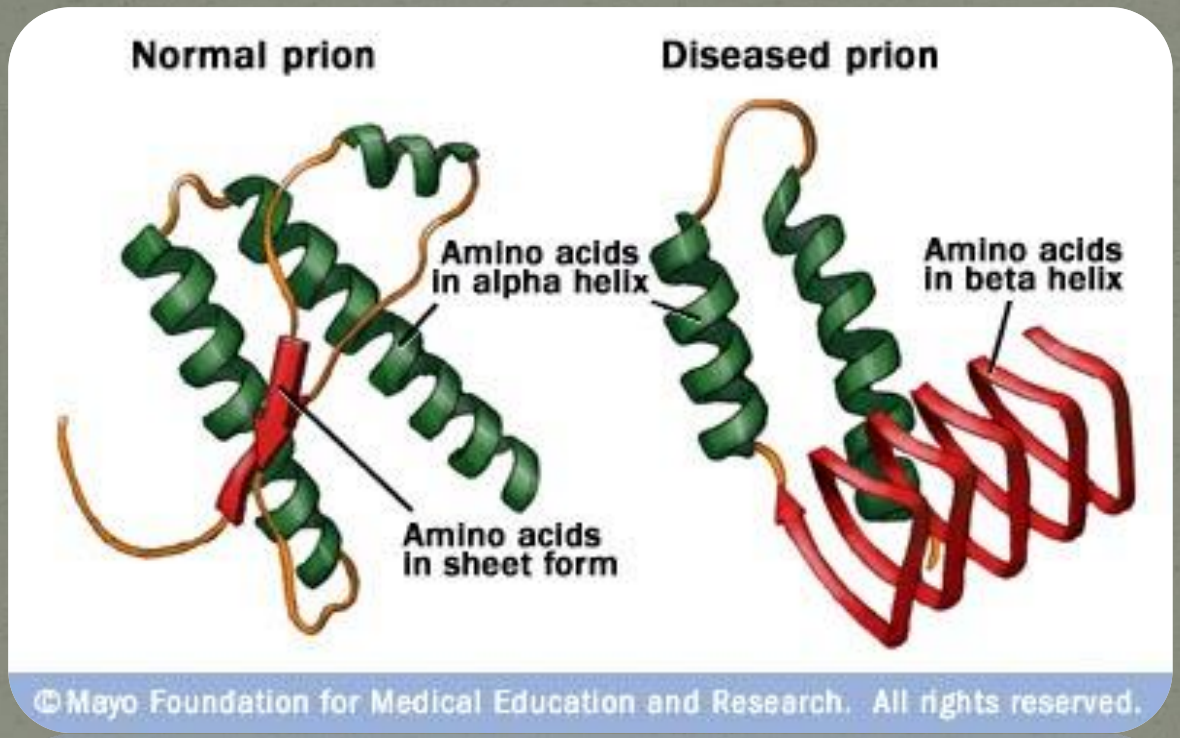
Etiology

- The causative agent of this disease is an abnormal protein known as a prion.
  - Prions were first discovered in the 1960's by radiation biologist Tikvah Alper and the mathematician John Stanley Griffith.
  - Prions are proteins with an abnormal fold known as an amyloid fold.
  - They have very stable structures in the form of beta pleated sheets.
  - Prions do not multiply in the host organism that they infect.

Prion theory



Prion


Normal prion
Diseased prion
Amino acids in alpha helix
Amino acids in sheet form
Amino acids in beta helix
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Transmission

- Sporadic CJD- very rare and occurs due to mutation of an individual's own normal proteins
- Variant CJD- acquired from using contaminated human growth hormone or consuming contaminated meat (bovine or human).
- Familial CJD- inheritance of a mutated gene for PrP.
- Iatrogenic- through contaminated surgical sources.

Pathogenesis

- A distinctive protein isoform of prion protein, PrPSc is present in CJD CNS tissue.
- The normal variant of this protein is PrPC.
- PrPSc deposits in the CNS of CJD patients causing dysfunction, and in the presence of PrPSc, PrPC is converted to PrPSc.
- In the case of familial CJD, a mutated form of the prion protein gene appears to lead to prion protein deposition.

Pathogenesis

- This was tested in several experiments, the presence of a mutated prion protein gene as a transgene in mice was found to induce a spongiform neuropathology.
- This suggests that the mutant PrPSc is sufficient to produce disease.
- The pathogenesis of sporadic Creutzfeldt-Jakob disease remains unclear.
- It has been hypothesized that a spontaneous somatic change in conformation of prion protein in the CNS initiates the disease.

Pathogenesis

- A number of reports have been published that demonstrate the presence of prion-like elements in yeast.
- Experiments show that these elements lead to aggregation and amyloid formation of a protein.
- These studies suggest that prions as a cause of abnormal phenotypes may be more widespread than realized.

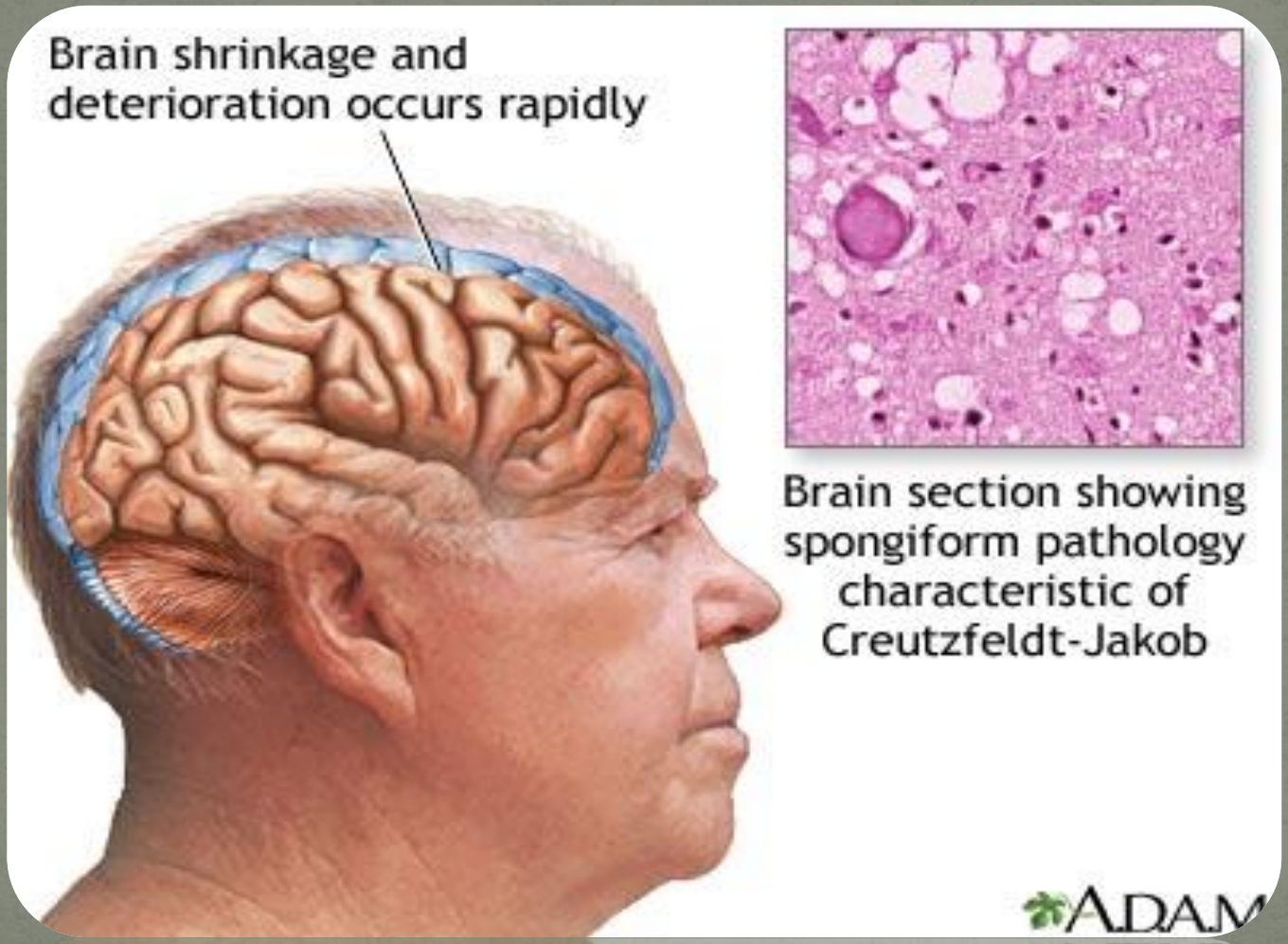
Pathogenesis

- Recently, misfolded proteins have been hypothesized to underlie a number of neurodegenerative diseases.
- These diseases may not be transmissible in the same way as the sub acute spongiform encephalopathies such as CJD are.
- However, they are assumed to affect the CNS in a prion like mechanism.
- In addition, the pathogenic proteins are also misfolded.

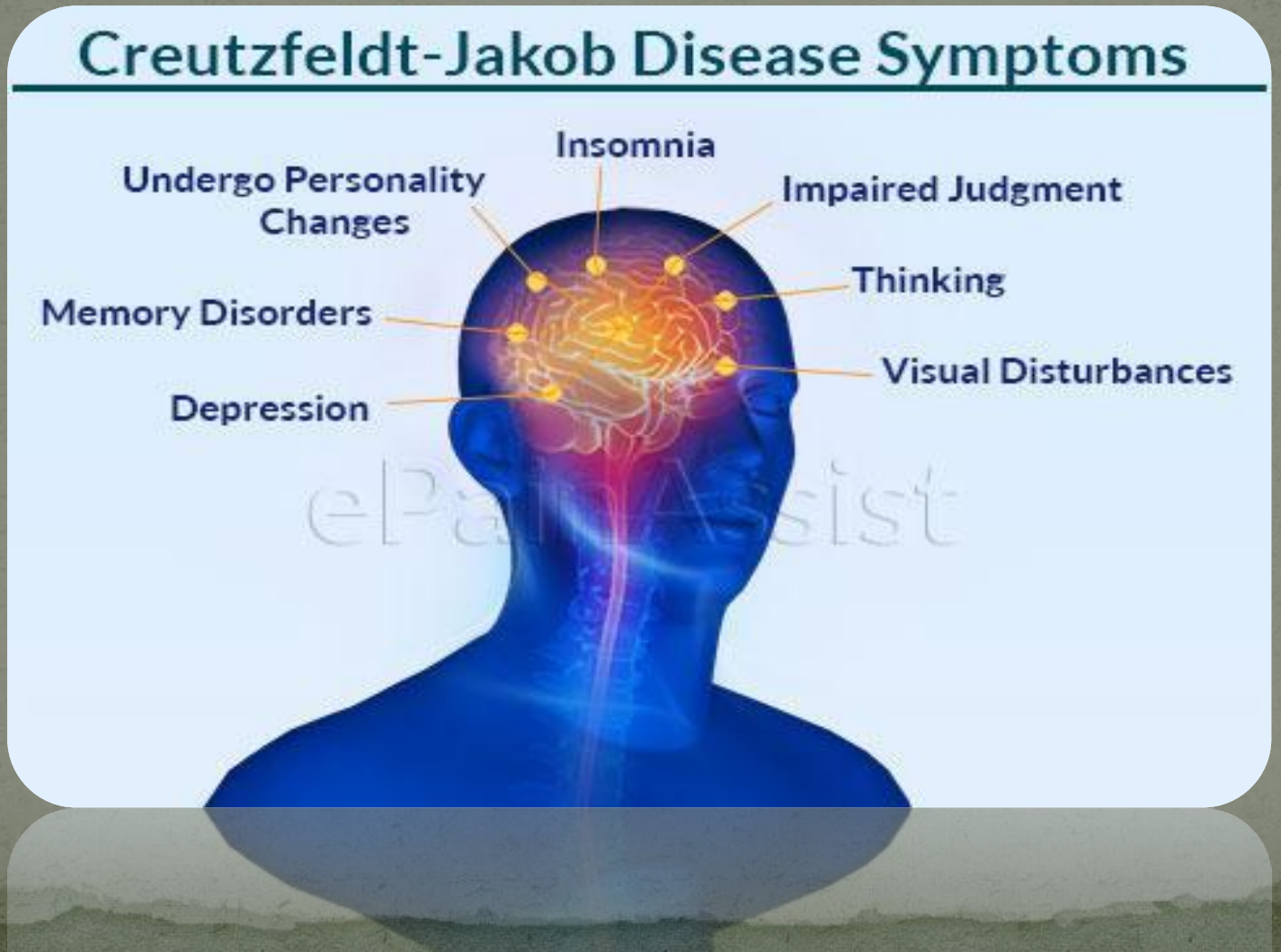
Pathology

- The pathologic condition is essentially degenerative with grossly evident cerebral atrophy.
- Microscopic findings are similar to those of other prion diseases with neuronal loss, astrocytosis, and the development of cytoplasmic vacuoles in neurons and astrocytes.
- Amyloid plaques that contain the abnormal PrP are found in the areas of infected tissue in most cases.
- There is no inflammation.
- The cortex and basal ganglia are most affected, but all parts of the neuraxis may be involved.
- Early lesions are more severe in the gray matter

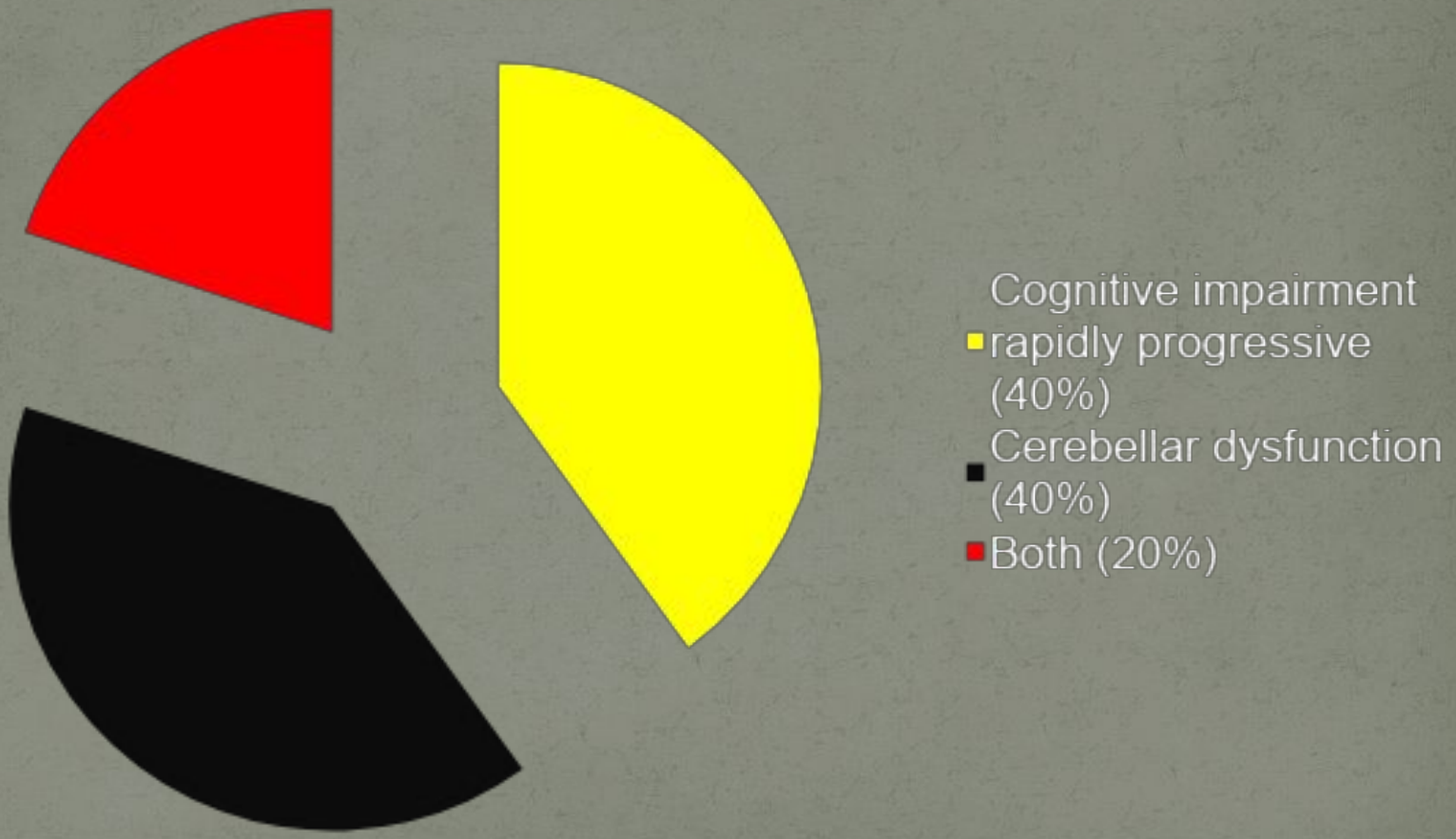
Spongiform pathology



Clinical Manifestations



Clinical Manifestations



Clinical Manifestations

- The clinical features include a gradual onset of dementia in middle or late life.
- Vague, prodromal symptoms of anxiety, fatigue, dizziness, headache, impaired judgment, and unusual behavior may occur.
- Once memory loss starts, it progresses rapidly, and other characteristic signs appear, sometimes abruptly.

Clinical Manifestations

- The most frequently seen signs, aside from dementia, are pyramidal tract disease
  - weakness
  - stiffness of the limbs
  - accompanying reflex changes
- Extrapyramidal signs
  - Tremor
  - rigidity,
  - Dysarthria
  - slowness of movement
  - myoclonus (often stimulus sensitive).

Clinical manifestations

- In advanced stages of the disease, patients have difficulties with movement, swallowing and talking.
- In the final stage, patients lose all mental and physical function and may lapse into a coma.
- Many patients die from an infection such as pneumonia.
- The average duration of disease from the onset of symptoms to death is four to six months.
- Ninety percent of patients die within a year.

Diagnostic Criteria CDC

- Sporadic

1. Diagnosed by standard neuropathological techniques; and/or immunocytochemically; and/or Western blot confirmed protease-resistant rP; and /or presence of scrapie-associated fibrils

Diagnostic Criteria CDC

2. Rapidly progressive dementia and at least two out of the following four clinical features:

- Myoclonus
- Visual or cerebellar signs
- Pyramidal/extrapyramidal signs
- Akinetic mutism

AND a positive result on at least one of the following laboratory tests:

- a typical EEG (periodic sharp wave complexes) during an illness of any duration; and/or
- a positive 14-3-3 cerebrospinal fluid (CSF) assay in patients with a disease duration of less than 2 years
- Magnetic resonance imaging (MRI) high signal abnormalities in caudate nucleus and/or putamen on diffusion-weighted imaging (DWI) or fluid attenuated inversion recovery (FLAIR).

Diagnostic Criteria CDC

- Iatrogenic

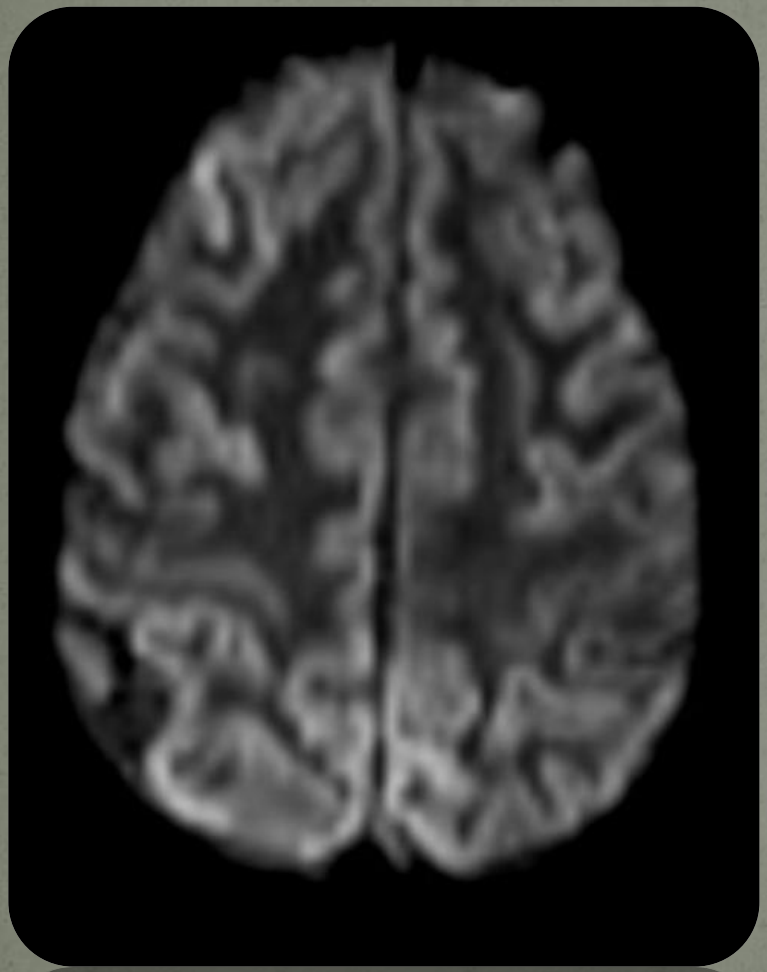
1. Progressive cerebellar syndrome in a recipient of human cadaveric-derived pituitary hormone
2. Sporadic CJD with a recognized exposure risk, e.g., antecedent neurosurgery with dura mater implantation.

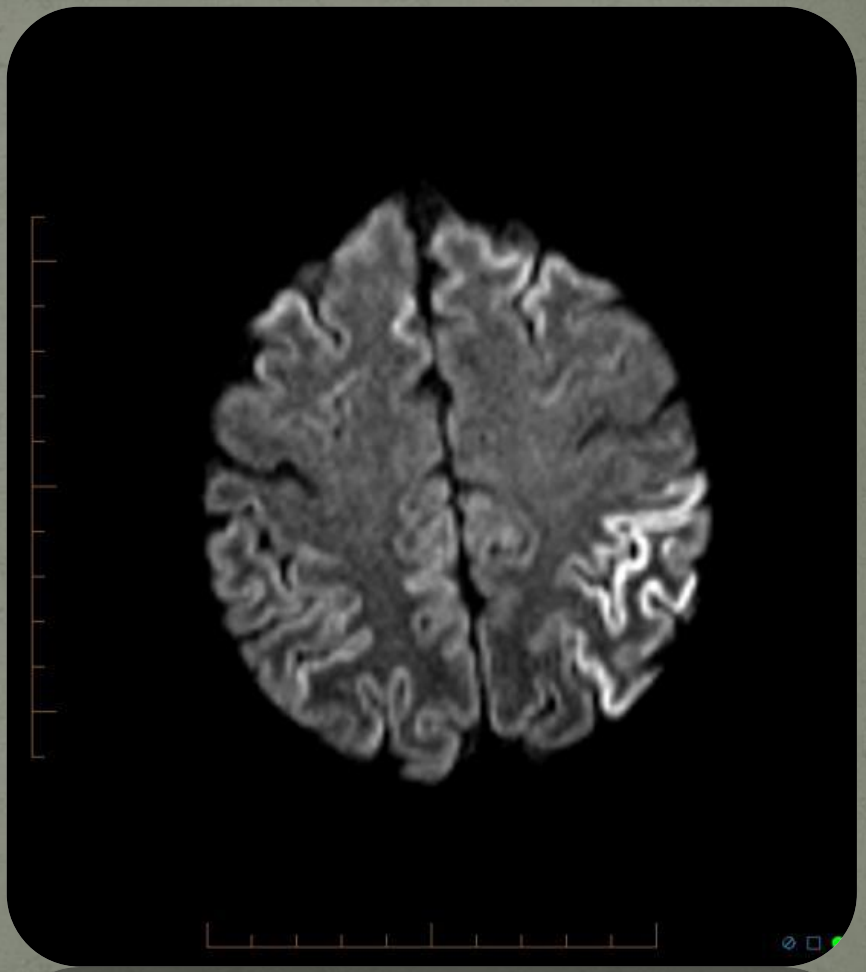
Diagnostic Criteria CDC

- Familial

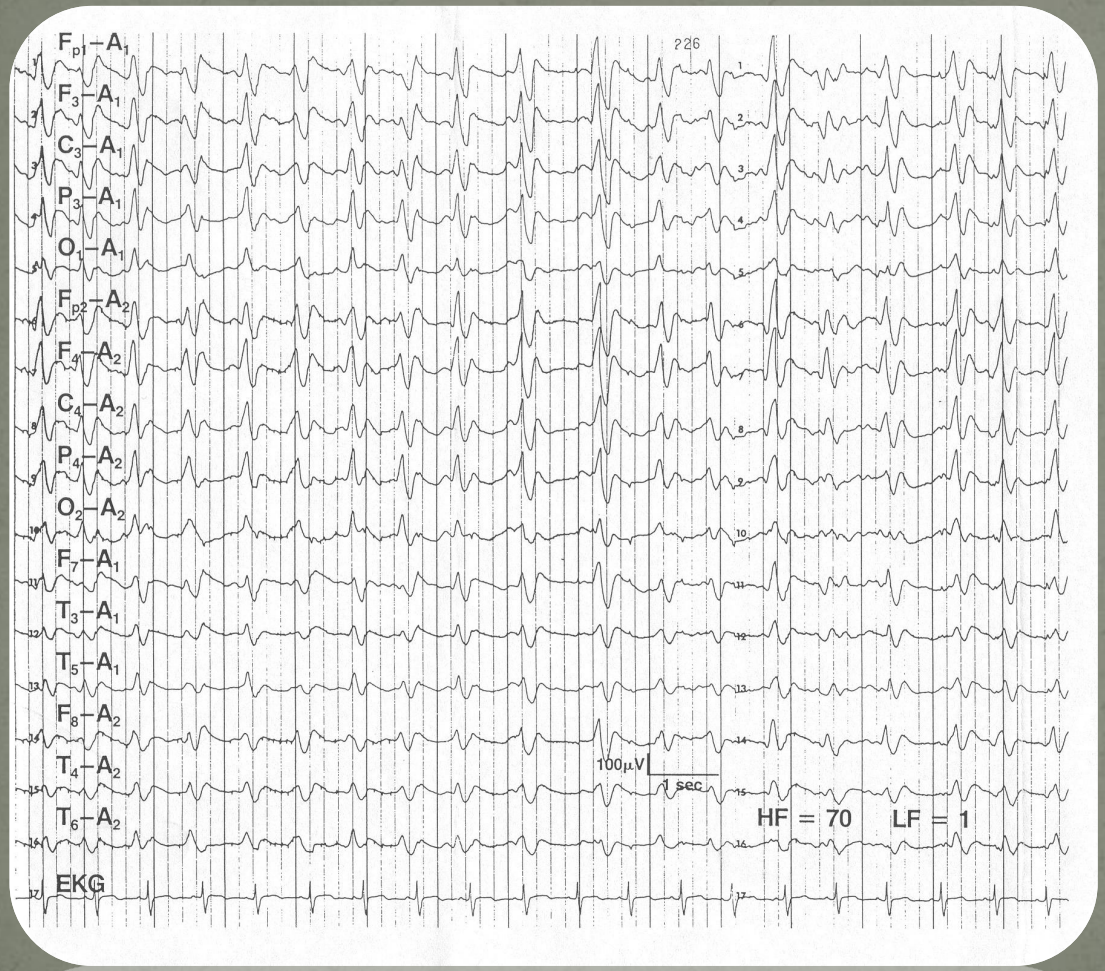
1. Definite or probable CJD plus definite or probable CJD in a first degree relative
2. Neuropsychiatric disorder plus disease-specific PrP gene mutation.

MRI (Sporadic)





EEG



- continuous periodic stereotypic 200- to 400-millisecond sharp waves occurring at intervals of 0.5-1.0 seconds.

Control

MANAGEMENT OF CASES

- No specific available treatment
- Patients should be excluded from blood, organ or other body tissue donations.
- Identify source of infection

MANAGEMENT OF CONTACTS

- Patients with potential exposure to CJD should be informed of their risk

Treatment Options

Symptomatic

- Antidepressents
  - Clonazepam
- Tremors
  - Sodium Valproate
- Pain
  - Opium based anaelgesics

Treatment on trial

- Pentosan polysulphate
  - Infused into the individual's lateral ventricle
  - PPS appears to slow down CJD's progression

References

- Appleby, B. S., & Zerr, I. (2012). Sporadic Creutzfeldt-Jakob disease Changes not only in the brain?. *Neurology*, *79*(10), 965-966.
- de Villemeur, T. B. (2012). Creutzfeldt-Jakob disease. *Handbook of clinical neurology*, *112*, 1191-1193.
- Merritt, H. H. (2010). *Merritt's neurology*. L. P. Rowland, & T. A. Pedley (Eds.). Lippincott Williams & Wilkins.
- Riley, D. E., Lang, A. E., & Lewis, A. (2010). Creutzfeldt–Jacob Disease.*Encyclopedia of Movement Disorders*, *1*, 263.
- Sikorska, B., Knight, R., Ironside, J. W., & Liberski, P. P. (2012). Creutzfeldt-Jakob disease. In *Neurodegenerative Diseases* (pp. 76-90). Springer US.

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