

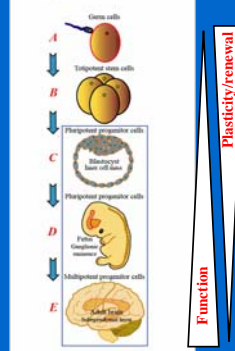
New Brain Cells For Damaged Brains

Dr Maurice A Curtis

Lecturer in the Department of Anatomy with Radiology
Faculty of Medical and Health Sciences
The University of Auckland



Stem and progenitor cells during development and in the adult brain



No New Neurons?

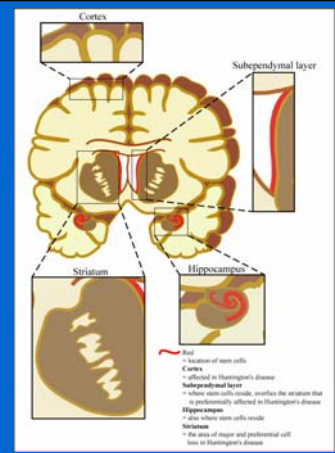


Adult Neurogenesis occurs in 2 regions

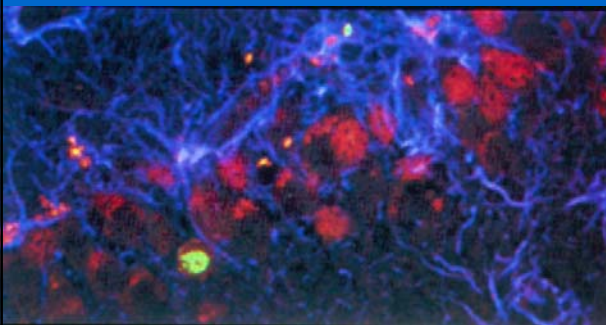
Subventricular zone
Subgranular zone

Neurogenesis = production of new neurons

Stem cells grow up to become adult neurons



Hippocampus

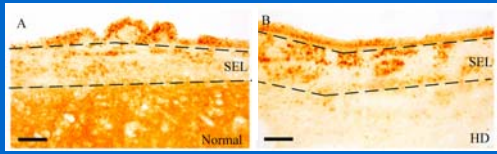


Memory Centre

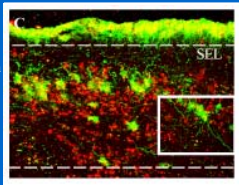
New Nerve Cells for the Adult Brain

Contrary to dogma, the human brain does produce new nerve cells in adulthood. Can our newfound capacity lead to better treatments for neurological diseases?

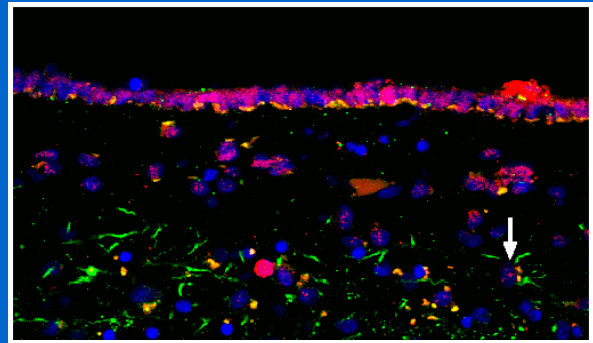
Cannabinoid immunostaining



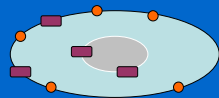
Dividing cells are red
Cannabinoid cells are green



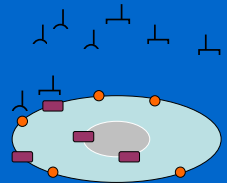
New neurons are born as the brain's repair mechanism



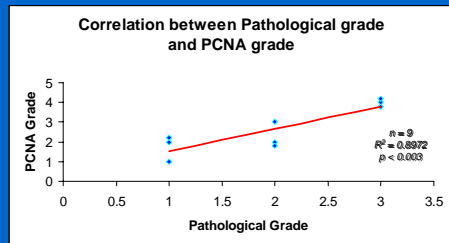
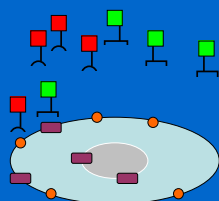
Confocal Microscopy



Confocal Microscopy



Confocal Microscopy

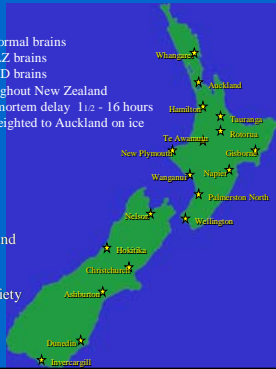


As the condition gets worse the brain tries harder to fix the problem by increasing brain cell production

The Neurological Foundation of New Zealand Human Brain Bank

- Huntington's Disease
- Parkinson's Disease
- Alzheimer's Disease
- Epilepsy
- Motor Neuron Disease
- Schizophrenia

164 normal brains
59 ALZ brains
107 HD brains
Throughout New Zealand
Post-mortem delay 1 1/2 - 16 hours
Air freighted to Auckland on ice



SUPPORTED BY:

- Huntington's Disease Association of New Zealand
- Parkinsonism Society of New Zealand
- Alzheimer's Foundation (Auckland)
- Alzheimer's Disease and Related Disorders Society
- Epilepsy Association of New Zealand

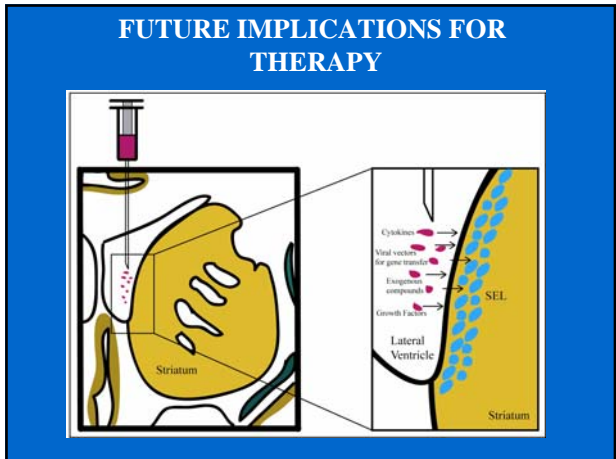
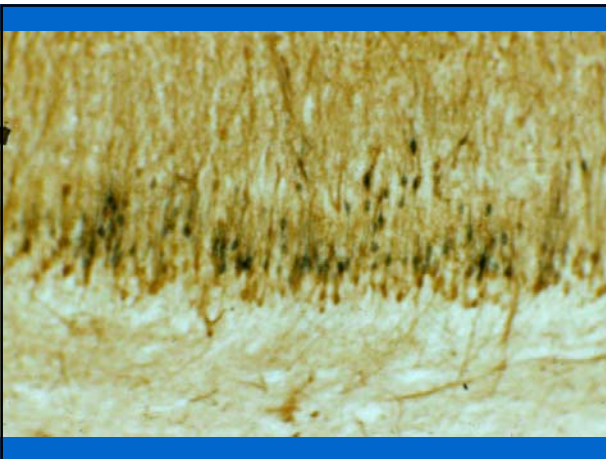
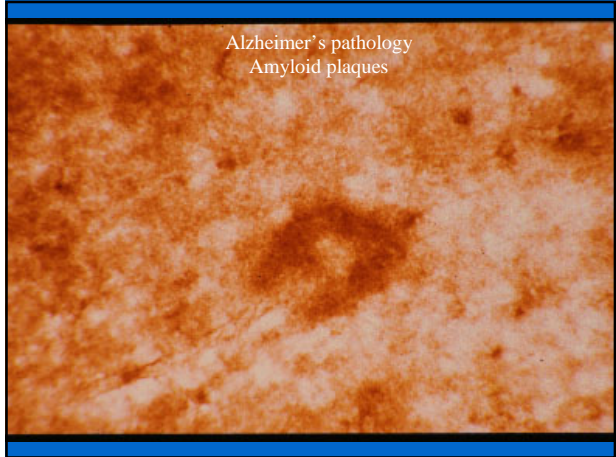


DISCLOSURE: Nancy agreed that going public would raise awareness of an intractable ailment

HEALTH

"The Sunset of My Life"

Ronald Reagan has survived bullets and cancer, but now he forthrightly faces his toughest foe: Alzheimer's



Are there things one can do to increase the amount of neurogenesis in the brain without injury, or after injury?

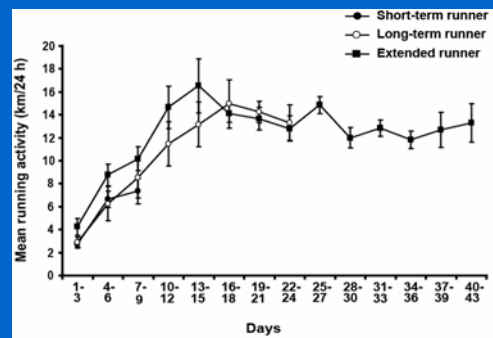
Yes

How exercise alters the brain

Exercise and Neurogenesis



How running affects the brain

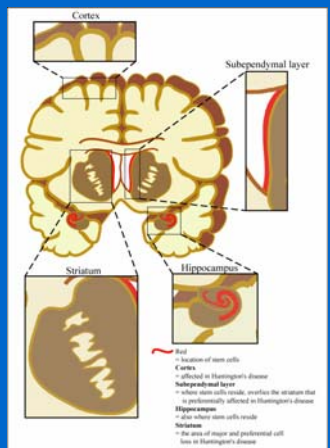


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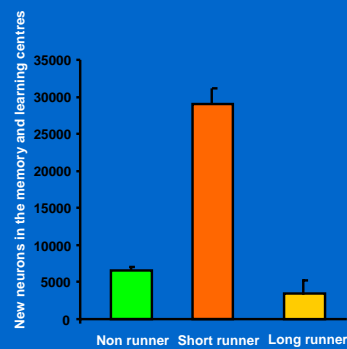
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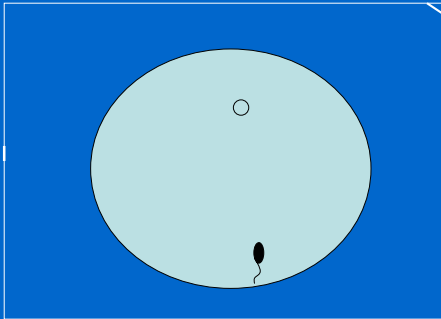
Stem cells grow up to become adult neurons



How running affects the brain



Spatial memory



Exercise and Neurogenesis



- Proliferation, Neurogenesis
- Spatial Memory
- Synaptogenesis

Van Praag et al., 1999a, 1999b.

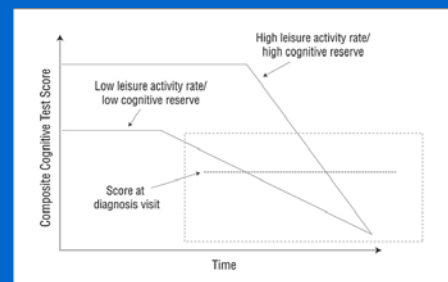
How your environment alters the brain



Living environment and neurogenesis



Cognitive decline vs leisure activity



Helzner, E. P. et al. Arch Neurol 2007;64:1749-1754.

Leisure activity improves brain health

Social Interaction
Physical exercise
Cognitive exercise

London cabbies grow their brains by learning new routes



400 routes must be stored in their memory



Leisure activity improves brain health

Social Interaction

Visiting friends
Meeting new people
Doing group activities

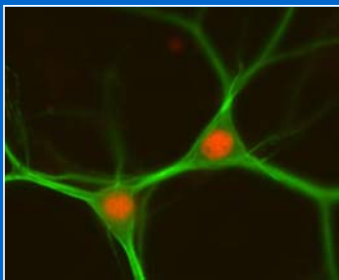
Physical exercise

Running/walking
Cycling
Swimming
(enough to increase cardiovascular output)

Cognitive exercise

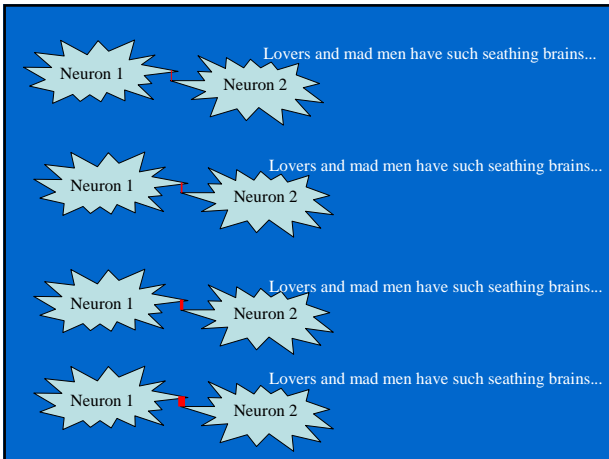
Memory exercises
Puzzles, crosswords, sudoku
brain teasers
Museums

Synapses are cell to cell contacts



Synapses are for memory production





Living environment and neurogenesis

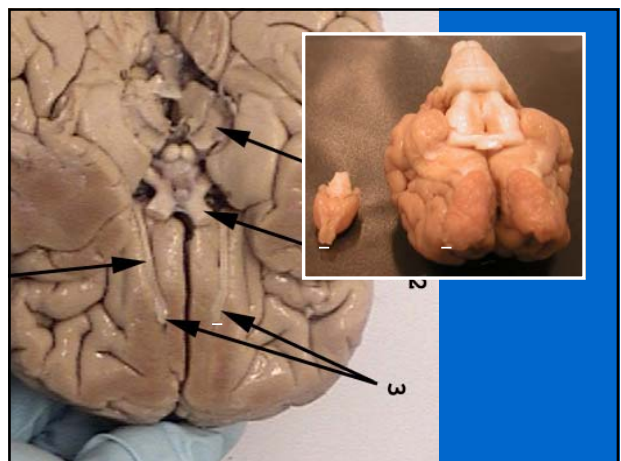
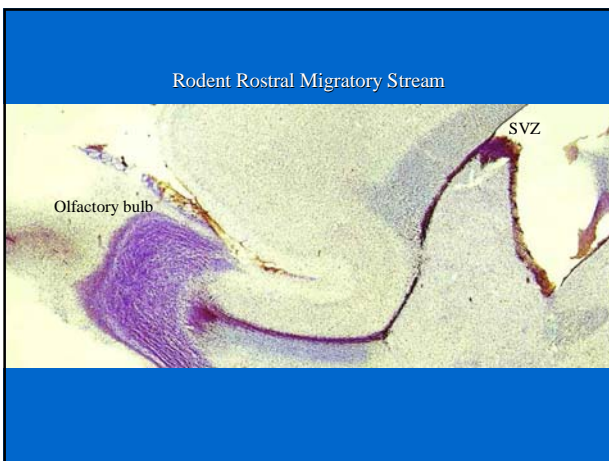
- Cell survival, Neurogenesis
- Spatial memory

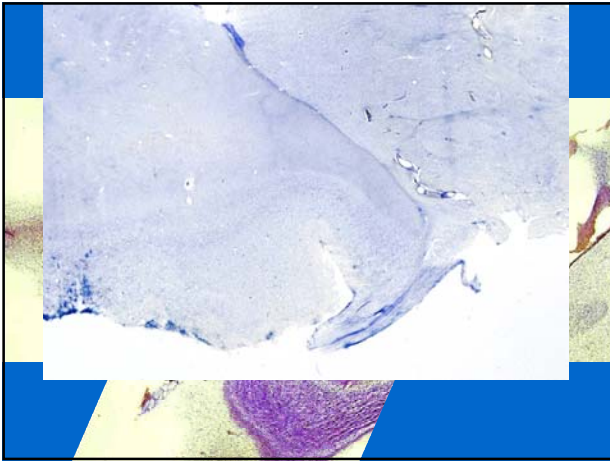
Kempermann et al., 1997, Nilsson et al., 1999

- ### Leisure activity improves brain health
- Social Interaction
 - Visiting friends
 - Meeting new people**
 - Doing group activities
 - Physical exercise
 - Running/walking
 - Cycling
 - Swimming
 - (enough to increase cardiovascular output)
 - Cognitive exercise
 - Memory exercises
 - Puzzles, crosswords, sodoku
 - Brain teasers
 - Museums**

BRAIN HEALTH in a nutshell

- Exercise....it increases neurogenesis
- Change your environment/engage in new activities.... It increases synaptic plasticity
- Memorize things....it also increases synaptic plasticity





Acknowledgements

Peter Eriksson – Göteborg University
Richard Faull – Auckland University

Ulf Nannmark – Göteborg University
Andrew Naylor – Auckland University

Neurological disease sufferers, their families and the associations
that support them nation-wide

Neurological Foundation of New Zealand
Auckland Medical Research Fund

