Johns Hopkins Engineering

Methods in Neurobiology

Brain Repair and Cell Replacement

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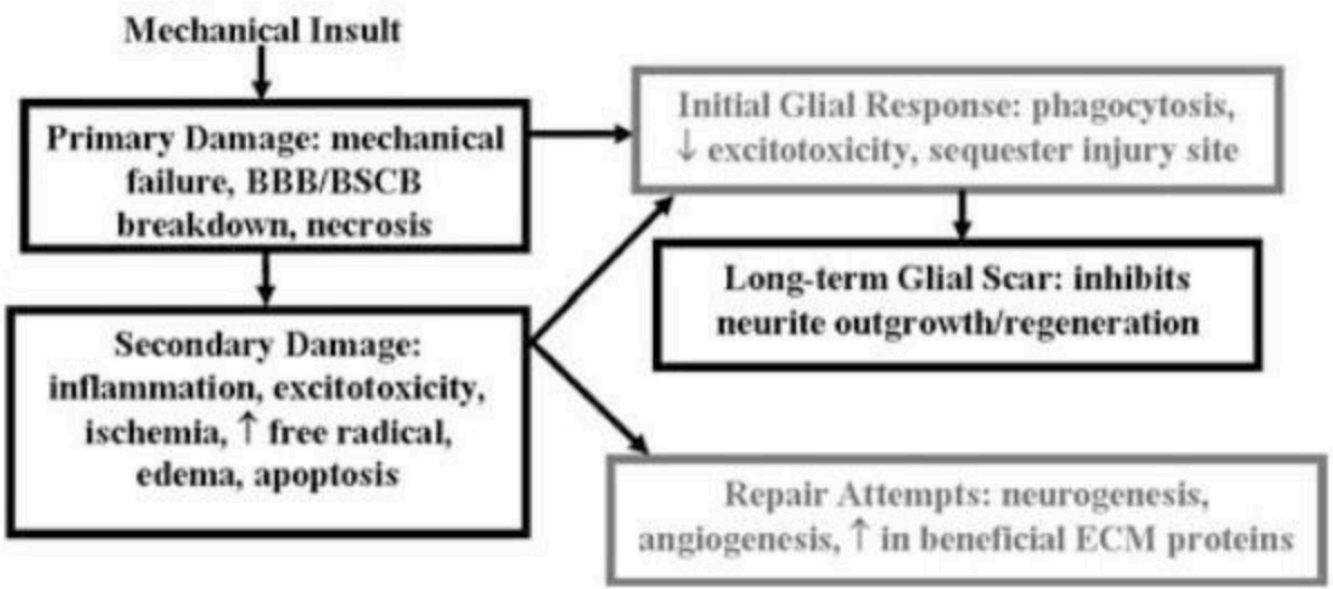
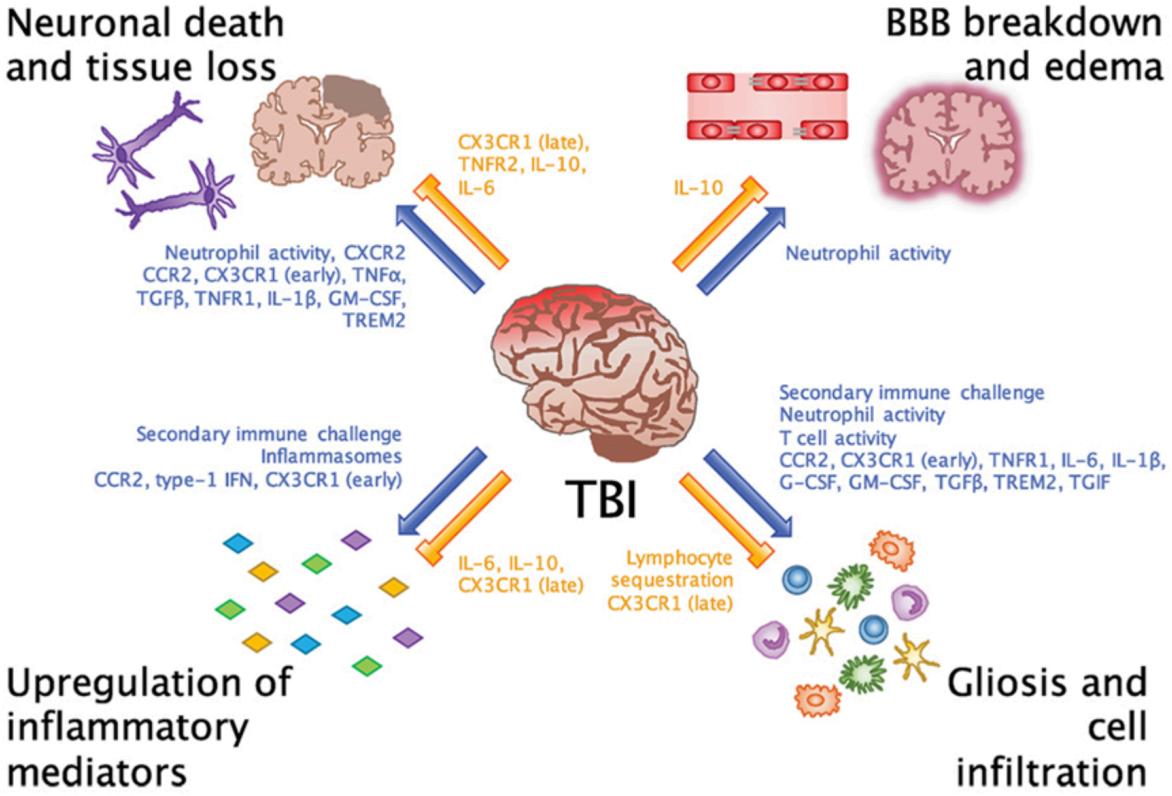
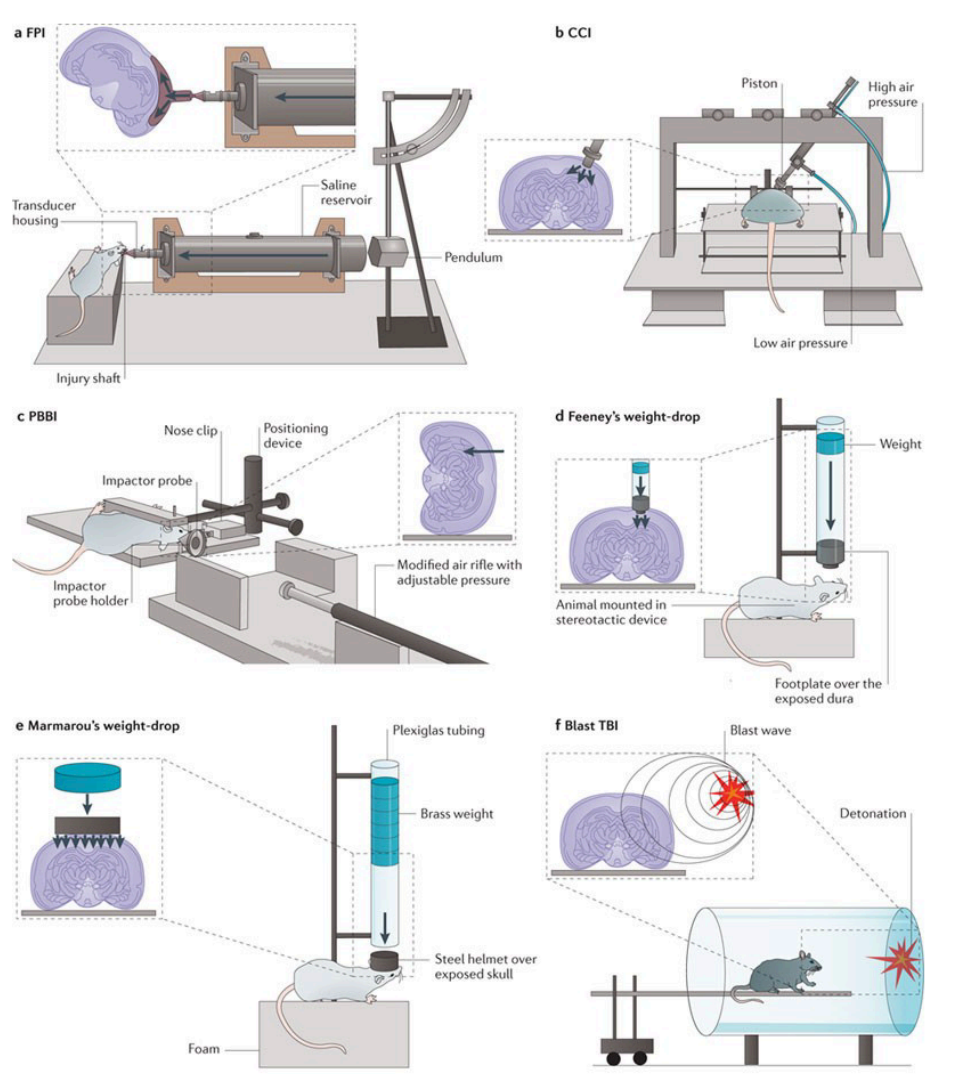
CNS injury


Mechanical Insult
Primary Damage: mechanical failure, BBB/BSCB breakdown, necrosis
Secondary Damage: inflammation, excitotoxicity, ischemia, ↑ free radical, edema, apoptosis
Initial Glial Response: phagocytosis, ↓ excitotoxicity, sequester injury site
Long-term Glial Scar: inhibits neurite outgrowth/regeneration
Repair Attempts: neurogenesis, angiogenesis, ↑ in beneficial ECM proteins

Traumatic brain injury (TBI)



Models of TBI

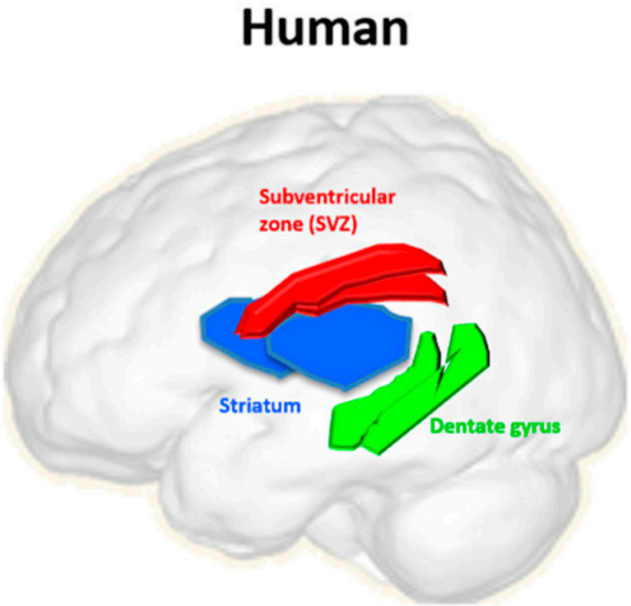


Therapeutic strategies in TBI and SCI

Therapeutic Goals In TBI And SCI[a]

		Brain	Spinal Cord
Neuroprotection	Goal	↓ Cell dysfunction/death caused by secondary cascades	
	Examples	Antiapoptotic molecules, free radical scavengers, antiexcitotoxic molecules, trophic factors	
Neuroregeneration	Goal	↑ Plasticity (reorganization of neuronal circuits)	↑ Axonal growth to reconnect brain with target cells
	Examples	Trophic support, enhance neurogenesis	Trophic support, ↓ inhibitory components of glial scar, physical guidance channels with chemical cues

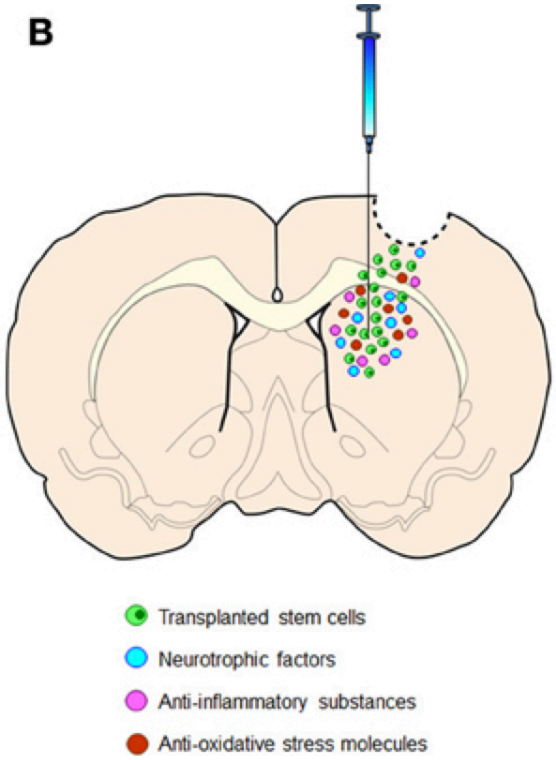
Brain Repair



Strategies:

- Increase neurogenesis and synaptogenesis;
- Cells or tissue replacement.

Cell replacement therapy and CNS injury



References

Slide	Reference
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