



Cell Communication II: Peptide Hormones

Readings: Review Alberts 531-6
Netters Chapter 29

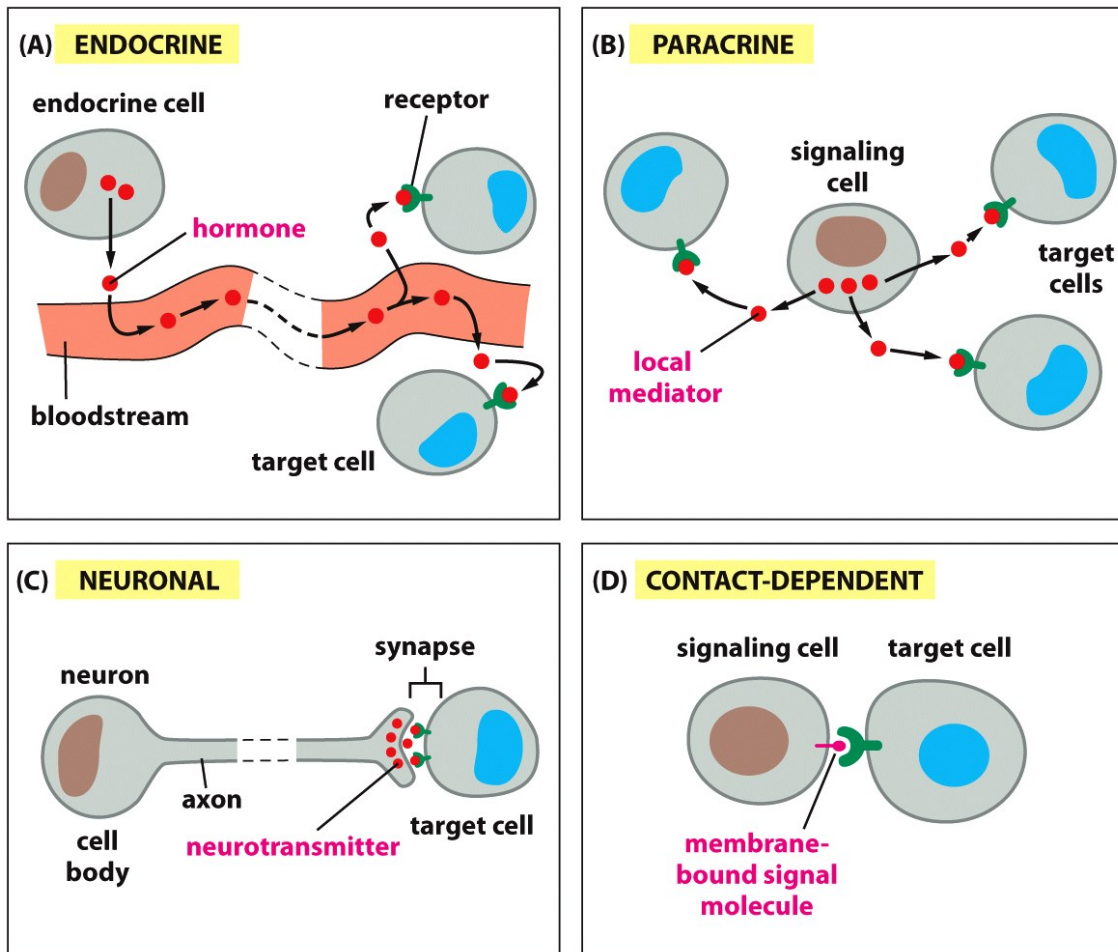
James Hebda

11/9/11



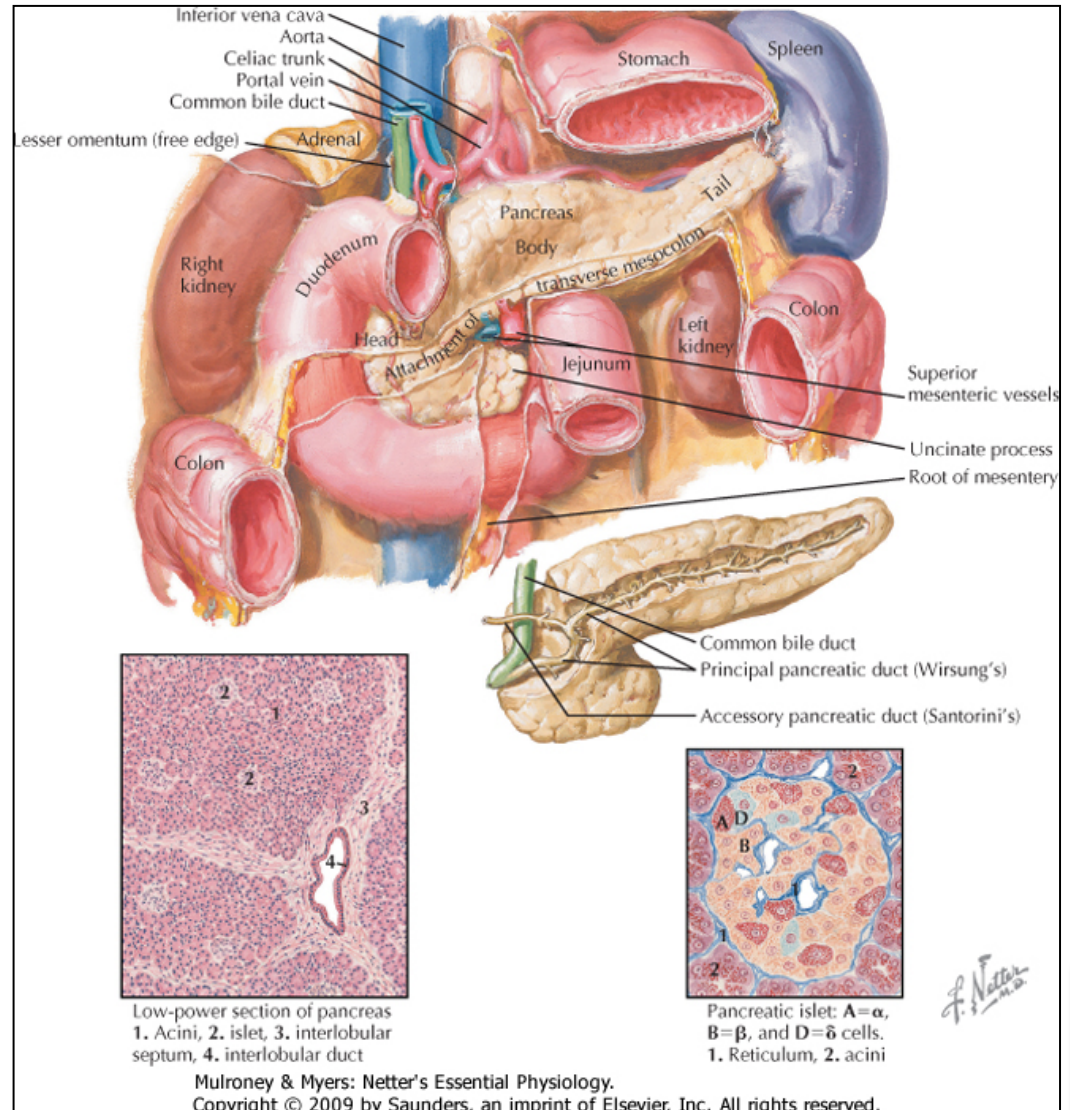
Cell Communication

- How do these signals get around?

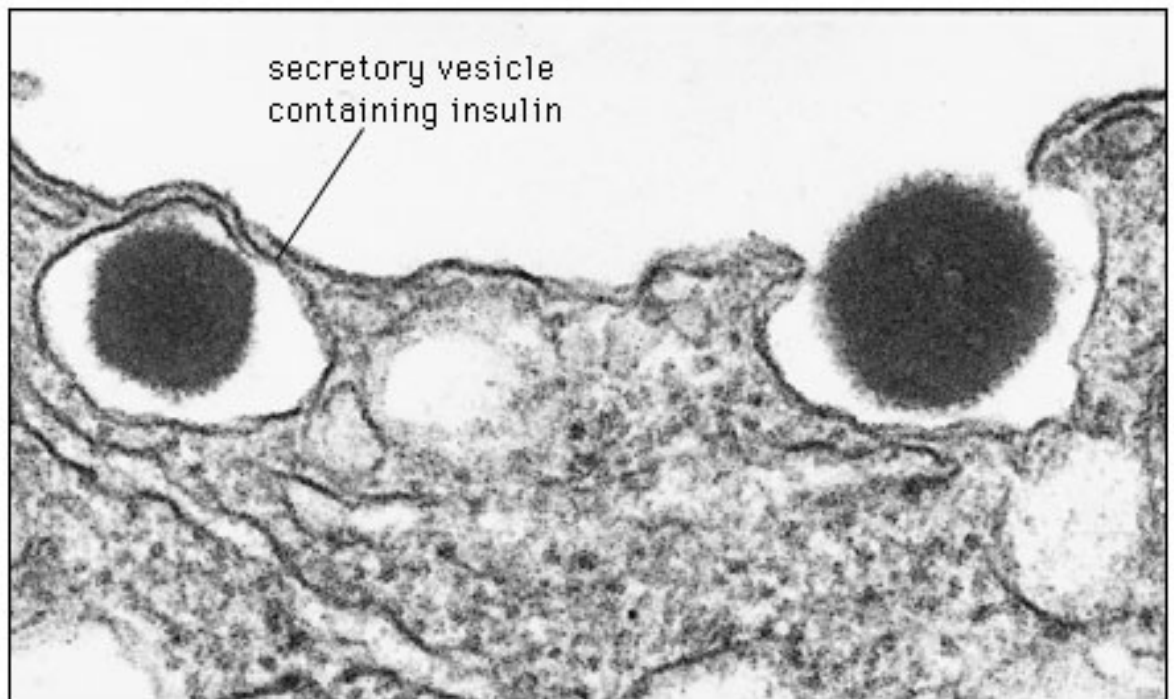
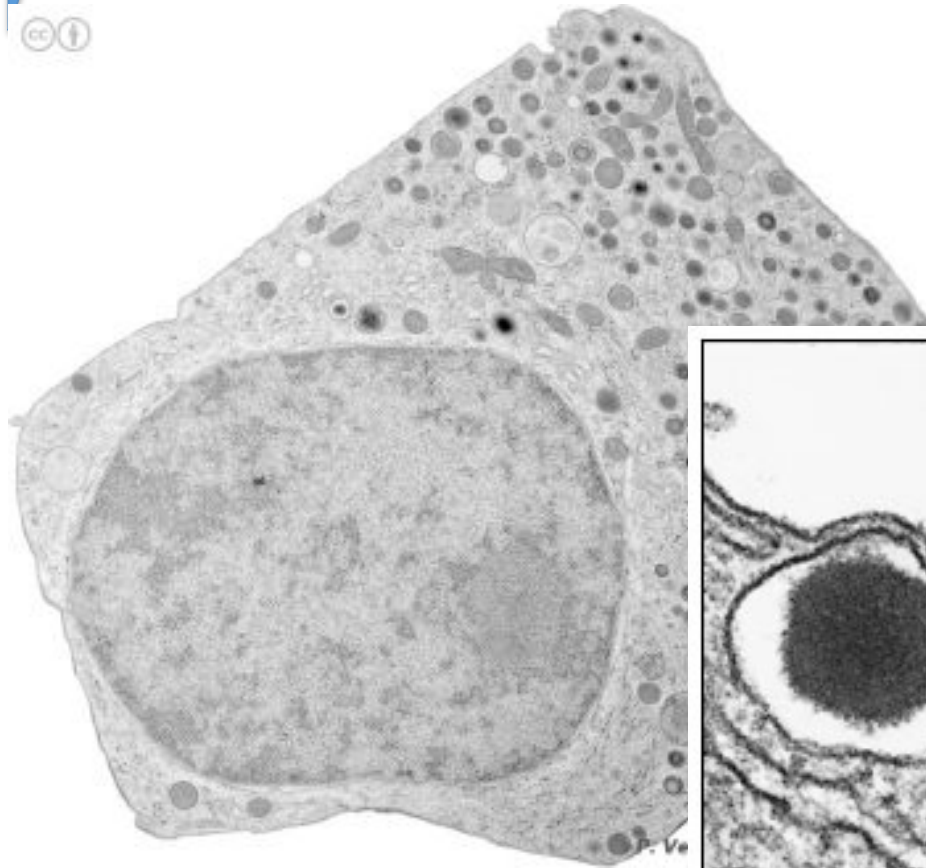


Endocrine Pancreas

- Three hormones
 - Three specialized cells
- All located in Islets of Langerhans
- Only 1% of Pancreas cells
- The other 99%?

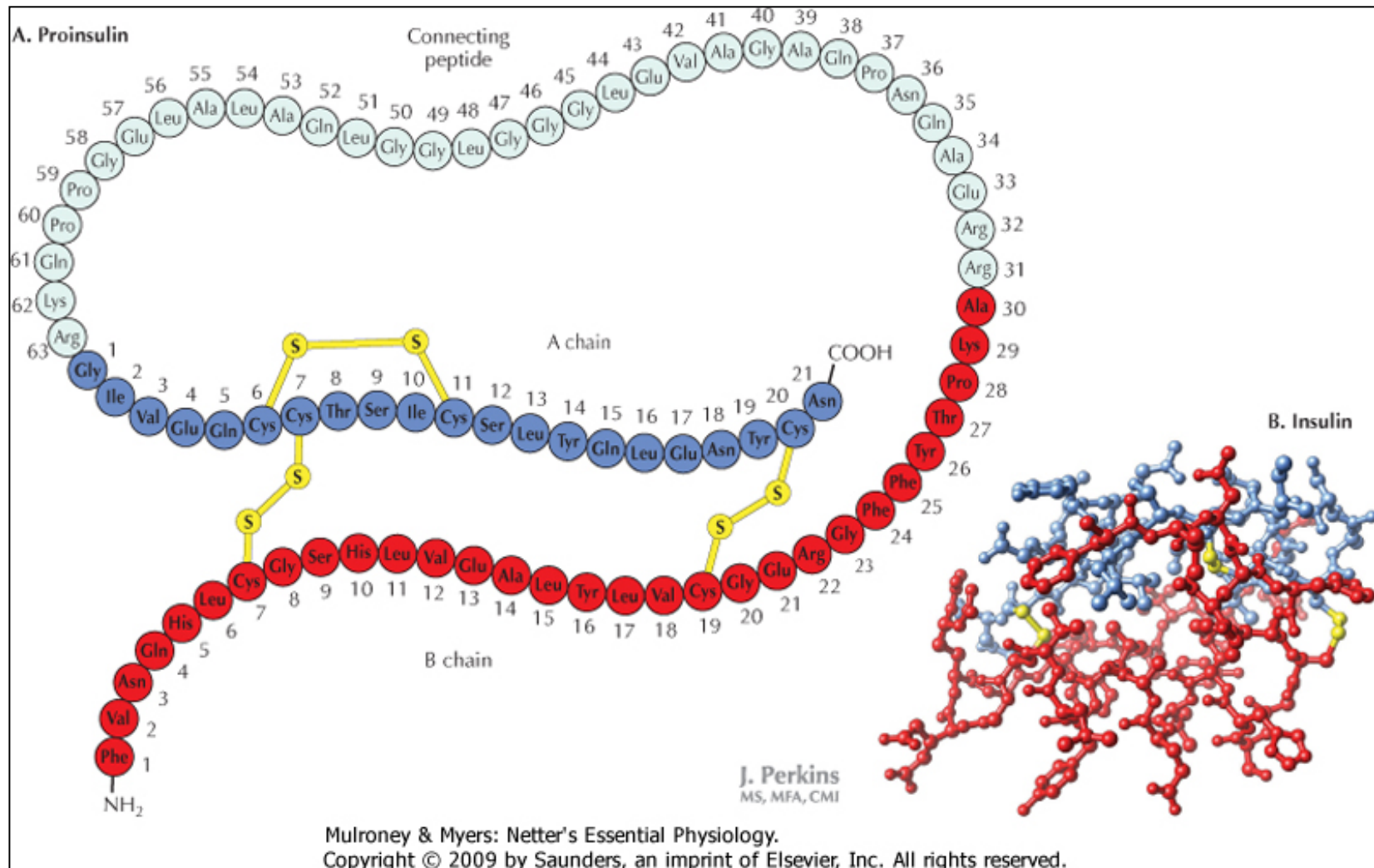


Zoom in on a Beta Cell



0.2 μm

Structure of Insulin





Brainstorm

- Possible benefits of peptide based hormones?
- Possible downsides?



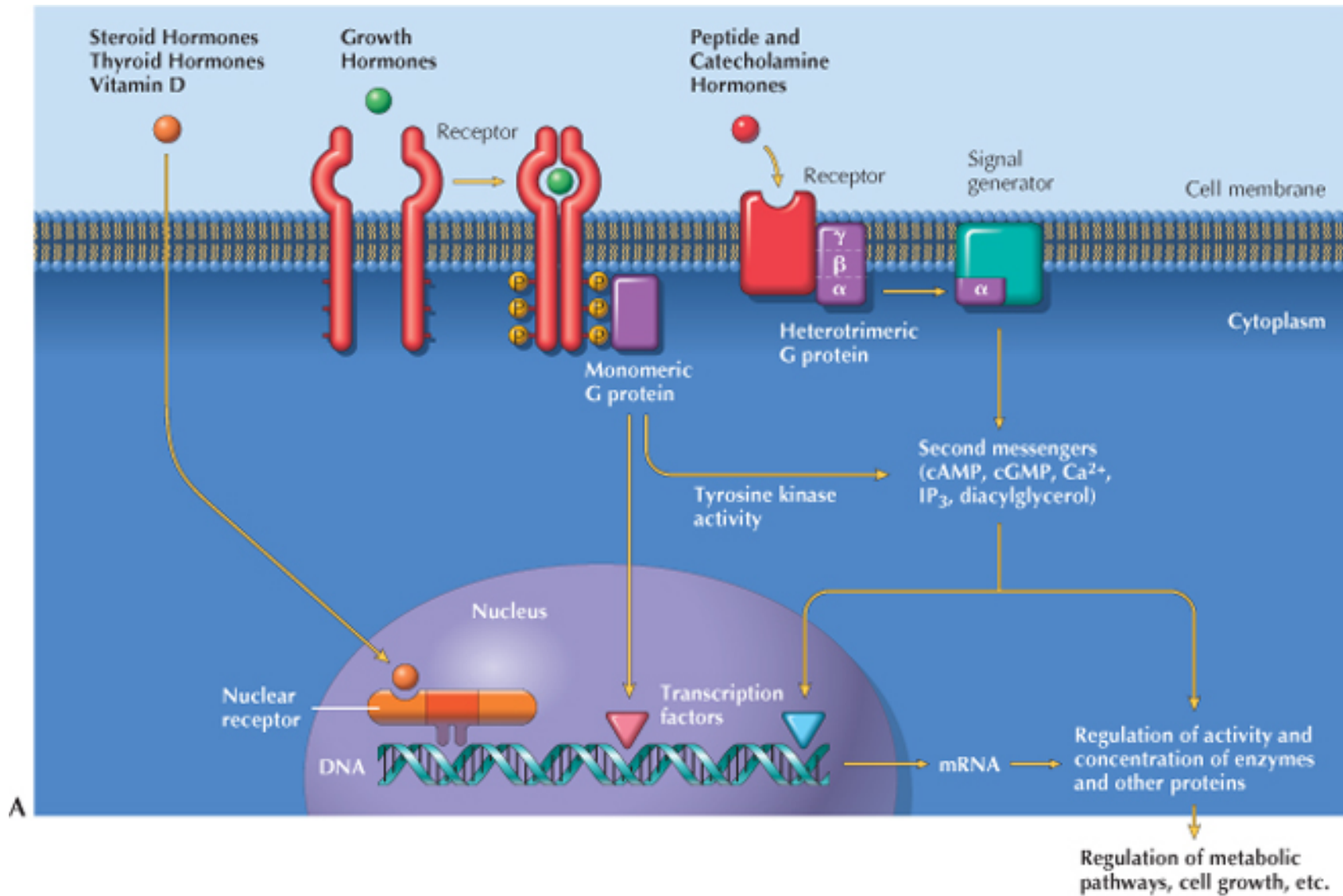


Important things to Connect

- Receptors bind a specific hormone.
 - Selectivity important
 - Hormone is the Ligand
- Activated when a certain threshold of ligand
 - Affinity determines amount of hormone needed for physiological response
 - Turns on when amount of hormone is high enough for receptor to be ligand-bound most of the time
 - Binding causes a conformational change that translates the hormone into an action



Hormone Signaling Pathways





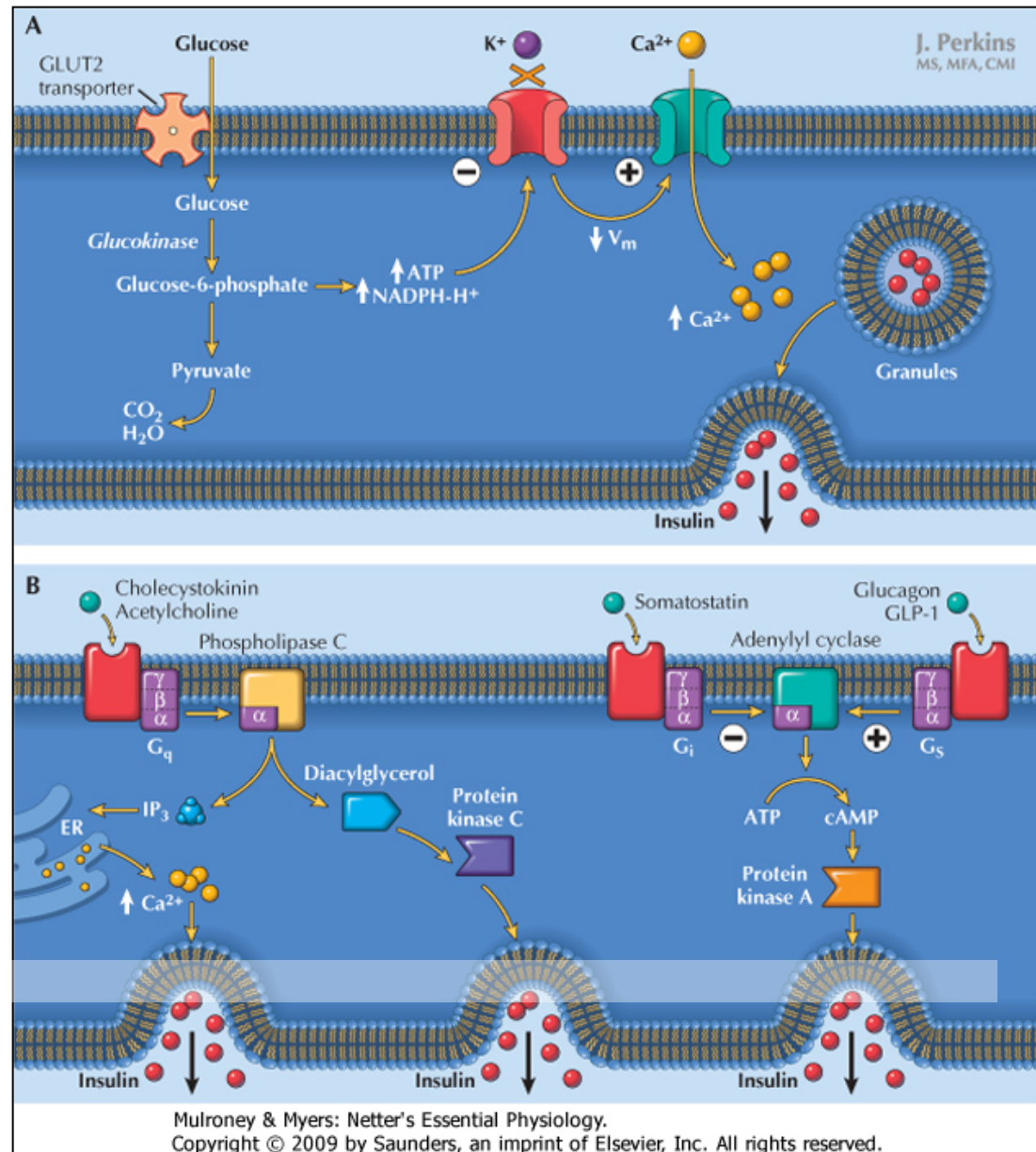
Why extra vs intra

- Peptide Hormones
 - Less than 10 to 50+ amino acid residues
 - Larger
 - Lower hydrophobicity
 - No “Channel” big enough to fit through.
- Small molecule hormones
 - Some are hydrophobic
 - So can pass through cell membrane by themselves
 - Receptors can be in the cell
 - No need for extra proteins to pass on the message

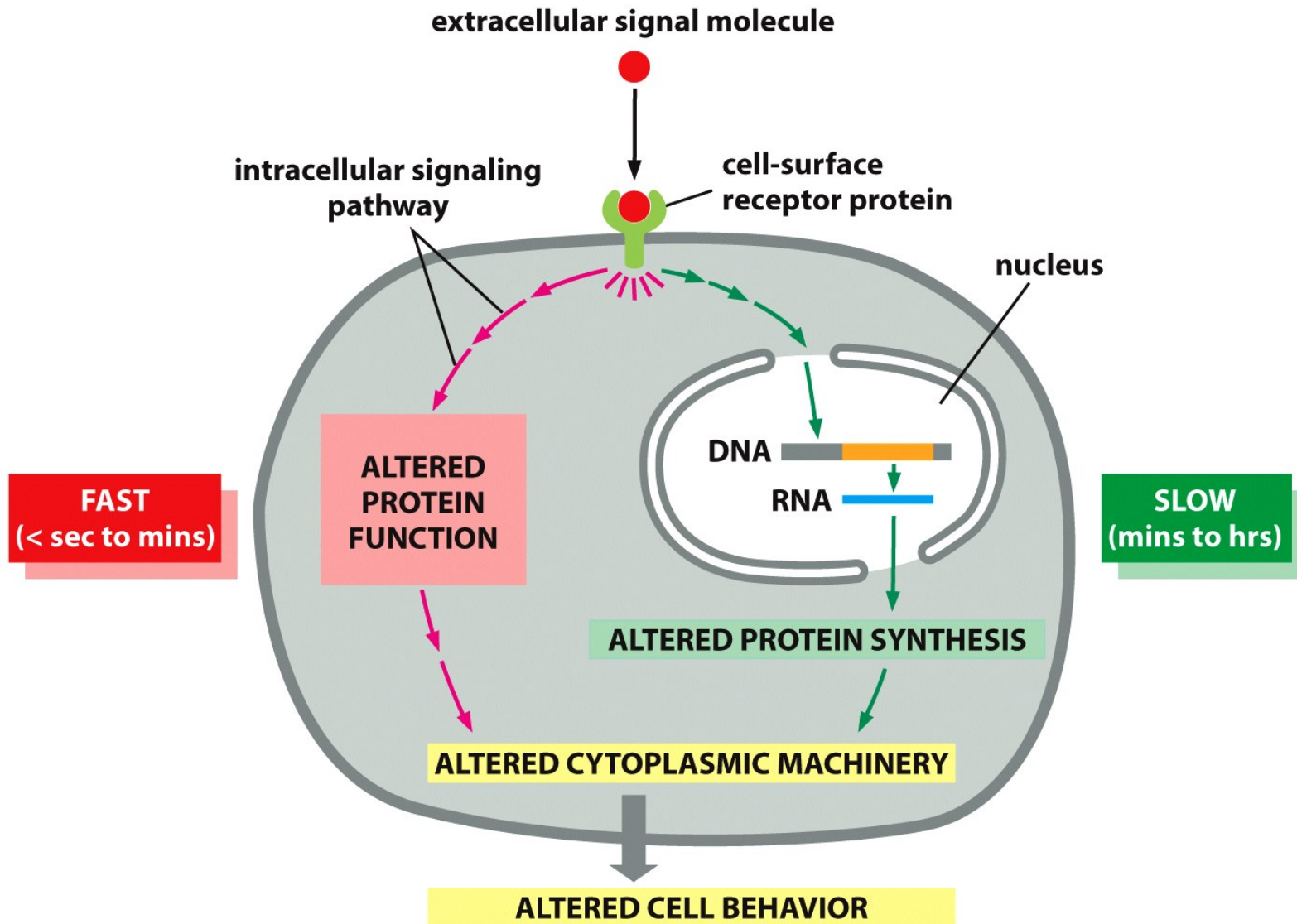


Insulin Regulated Release

- Glucose transported into cell by GLUT2 membrane protein
- Triggers blocking of K⁺ transport, increasing Ca²⁺
- Results in release of Insulin
- Other hormones act via even more complex pathways
- Signal “Cascade”



Hormone Pathways





Reading for Friday

- Alberts: 536-538, Figure 16-10





Diabetes Now

- US: an epidemic
 - 7th leading cause of death
 - 17.9 million **diagnosed** cases
 - Children
 - Up to 25% of children have impaired fasting glucose
 - Just the US? Obesity of 30% in children in Italy!
 - Cost in USA per year: \$174 billion (as of 2007)
 - Up to \$218 billion factoring in undiagnosed cases
 - Cost of war in Iraq for 2009: \$136 billion
 - China: 30 million and growing
 - Cause?
 - Diet
 - Sedentary lifestyle
 - Doting Grandparents
 - Trend – This is a huge problem
 - One intricately tied to an evolving cultural and societal norms
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