





Who does Parkinson's disease affect?

- 1 million people in the US
- 5 million worldwide
- 60,000 new each year in the US
- Men are one and a half times more likely to have Parkinson's than women.
- Average age of onset is 70




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What is Parkinson's disease?

What is Parkinson's disease?

- Parkinson's disease is a chronic, degenerative neurological disorder



Dr. James Parkinson (1733-1824)

GOETZ CG. Cold Spring Harbor Perspect Med. (2011)

What Are the Motor Symptoms of Parkinson's Disease?

- **Primary motor symptoms**
 - tremor of the hands, arms, legs, jaw and face
 - bradykinesia or slowness of movement
 - rigidity or stiffness of the limbs and trunk
 - postural instability or impaired balance and coordination
- **Secondary motor symptoms**
 - Freezing
 - Micrographia
 - Mask-like Expression
 - Unwanted Accelerations



Parkinson's Disease Foundation

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What Are the Non-Motor Symptoms of Parkinson's Disease?

- Non-motor symptoms
 - Cognitive impairment -- decline in ability to multi-task and/or concentrate and potentially decline in intellectual functioning
 - Mood disorders -- depression and anxiety
 - Problems sleeping -- REM Sleep Disorder, where individuals act out their dreams
 - Speech and swallowing problems
 - Unexplained pains, drooling and smell loss



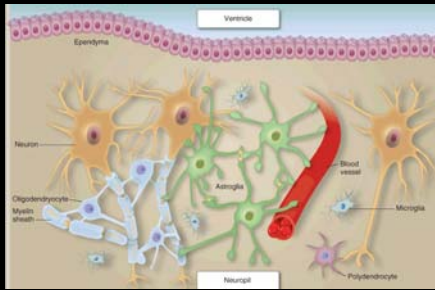
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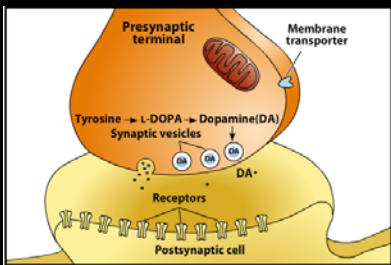
What causes Parkinson's disease?

Neuronal environment



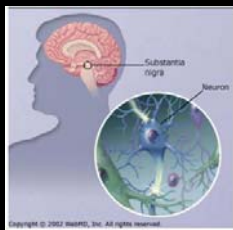
Krebs et al. 2012. Lippincott's Illustrated Reviews Neuroscience, Lippincott's Illustrated reviews

What is dopamine?

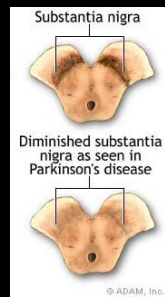


Welcome to the Neuroscience, Fifth Edition Companion Website. Neuroscience, Fifth Edition

What causes Parkinson's disease?

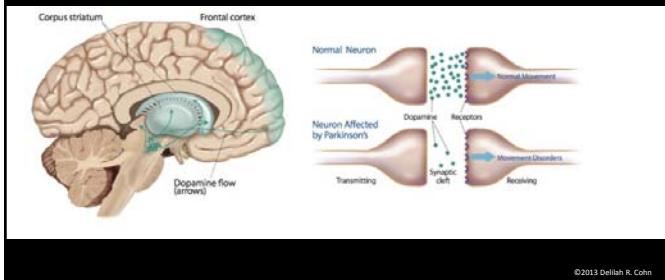


- Death of dopaminergic neurons in the substantia nigra



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Parkinson's disease and dopamine



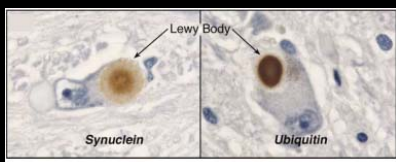
Genetics of Parkinson's disease

- A combination of genetic and environmental factors
- Rare instances where Parkinson's disease appears to be caused by a single genetic mutation

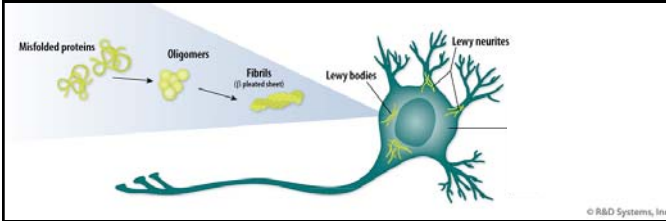
Early-onset PD (~15%)		Late-onset PD (~85%)	
Probability of monogenic cause: range very high to exceedingly low			
Familial PD		Sporadic PD	
Parkin	(~10-20%)	LRRK2	(~2%)
PINK1	(~2-7%)	Parkin	(rare, but very limited data)
SNCA	(~1-2%)	SNCA	(~0.5%)
LRRK2	(~5-10%)	SNCA	(~0.5%)

Lee et al. Future Neurology 2012

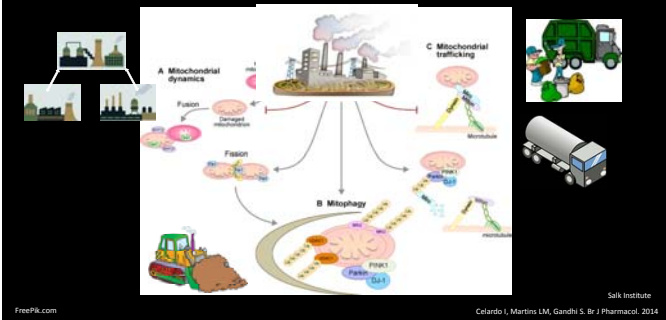
Lewy bodies in Parkinson's disease



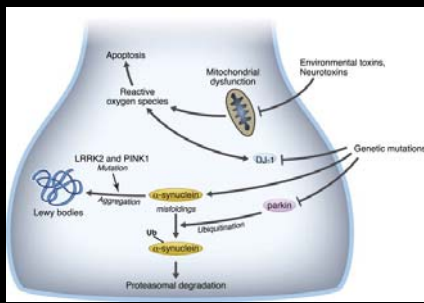
Protein aggregation in Parkinson's disease



Mitochondrial Dysfunction in Parkinson's



Common pathways affected



How does aging influencing neurons?

