

3 Ideas Presentation

Team Roll Up Your Sleeves

Edgar Aranda-Michel

Hikaru Miyazaki

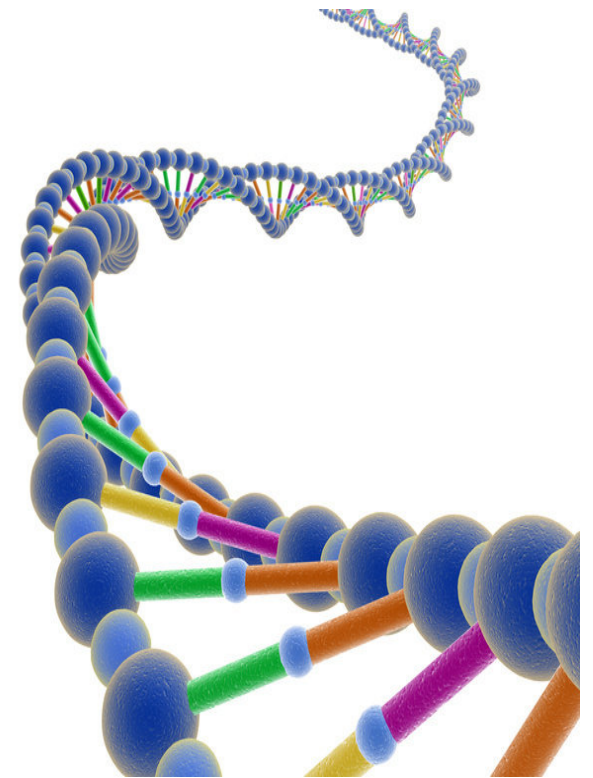
Jeff Chen

Jenny Wei

Yi-Shiuan Tung

Mentors:

Jamal, Shelley & Shlomiya



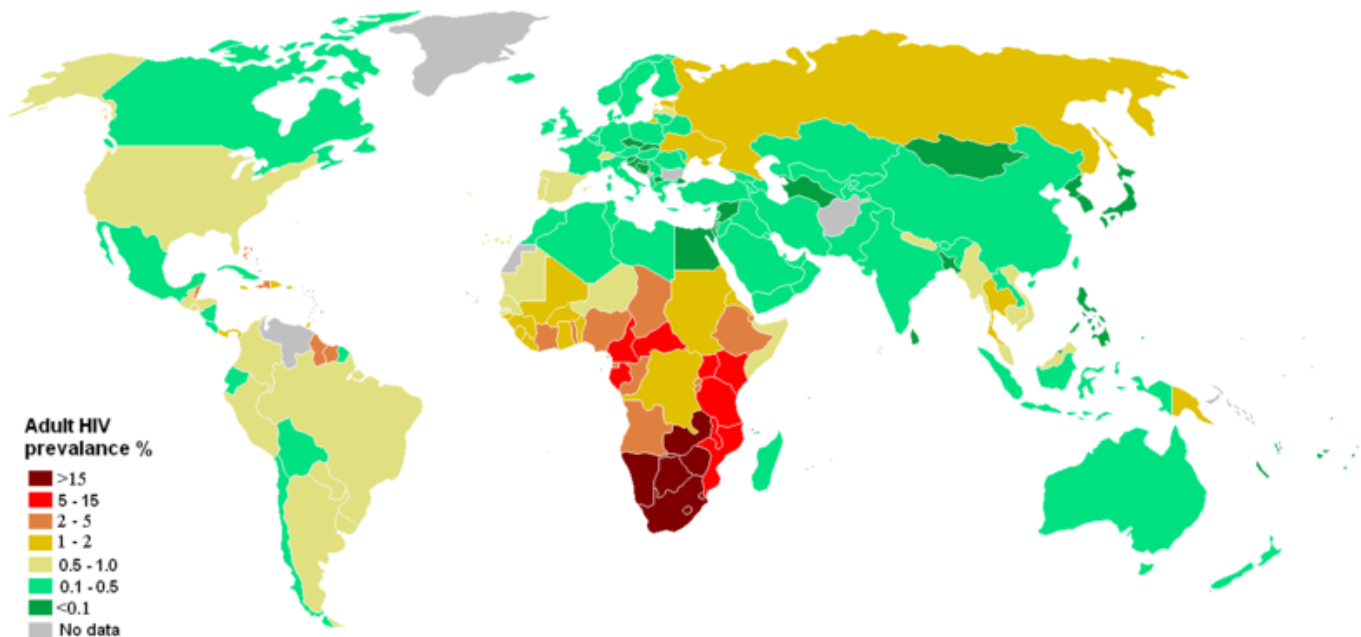
Idea #1: Targeting HIV through Genetic Engineering



<http://achoiceofweapons.blogspot.com/2010/12/world-aids-day.html>

Importance

- Classified as Pandemic by WHO
- Killed 30 million since 1980
- 35 million currently living with HIV

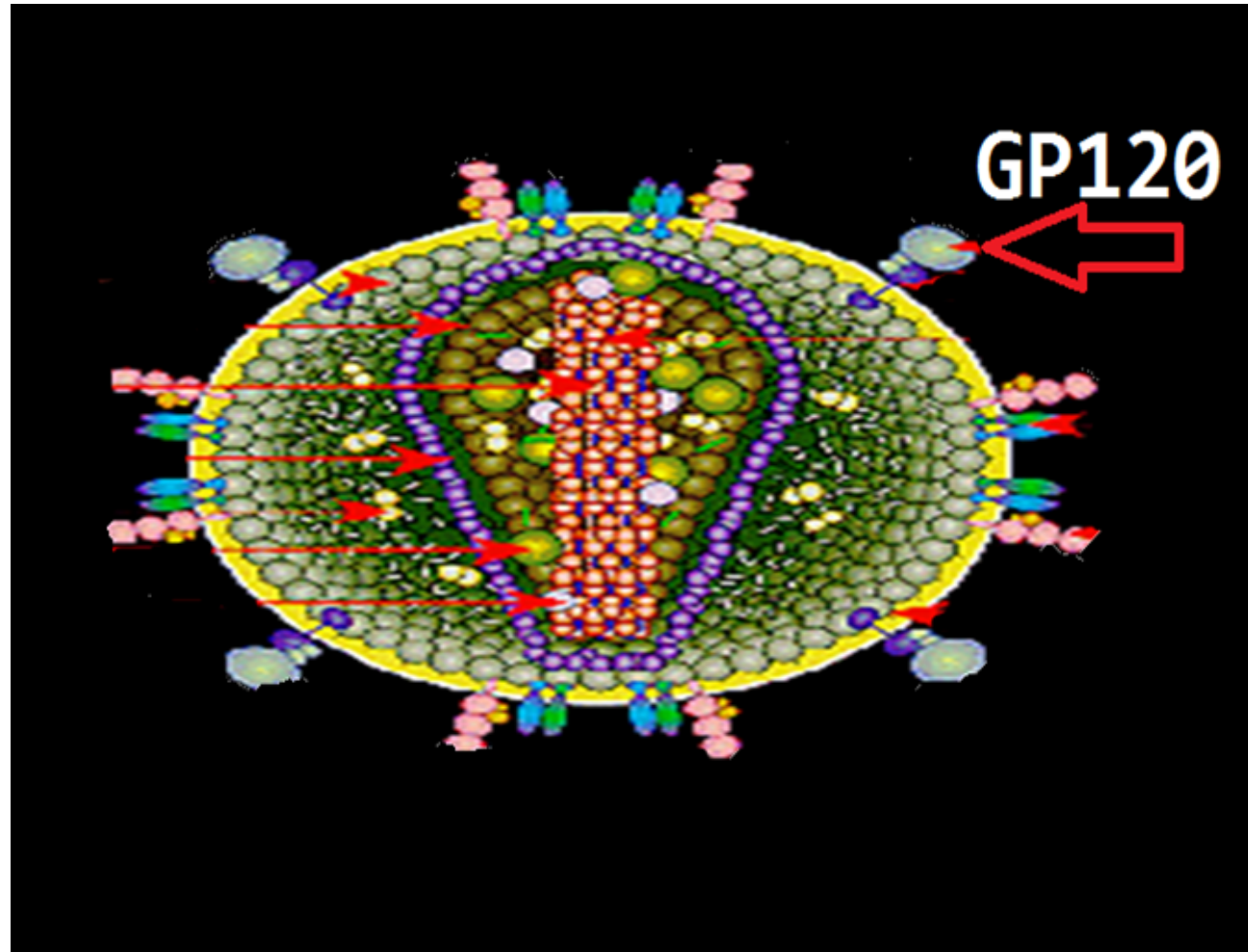


Impact

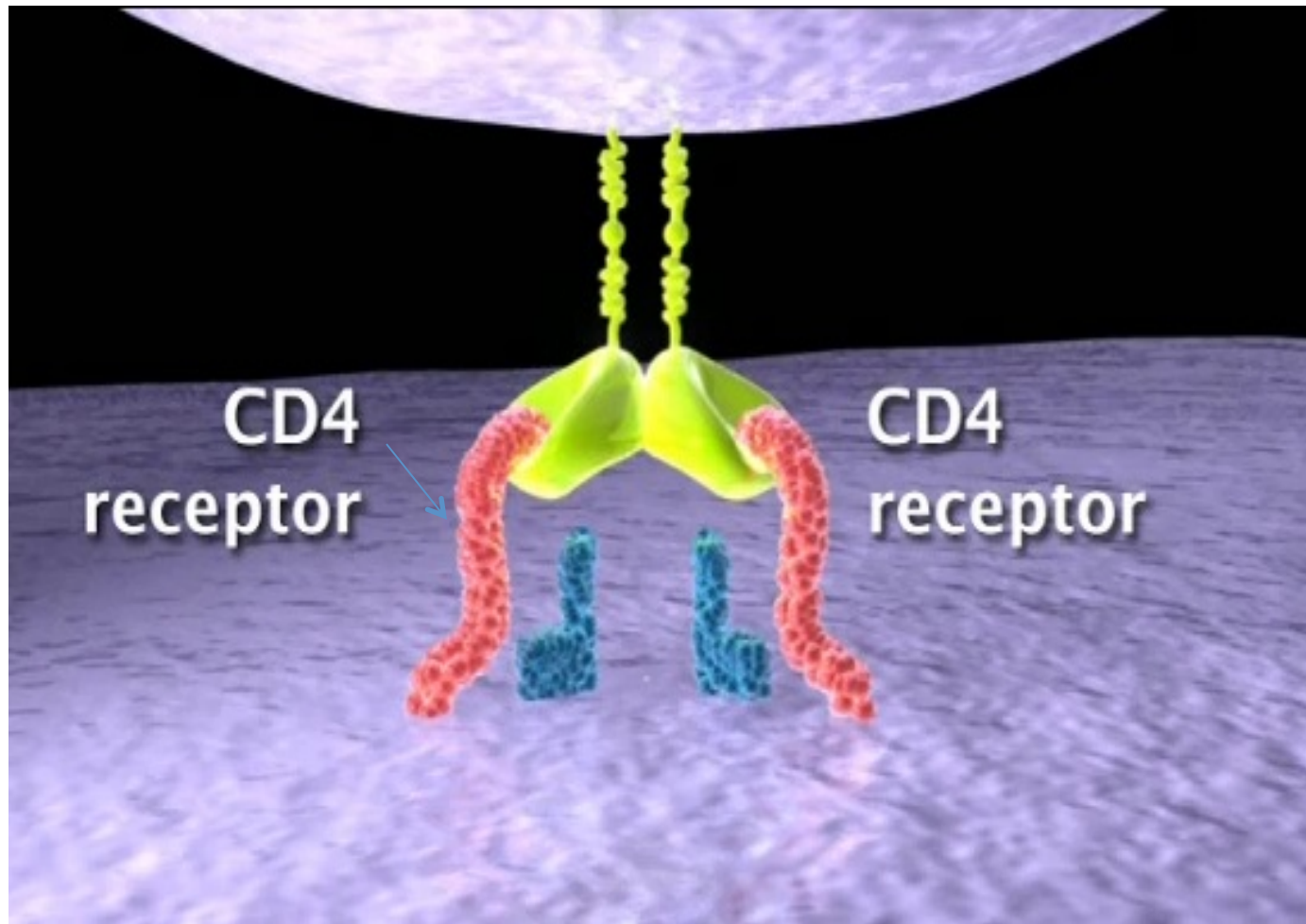
- Permanent solution of HIV
 - Prevention
 - Injection
 - Eradication
- Provide for Emerging Markets

HIV Membrane Protein Interference

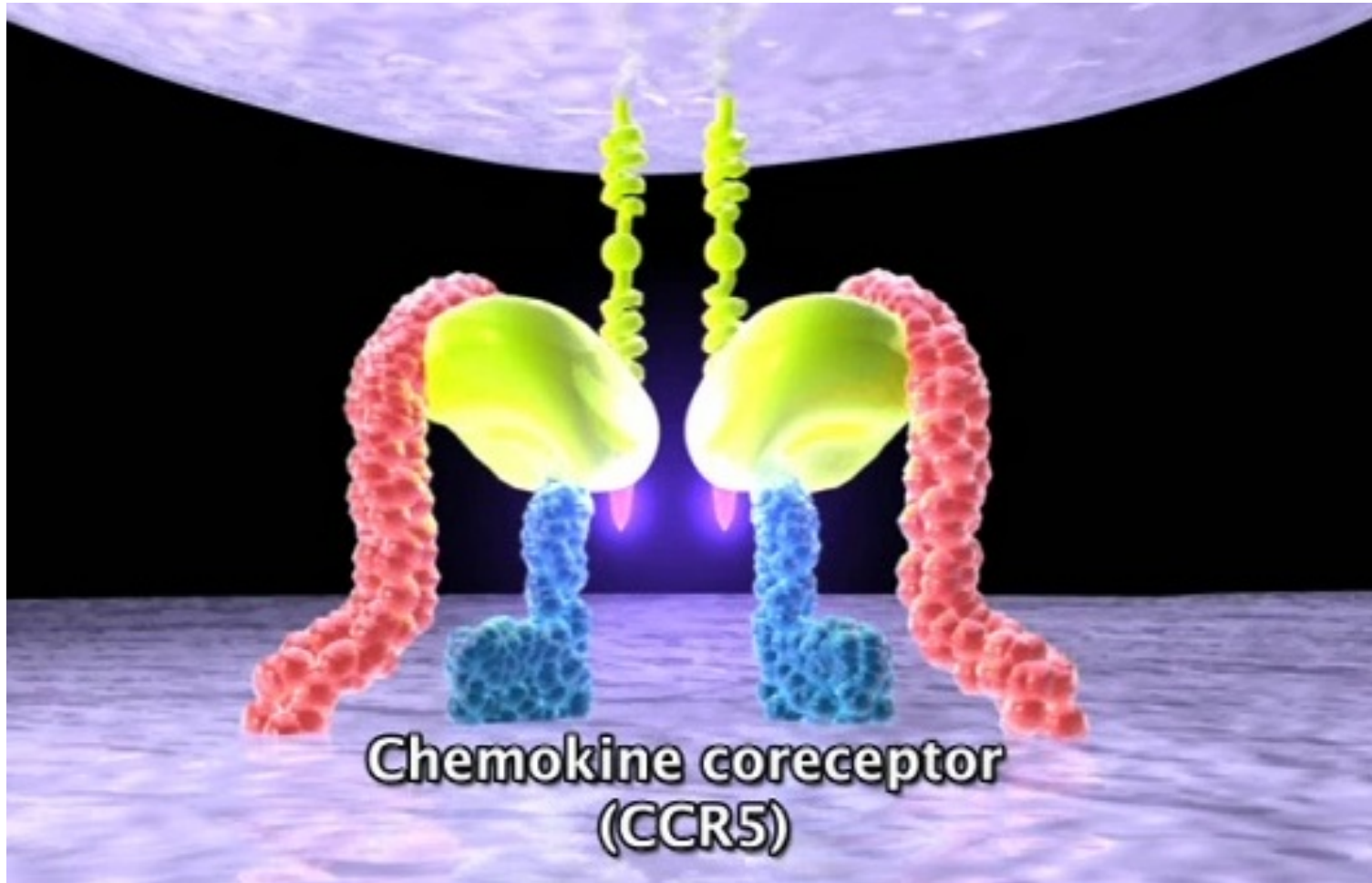
-gp120
-B12
-IgA



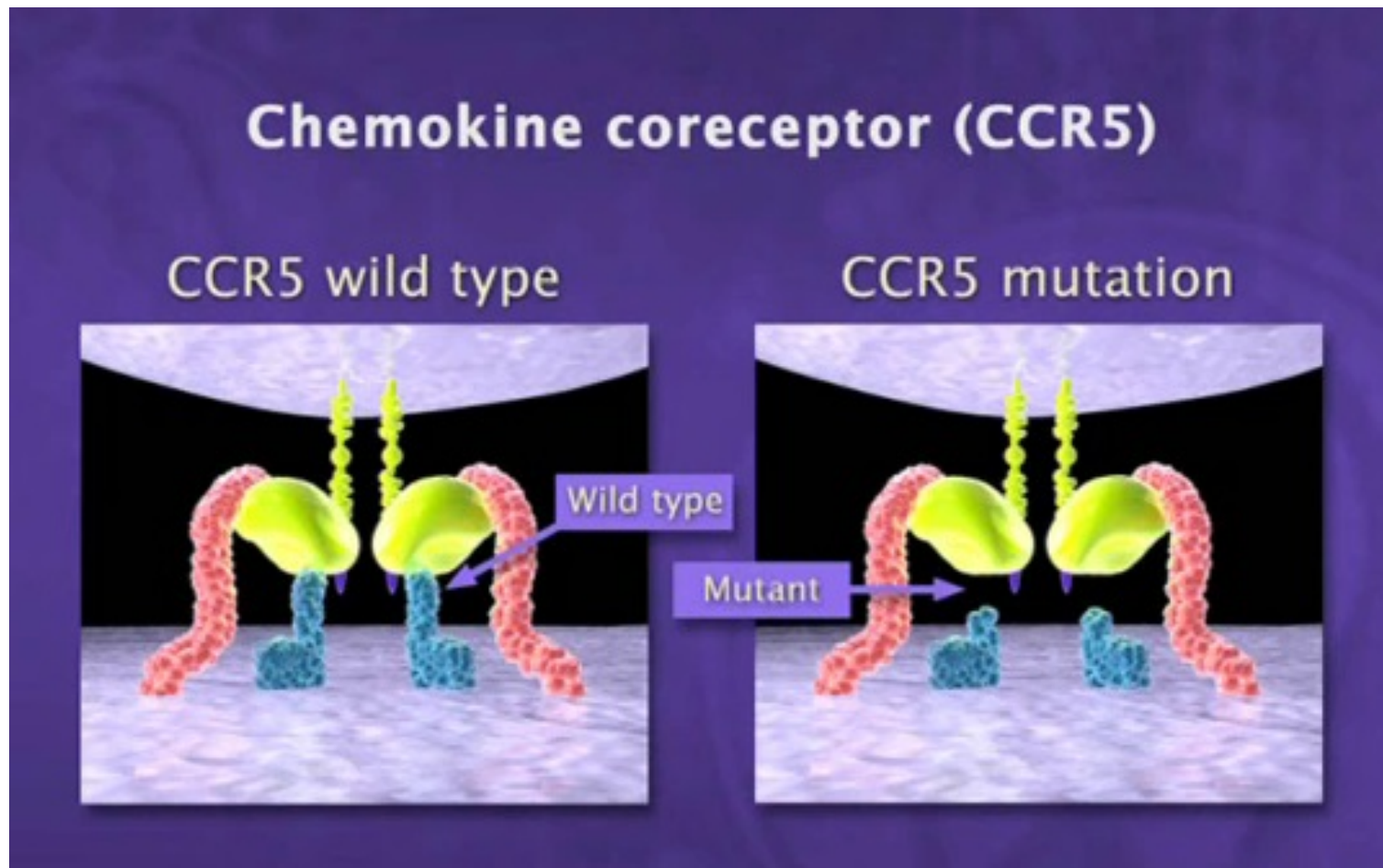
HIV's binding to CD4



HIV-CCR5 Interaction



WT vs. Mutant CCR5



Competition

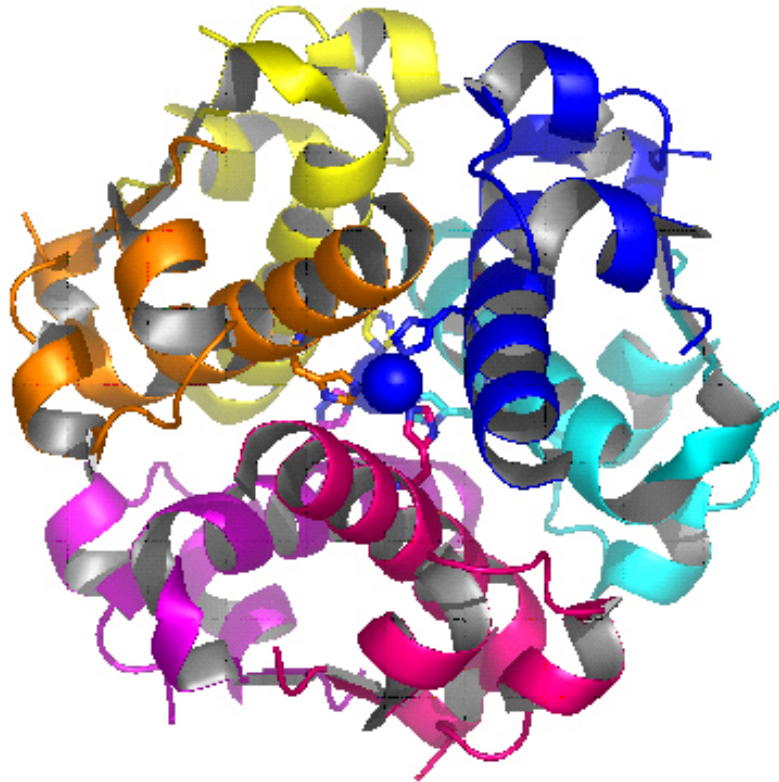
- Anti-retroviral medication
 - Inhibitors for RT/integrase/protease
- Genomic Studies
 - HIV progresses differently in patients
- Our goal:
 - Prevention of infection

Knowns and Unknowns

- Knowns:
 - Gp120 importance
 - CCR5 mutation -effective in preventing HIV entry
 - HIV life cycle
- Unknowns:
 - Full effect on T helper cells
 - HIV diversity and its effect

Idea #2: Delivery of Insulin

- Insulin-producing microbe coupled with a glucose level detection device



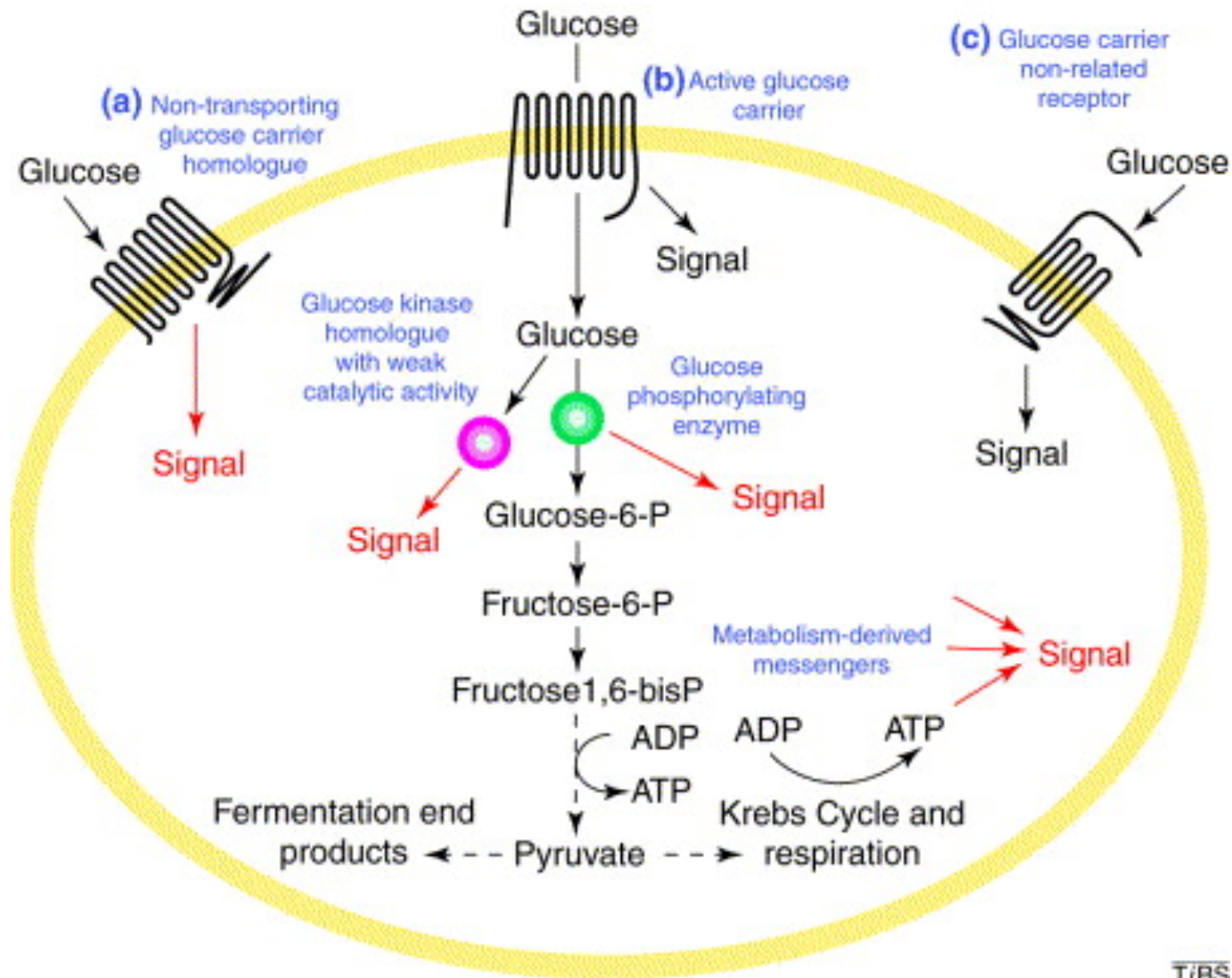
Importance

- Type I vs. Type II
- Chronic condition with no cure
- Insulin
 - Daily injection
 - Insulin pumps
- Widespread and costly

Impact

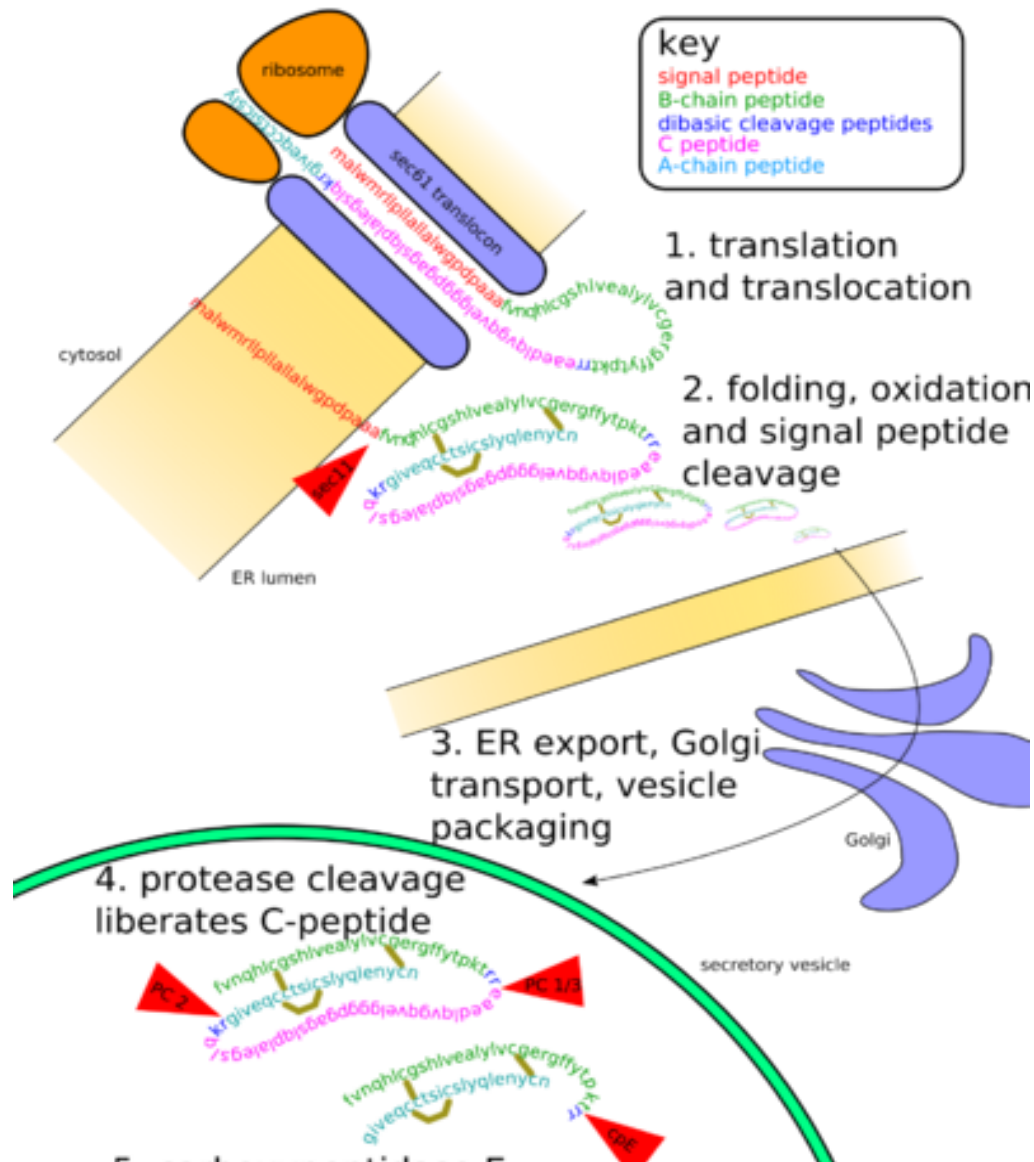
- Reduces pain
- Less frequent
- Decreases costs
- Not noticeable & convenient
- Patient compliance

Mechanism of Glucose Sensing



T/RS

Conversion of proinsulin into insulin



Picture courtesy of Isaac Yonemoto (Inkscape image)

Competition

- Insulin injection or Insulin pumps



- Beta cell implant



Knowns and Unknowns

- Knowns:
 - Recombinant DNA
 - Yeast signal cascade
- Unknowns:
 - The design of yeast cells
 - Survival in human blood
 - Regulation of delivery
 - Other similar research?

Idea #3: Mucus



Importance

- Mucus hypersecretion is a major cause of airway obstruction in Cystic fibrosis
 - Inherited chronic disease
 - Affects about 30,000 children and adults in the US and 70,000 in the world

Impact

- Develop Biological Agent
 - Microbe that secretes surfactant
 - Decreases viscosity of mucus
 - Natural mucosal clearance
 - Permanent



Competition

Cystic Fibrosis

- Classic mucolytics
- Peptide mucolytics
- Expectorants
- Hyperosmolar aerosols
- Mucoregulatory drugs



Mannitol

Knowns and Unknowns

- Knowns:
 - Peptide mucolytics > classic mucolytics
 - Benefit of airway hydration
- Unknowns:
 - Mechanisms of epithelial mucus regulation
 - Effective mechanism for mucus expulsion
 - Delivery

Conclusion

- Idea #1: Target HIV with genetic engineering
- Idea #2: Glucose-sensing + insulin-producing microbes
- Idea #3: Mucus degradation in CF patients by biological agent

Works Cited

HIV:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2584968/?tool=pmcentrez>

<http://www.jimmunol.org/content/165/9/5170.abstract>

<http://www.nature.com/ni/journal/v8/n12/abs/ni1521.html>

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0003671>

Insulin:

<http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2958.2000.02125.x/full>

<http://w3.ualg.pt/~jvarela/biotecnol/pdf/humaninsulin.pdf>

<http://www.sciencemag.org/content/206/4423/1190.short>

<http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682611.html>

Mucus/CF:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1433406/>

<http://ajrcmb.atsjournals.org/content/44/4/562.abstract>

<http://ajrccm.atsjournals.org/content/183/11/1463.abstract>

<http://www.mayoclinic.com/health/cystic-fibrosis/DS00287/DSECTION=treatments-and-drugs>

The End

We'd love to hear your
questions and comments!