Johns Hopkins Engineering

Methods in Neurobiology

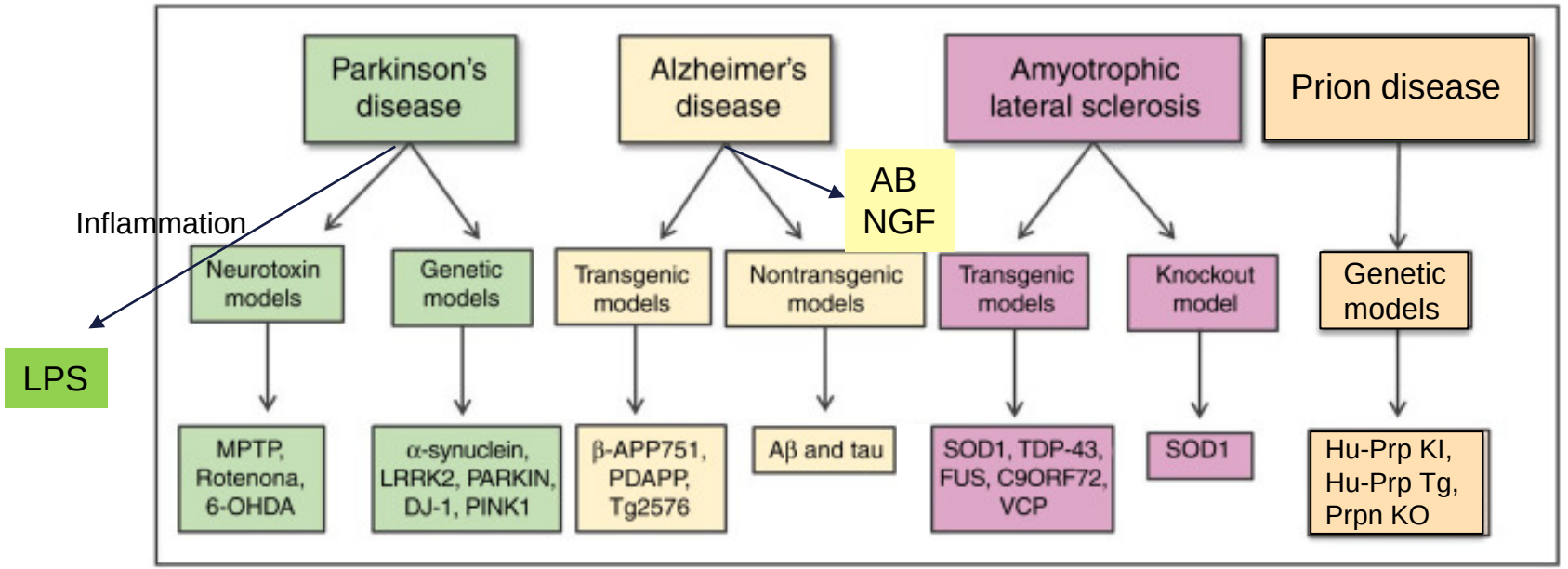
Models of Neurodegeneration

Common models used in neurodegeneration

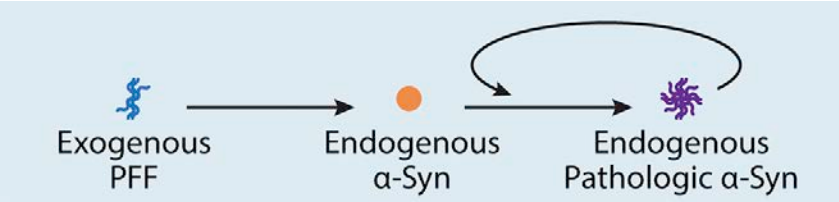
- Genetic animal models;
- Toxin-induced models (PD);
- Amyloid-seeded models;
- iPSCs.

Species commonly used
Mouse
Drosophila M.
C. Elegans
S. Cerevisiae
Rat
Monkey

Common models used in neurodegeneration



Seeded models in PD



- Primary neurons;
- In mice injections can be:

  - intracerebral;

  - peripheral (OB, intestine, stomach, intramuscular, bladder)

Limitations of neurodegeneration models

Limited relevance of models based on expression of rare genetic variants for understanding and treating sporadic disease.
Shorter life-span when compared to humans
Genomic differences between rodent and human may have profound implications when modeling neurodegenerative diseases.
Protein inclusions are very difficult to obtain unless a whole organism system is used. Better with seeded models in primary neurons.
Cannot recapitulate completely pathology and symptomatology
Toxin models are acute, often partial and cannot reflect slow disease progression

References

Slide	Reference
3	Modified from Colpo G.D., Ribeiro, F.M., Rocha, N.P., Teixeira, A.L. 2017 Chapter 42 - Animal Models for the Study of Human Neurodegenerative Diseases, Editor(s): P. Michael Conn, Animal Models for the Study of Human Disease (Second Edition), Academic Press, Pages 1109-1129.
4	Kim, S., Kwon, S-H., Kam, T-I., Panicker, N., Karuppagounder, S.S., Lee, S., Lee, J. L., Kim, W. R., Kook, M., Foss, C.A., Shen, C., Lee, H., Kulkarni, S., Pasricha, P.J., Lee, G., Pomper, M.G., Dawson, V.L., Dawson, T. M., Ko, H.S. 2019 Transneuronal Propagation of Pathologic α-Synuclein from the Gut to the Brain Models Parkinson's Disease, Neuron, 103: 627-641.

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