

**Verbal Finals:** "The final day to pass with a LA is Friday, **April 7th**" "Last day Luckie will offer opportunities to pass the VF will be Friday, **April 14th.**"

**1. Pick up Name Folder**

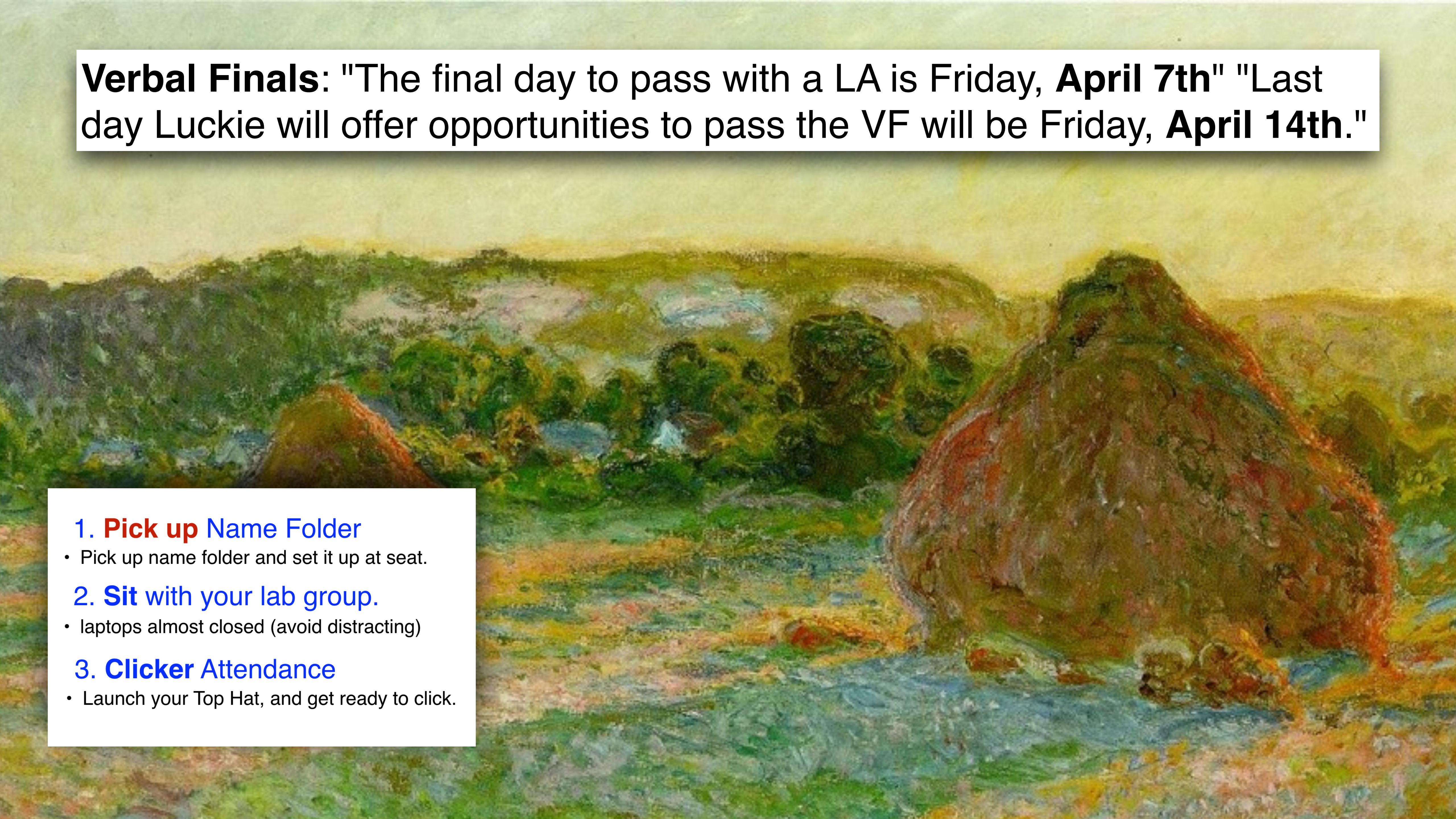
- Pick up name folder and set it up at seat.

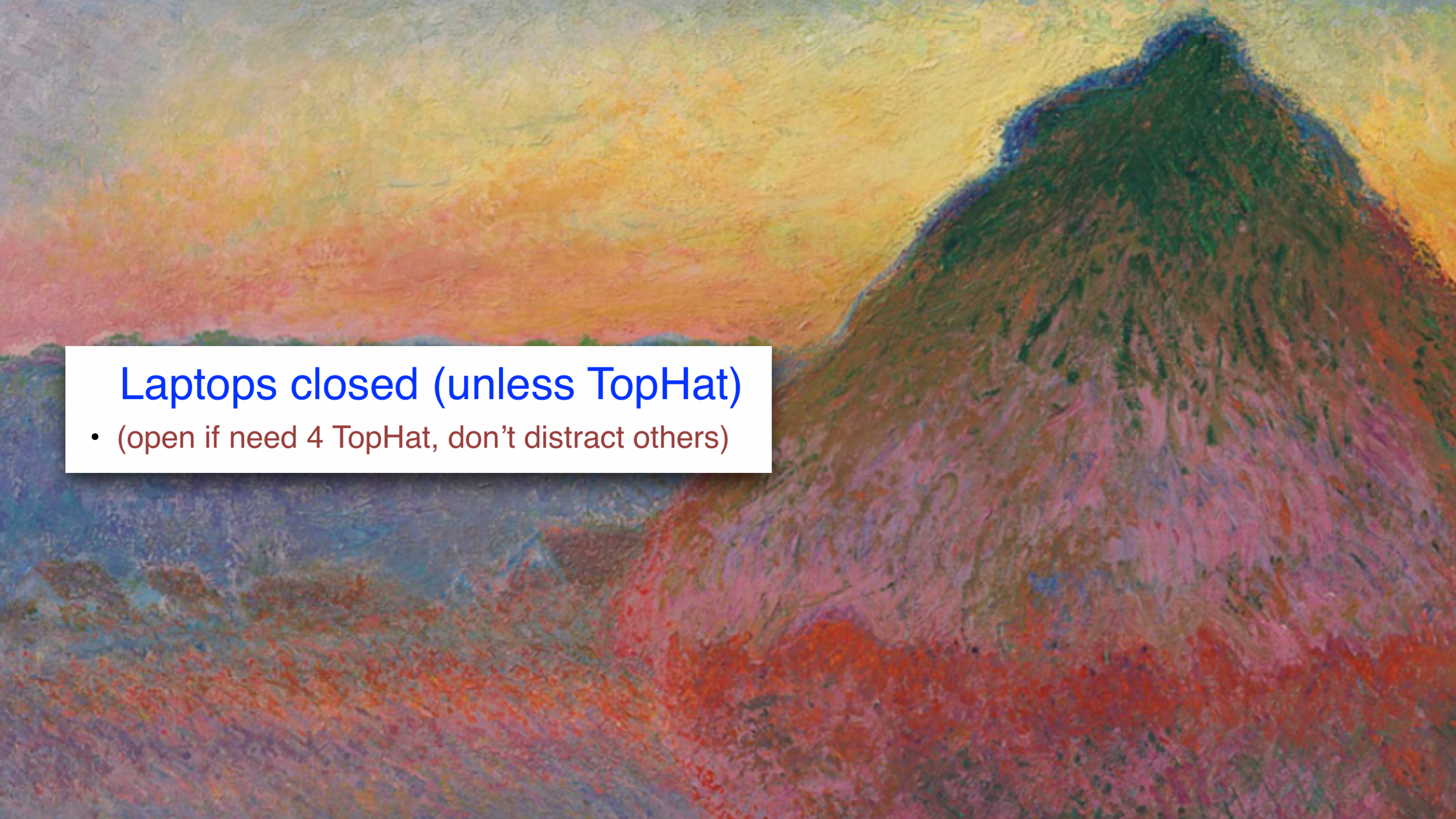
**2. Sit with your lab group.**

- laptops almost closed (avoid distracting)

**3. Clicker Attendance**

- Launch your Top Hat, and get ready to click.



An impressionist painting of a landscape. The scene features a large, dark green mountain peak on the right side, with a blue outline. The sky is a mix of yellow, orange, and pink, suggesting a sunset or sunrise. The foreground is a textured, colorful area with shades of purple, red, and blue, possibly representing a field or a path. The overall style is characterized by visible brushstrokes and a vibrant, somewhat abstract color palette.

## Laptops closed (unless TopHat)

- (open if need 4 TopHat, don't distract others)

# Announcements

1. **Exam II results** (Part1=effort, Part2=accuracy, Final total= average 76%)
2. **MidSemester SALG Evaluation Feedback** will be provided in its entirety online. Remind me to discuss with 10 minutes remaining.

**Budgeting homework time (60 min):** This is a professional Review paper that is 3700 words in length from an important medical journal so it will take some time to read, but if you have gained some understanding about genetics and diseases while working in the lab this semester you should be able to more quickly grasp most of what is discussed. If you struggle with the text, focus on each figure and determine what it is trying to explain. Scientists almost always first focus on the figures.

1. \_\_\_\_\_ **For Tuesday's lecture**, read Kenneth Polonsky's review paper on "The Past 200 Years in Diabetes" published in *New England Journal of Medicine* in 2012. This paper is provided at the back of your Course Pack. You do not need to take notes from all the written text, simply read for your own learning and to help you with your research.
2. \_\_\_\_\_ While reading, **focus mostly on the figures**. We will discuss these in class. Be prepared to state aloud what each figure is trying to explain or communicate.
3. \_\_\_\_\_ **Write out in your notebook** your explanation for Figure 2 and how that structure relates to what you learned about the biosynthesis of a protein back in the reading and lecture about *Endomembranes*. Describe how you predict the insulin protein is made DNA -> RNA -> protein and the path it takes via which organelles and what happens to it at each?

# The Past 200 Years in Diabetes

Kenneth S. Polonsky, M.D.

From the Department of Medicine, University of Chicago, Chicago. Address reprint requests to Dr. Polonsky at the Department of Medicine, University of Chicago, 5841 S. Maryland Ave., Chicago, IL 60637, or at polonsky@bsd.uchicago.edu.

N Engl J Med 2012;367:1332-40.

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**D**IABETES WAS FIRST RECOGNIZED AROUND 1500 B.C.E. BY THE ANCIENT Egyptians, who considered it a rare condition in which a person urinated excessively and lost weight. The term diabetes mellitus, reflecting the fact that the urine of those affected had a sweet taste, was first used by the Greek physician Aretaeus, who lived from about 80 to 138 C.E. It was not until 1776, however, that Matthew Dobson actually measured the concentration of glucose in the urine of such patients and found it to be increased.<sup>1</sup>

Diabetes was a recognized clinical entity when the *New England Journal of Medicine and Surgery* was founded in 1812. Its prevalence at the time was not documented, and essentially nothing was known about the mechanisms responsible for the disease. No effective treatment was available, and diabetes was uniformly fatal within weeks to months after its diagnosis owing to insulin deficiency. In the intervening 200 years, major fundamental advances have been made in our understanding of the underlying causes of diabetes and the approach to its prevention and treatment (see timeline, available with the full text of this article at NEJM.org). Although diabetes is still associated with a reduced life expectancy, the outlook for patients with this disease has improved dramatically, and patients usually lead active and productive lives for many decades after the diagnosis has been made. Many effective therapies are available for treating hyperglycemia and its complications.

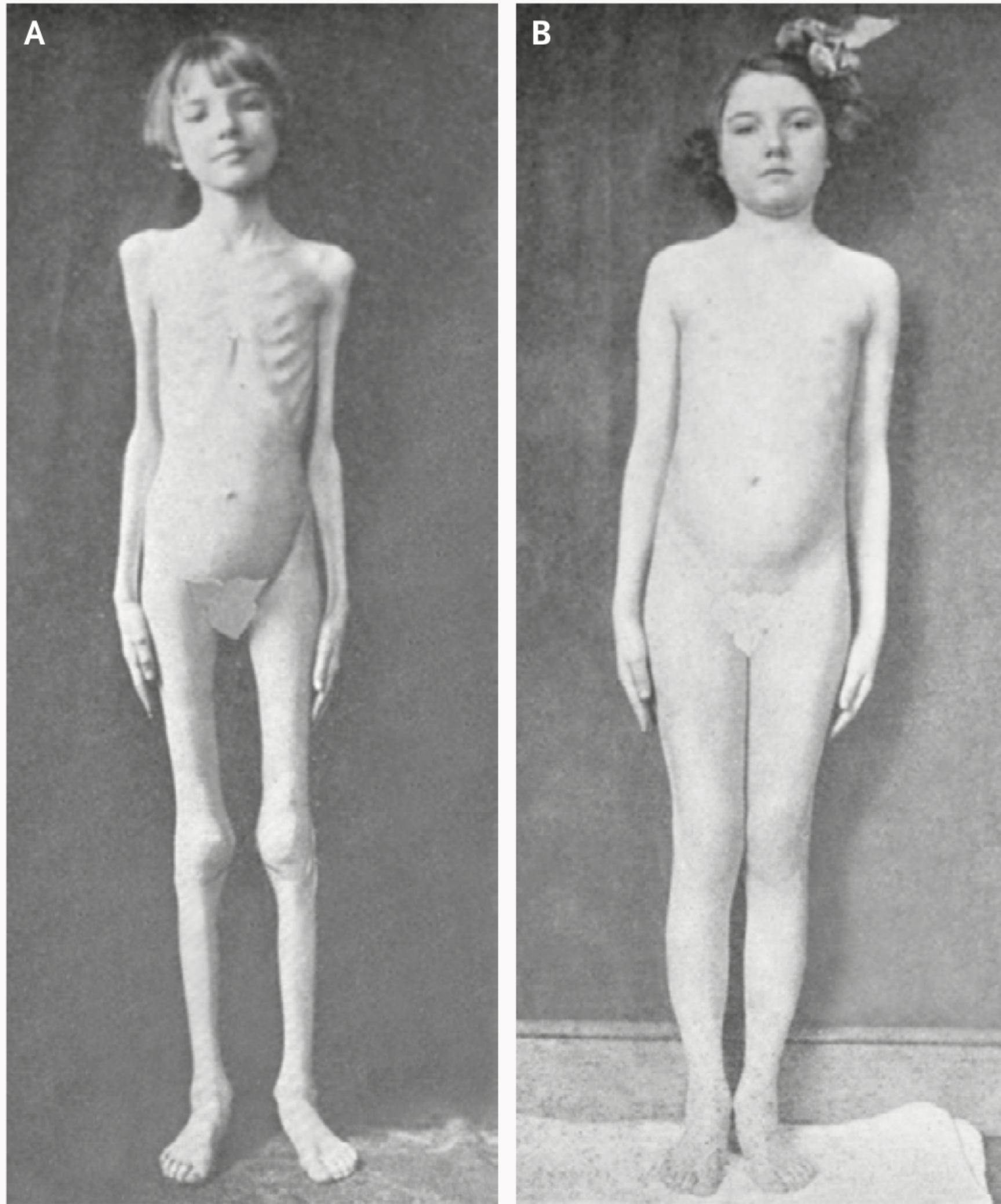


A timeline is  
available at  
NEJM.org



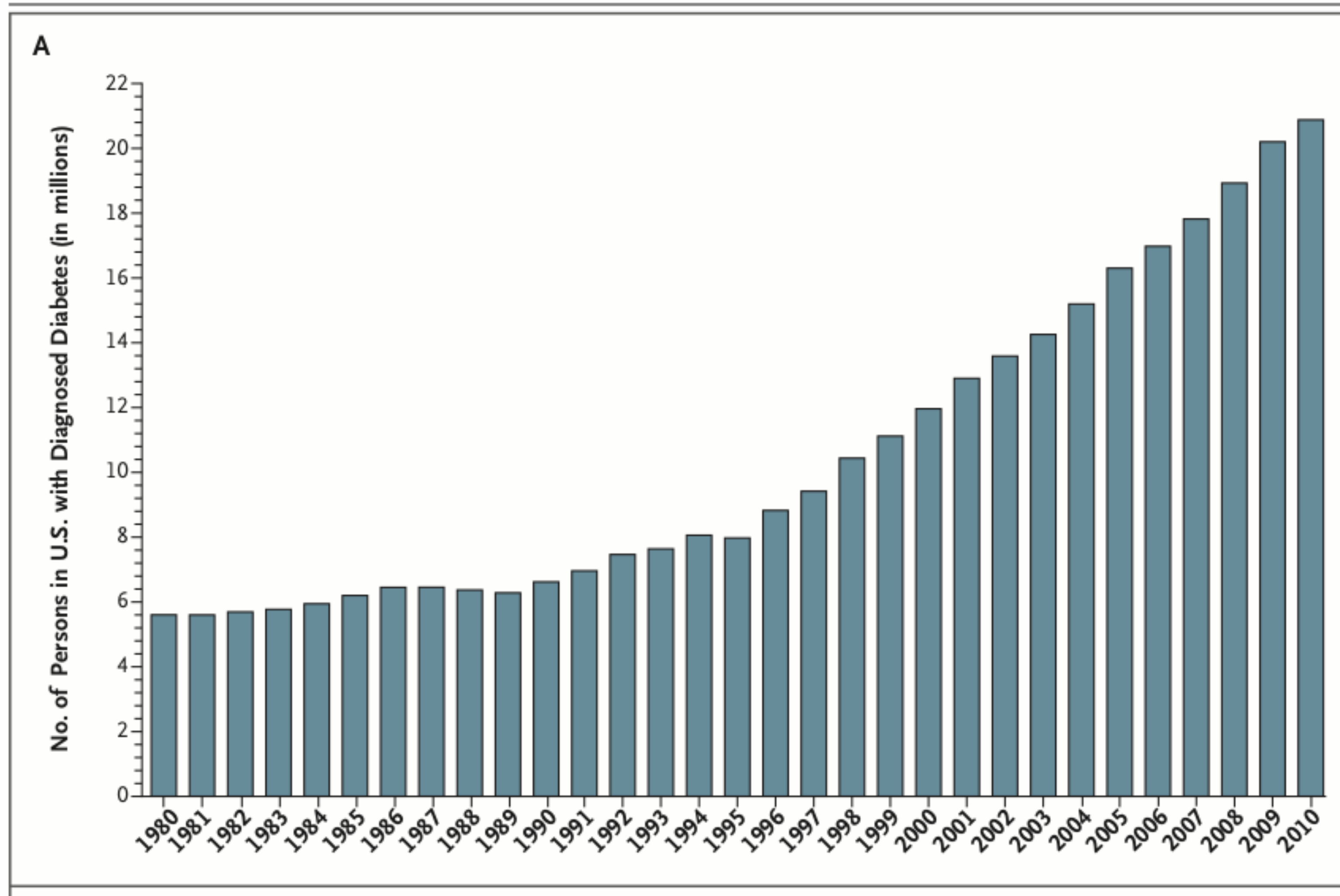
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**Figure 1. Effects of Insulin Therapy.**

These photographs from 1922, in a case described by Geyelin,<sup>11</sup> show a young girl with insulin-deficient diabetes before treatment with insulin (Panel A) and after treatment (Panel B).



# The Past 200 Years in Diabetes

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## So what causes Diabetes??

Diabetes was a recognized clinical entity when the *New England Journal of Medicine and Surgery* was founded in 1812. Its prevalence at the time was not documented, and essentially nothing was known about the mechanisms responsible for the disease. No effective treatment was available, and diabetes was uniformly fatal within weeks to months after its diagnosis owing to insulin deficiency. In the intervening 200 years, major fundamental advances have been made in our understanding of the underlying causes of diabetes and the approach to its prevention and treatment (see timeline, available with the full text of this article at NEJM.org). Although diabetes is still associated with a reduced life expectancy, the outlook for patients with this disease has improved dramatically, and patients usually lead active and productive lives for many decades after the diagnosis has been made. Many effective therapies are available for treating hyperglycemia and its complications.



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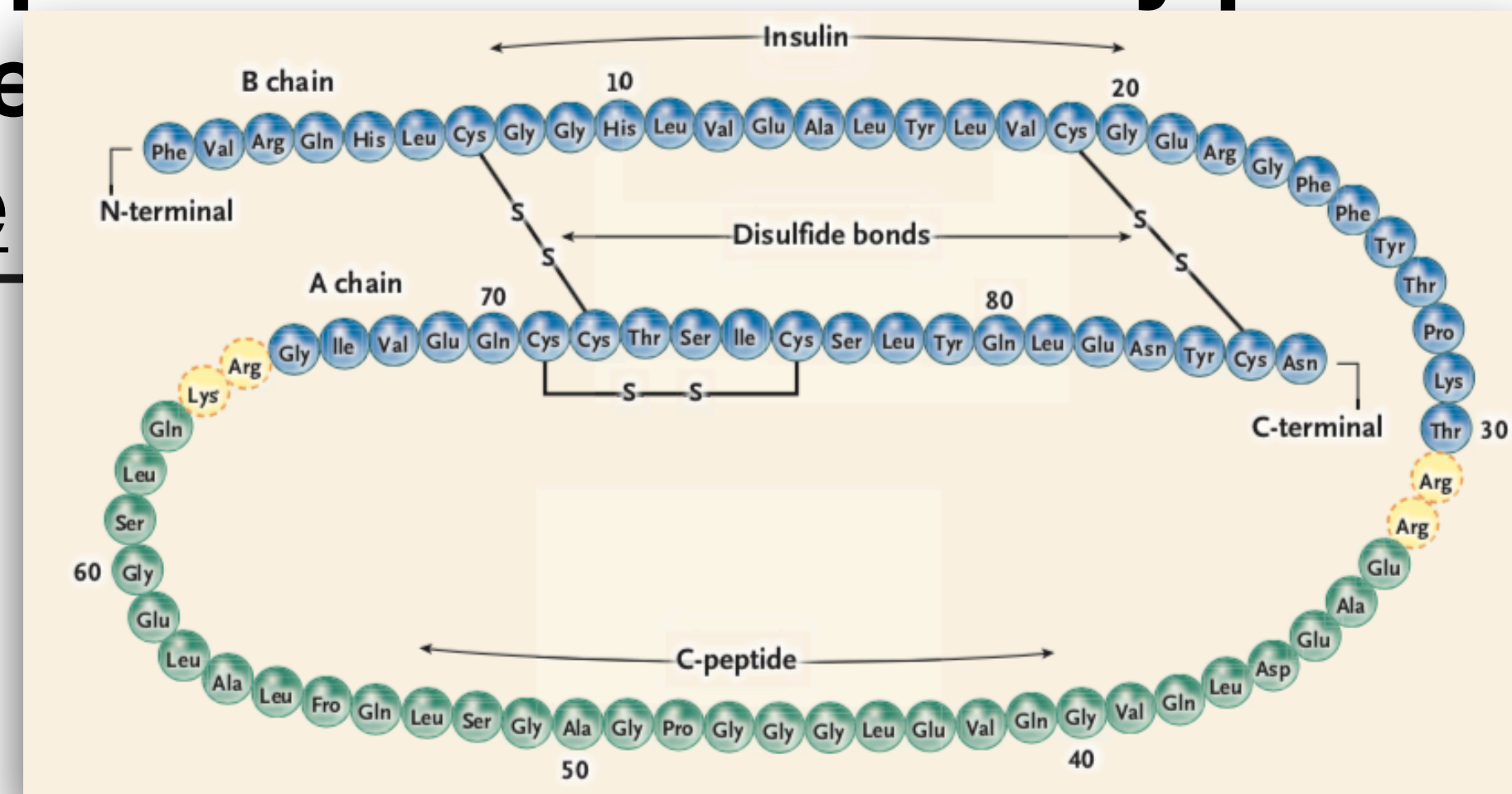
Type 1?

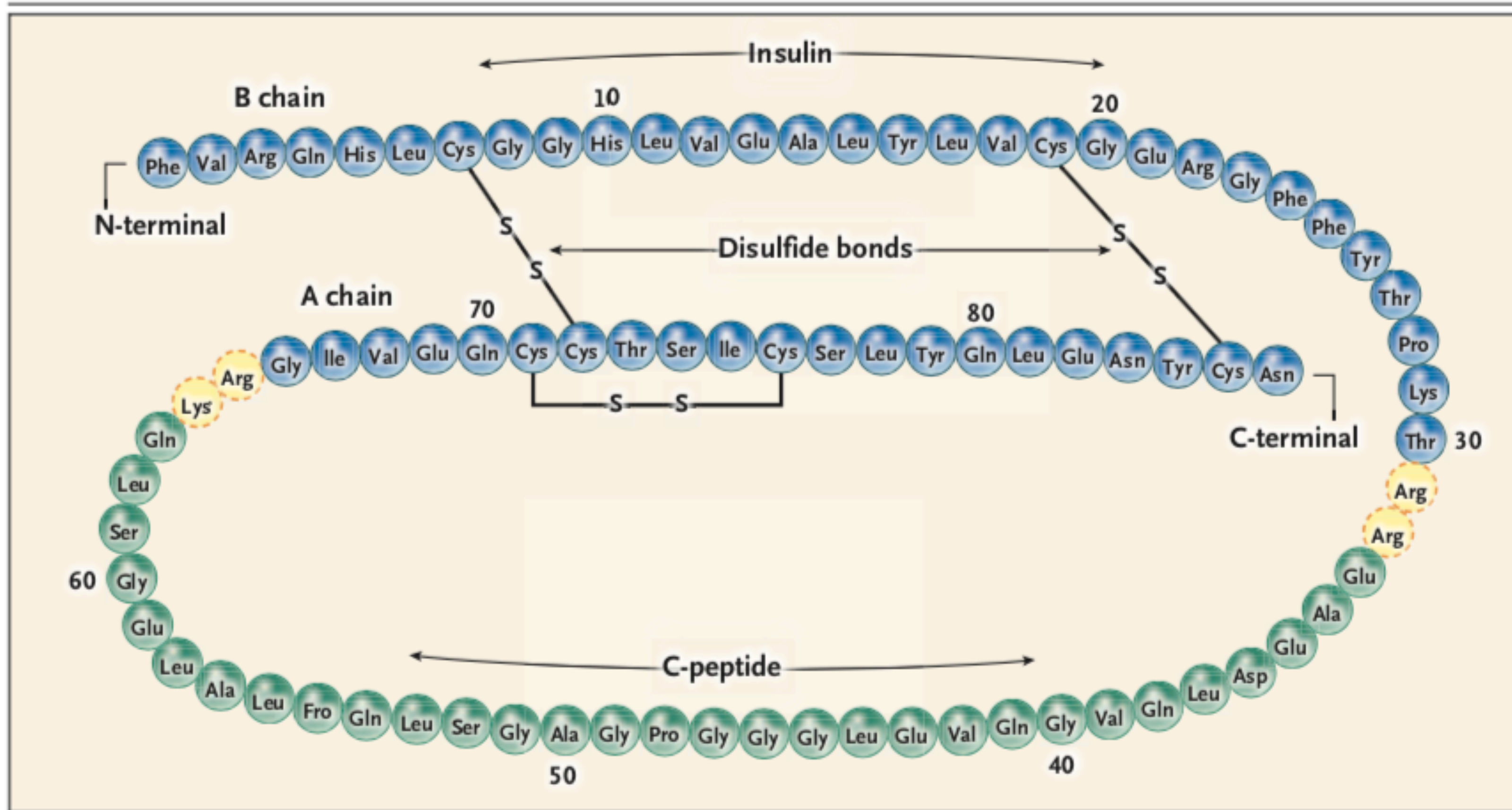
Type 2?

**“So what causes Diabetes?”**  
(failure at generation or action of insulin)

Type 1 diabetes occurs predominantly in young people and is due to selective autoimmune destruction of the pancreatic beta cell, leading to insulin deficiency.

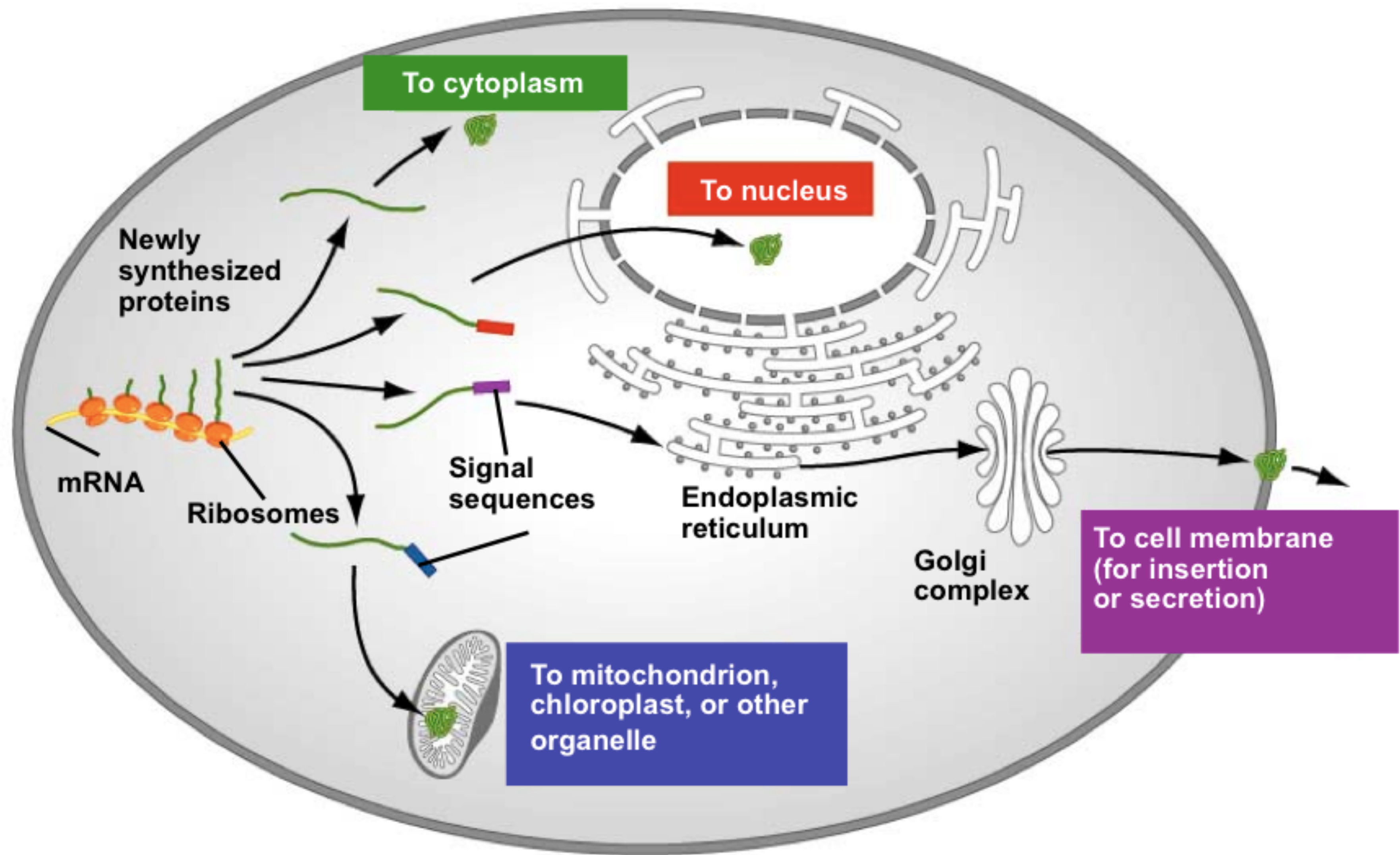
Himsworth first proposed in 1936 that many patients with diabetes have insulin resistance. We now know that insulin resistance is a characteristic of type 2 diabetes

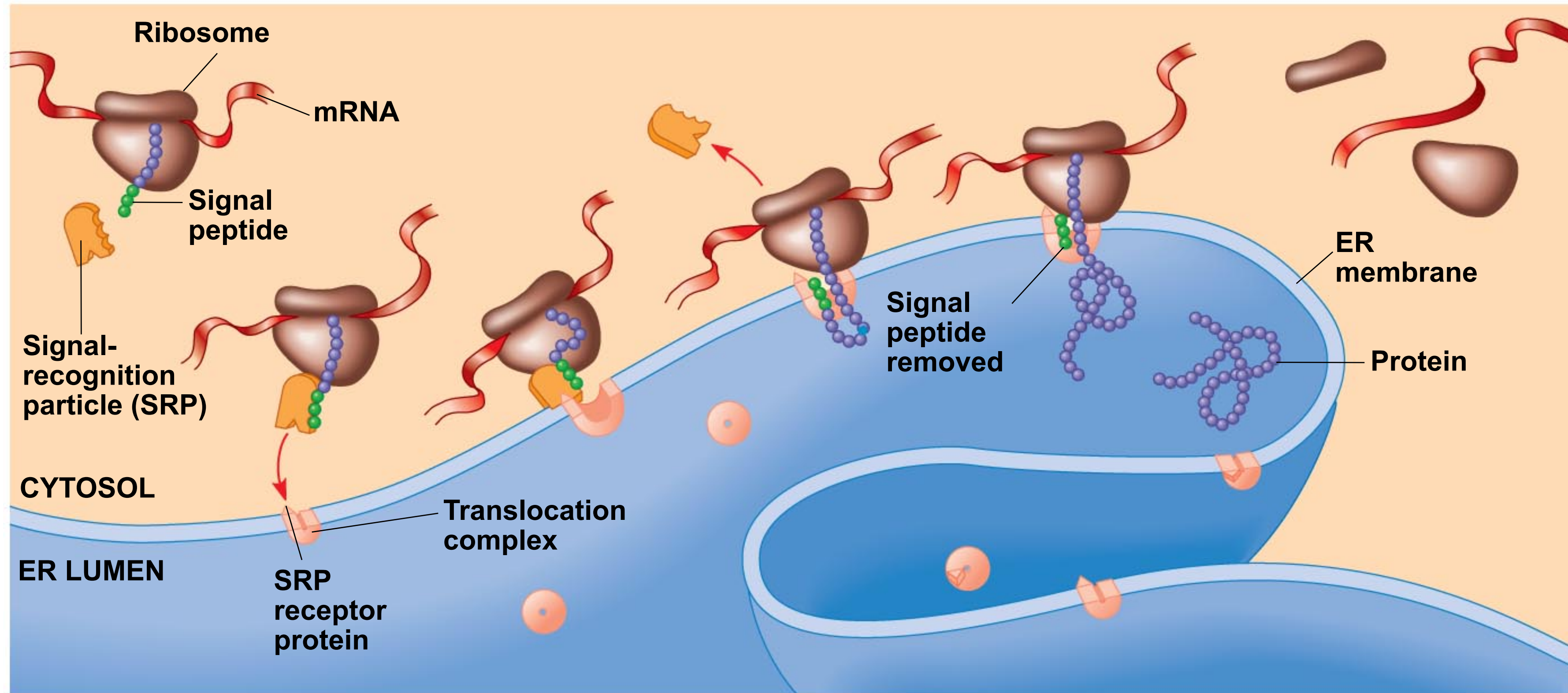


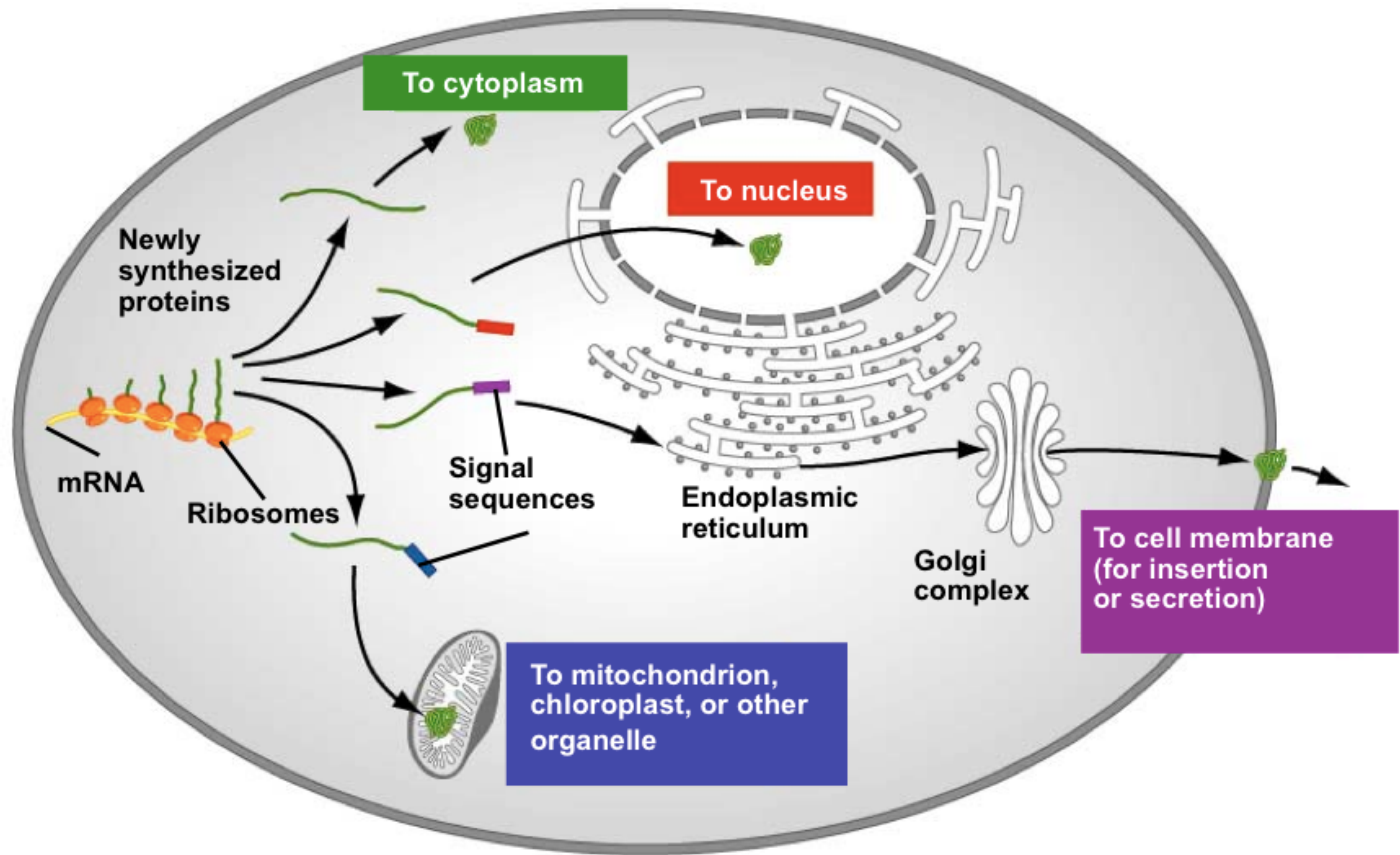


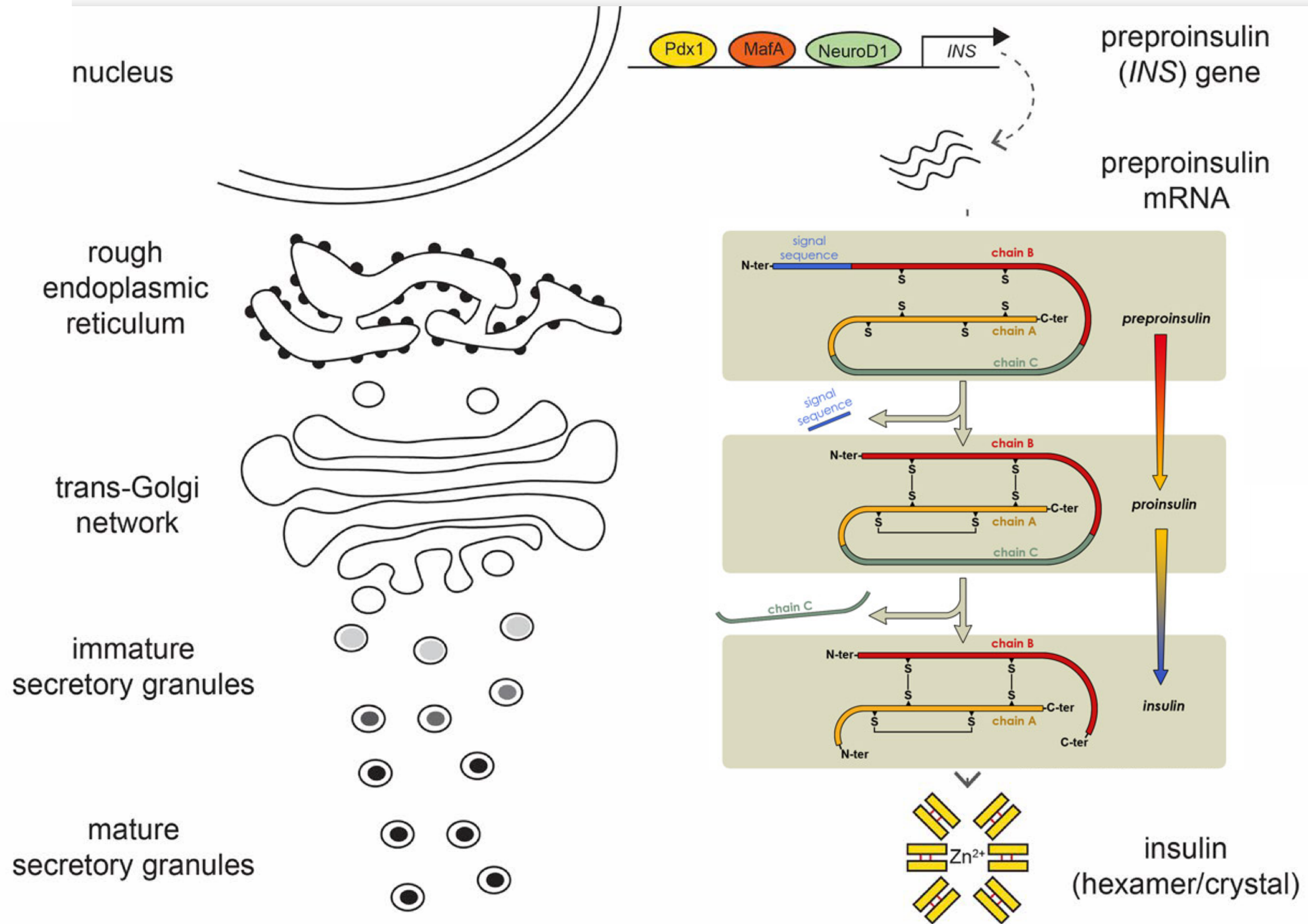
**Figure 2. The Structure of Human Proinsulin.**

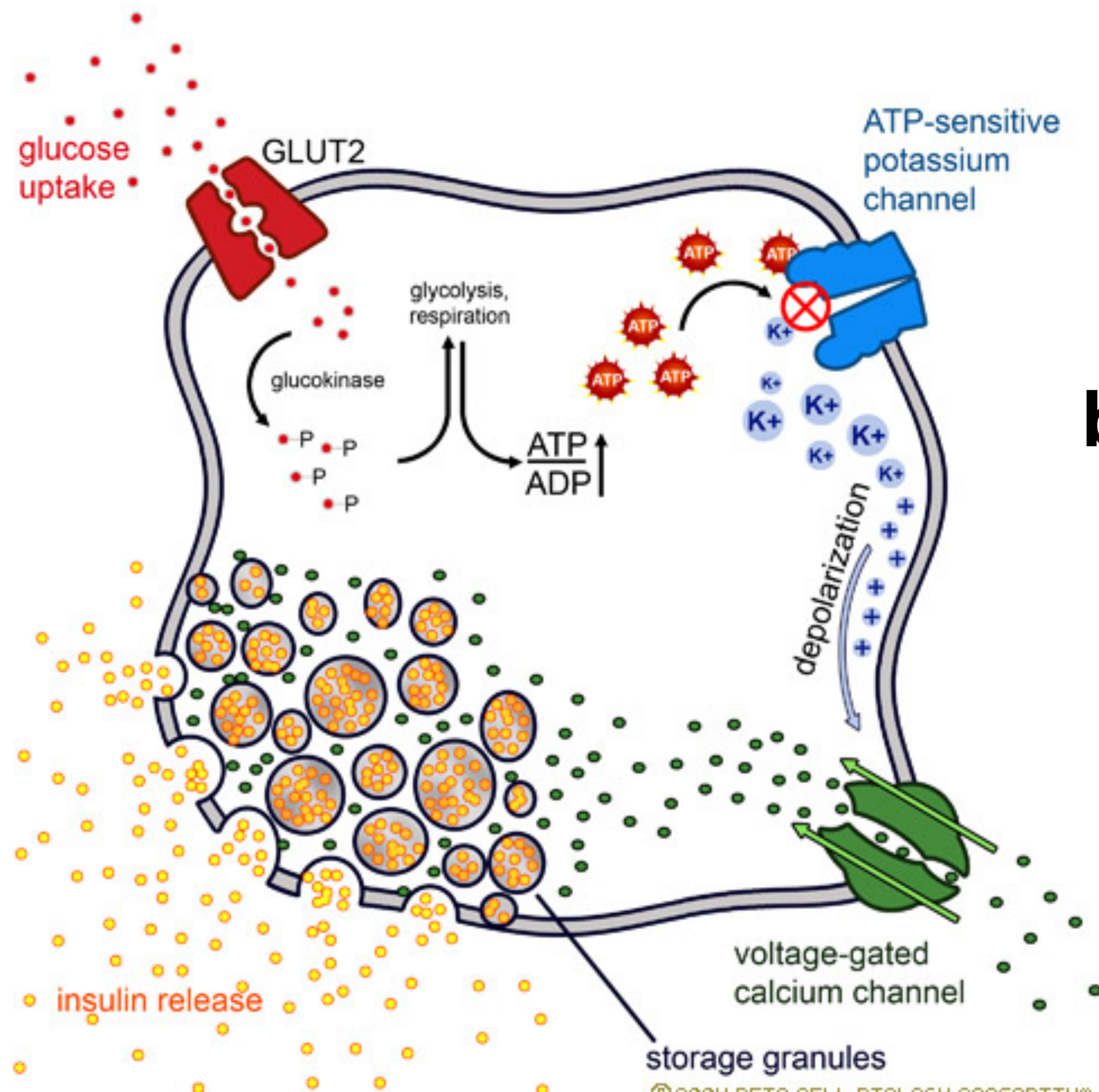
Proinsulin is converted to insulin by proteolytic converting enzymes that remove the connecting peptide (C-peptide) and the lysine-arginine (Lys-Arg) and arginine-arginine (Arg-Arg) sequences of dibasic amino acids, leaving the mature insulin molecule, which consists of A and B chains connected by disulfide bonds.







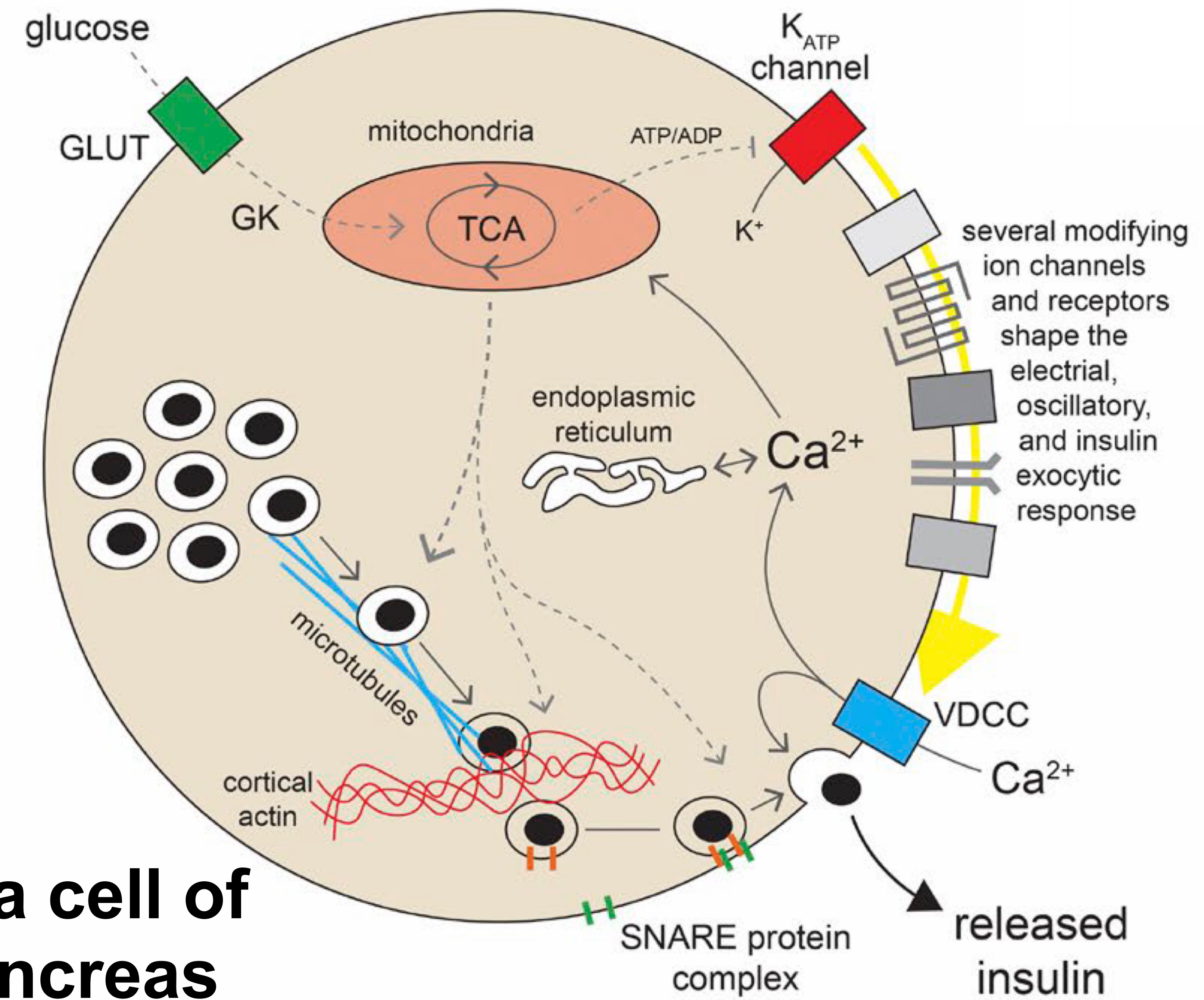




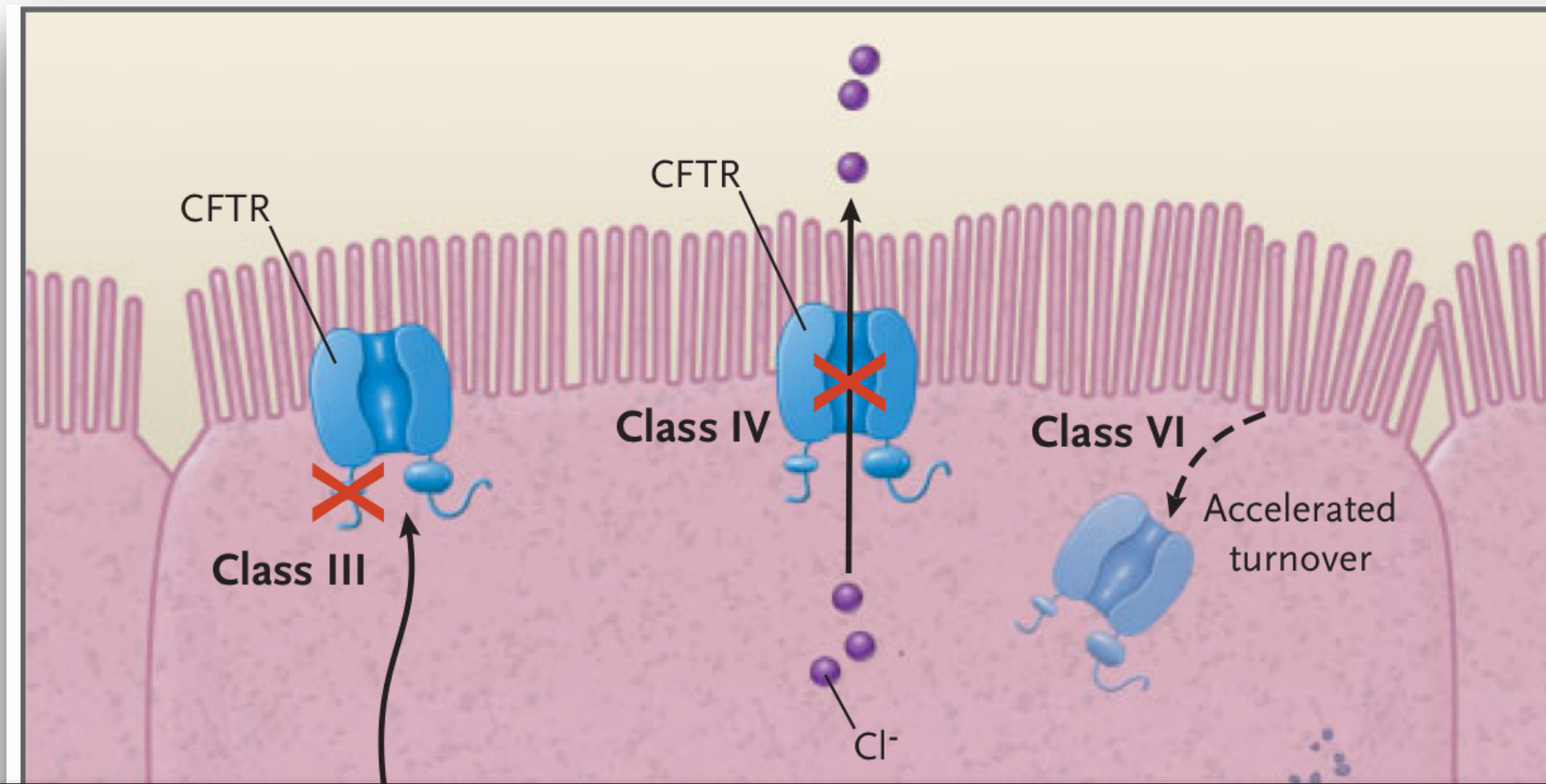
# beta cell of pancreas



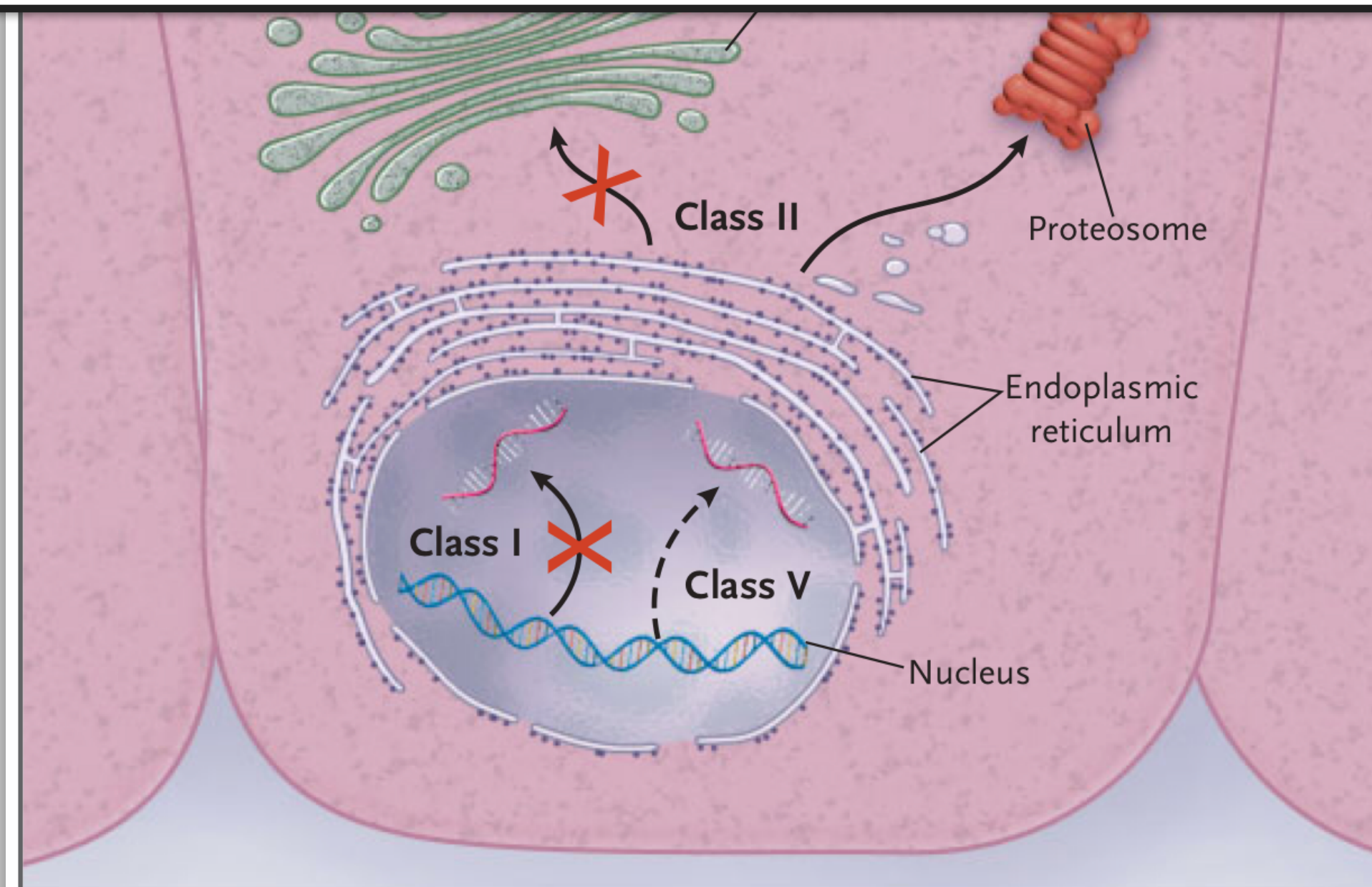
**B**



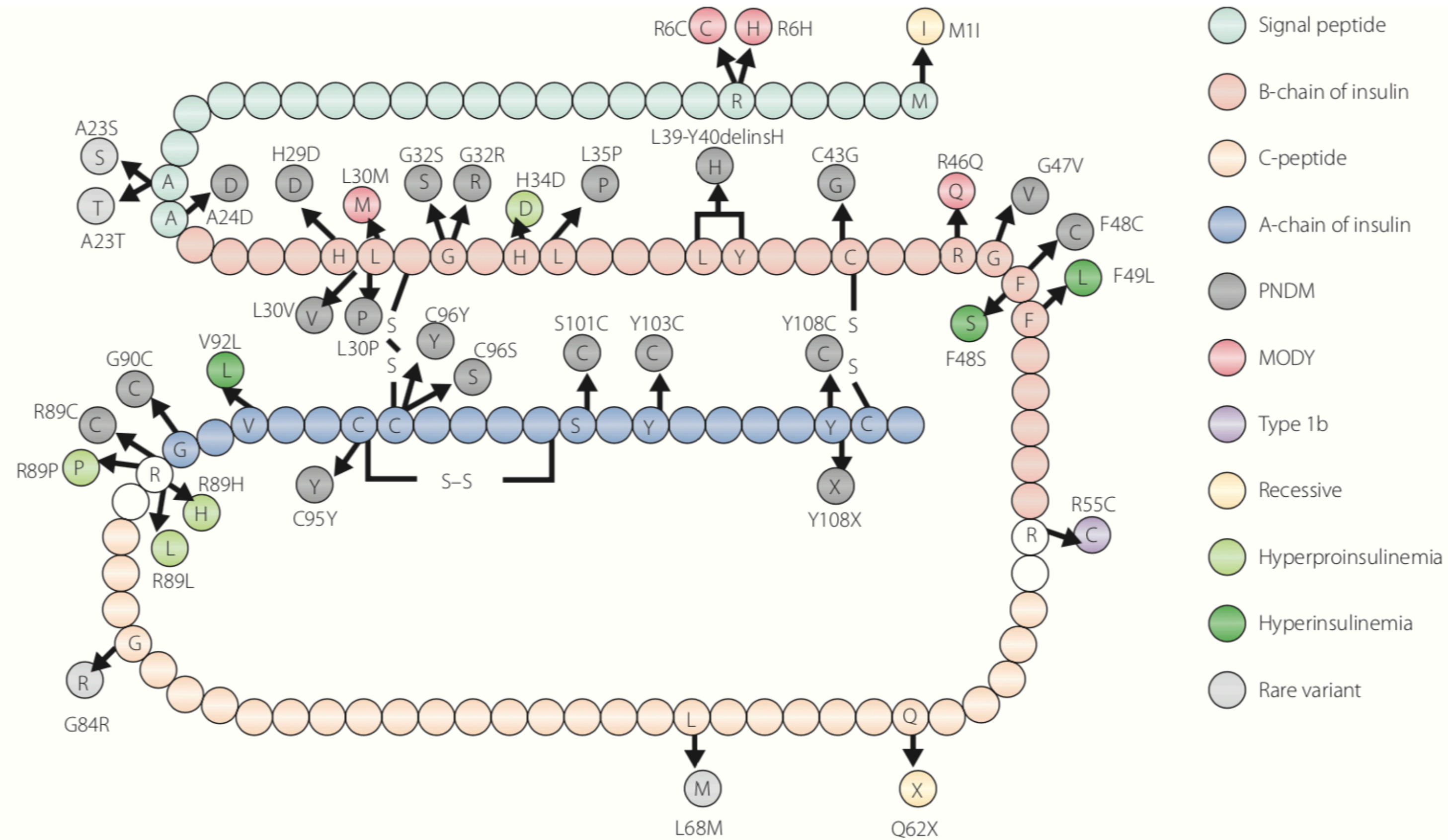
**beta cell of  
pancreas**



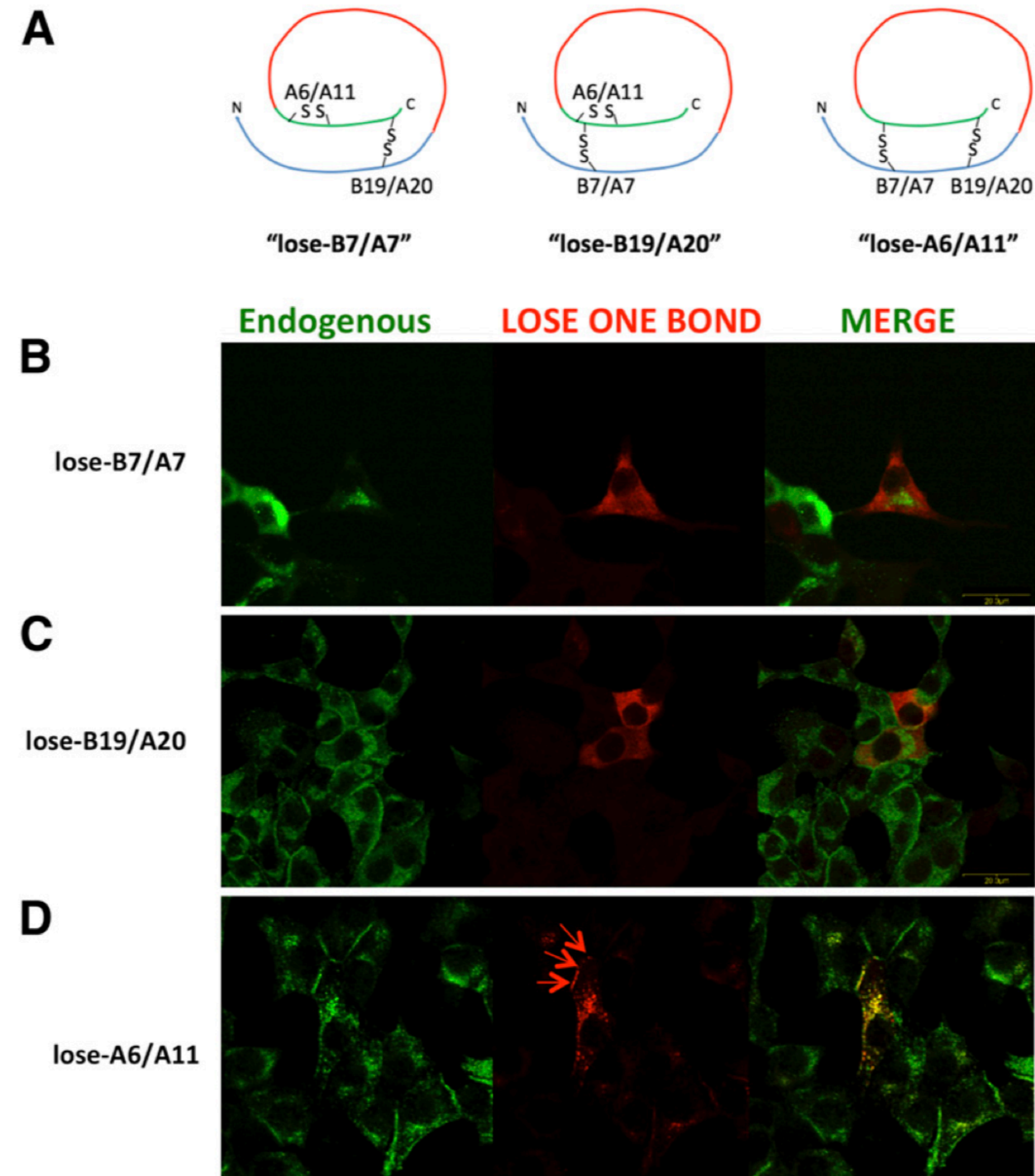
# So what causes cystic fibrosis??



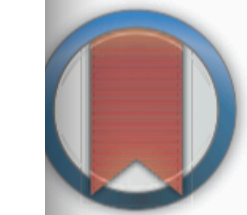
**Figure 5.** Categories of CFTR Mutations.



**Figure 2** | Schematic representation of the amino acid sequence of human preproinsulin showing the positions of mutations. Signal peptide,  $\beta$ -chain or  $\alpha$ -chain of insulin, and C-peptide are shown in different colors. Mutations identified in patients with permanent neonatal diabetes mellitus, maturity-onset diabetes of the young, type 1b-like, hyperproinsulinemia, hyperinsulinemia or recessive mutation are shown in different colors. Modified from Stoy J, Steiner DF, Park S-Y *et al.* Clinical and molecular genetics of neonatal diabetes due to mutations in the insulin gene. *Rev Endocr Metab Disord* 2010; 11: 205–215.



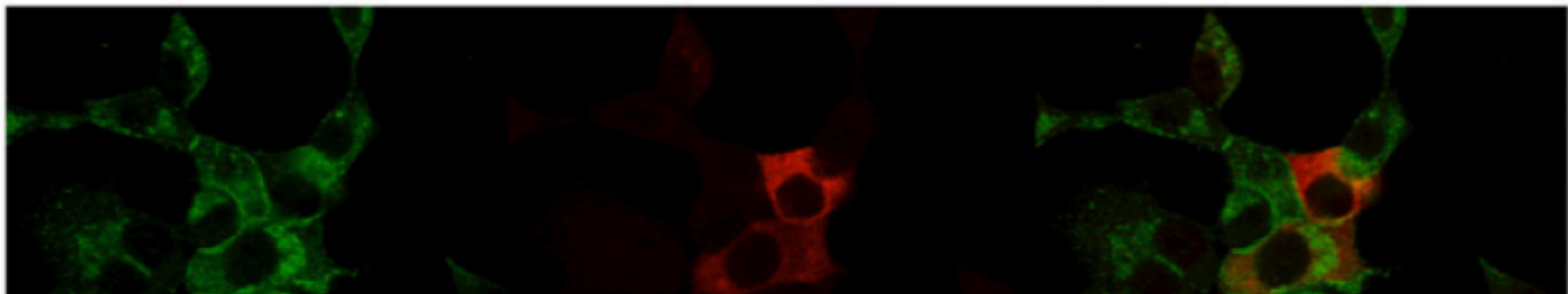
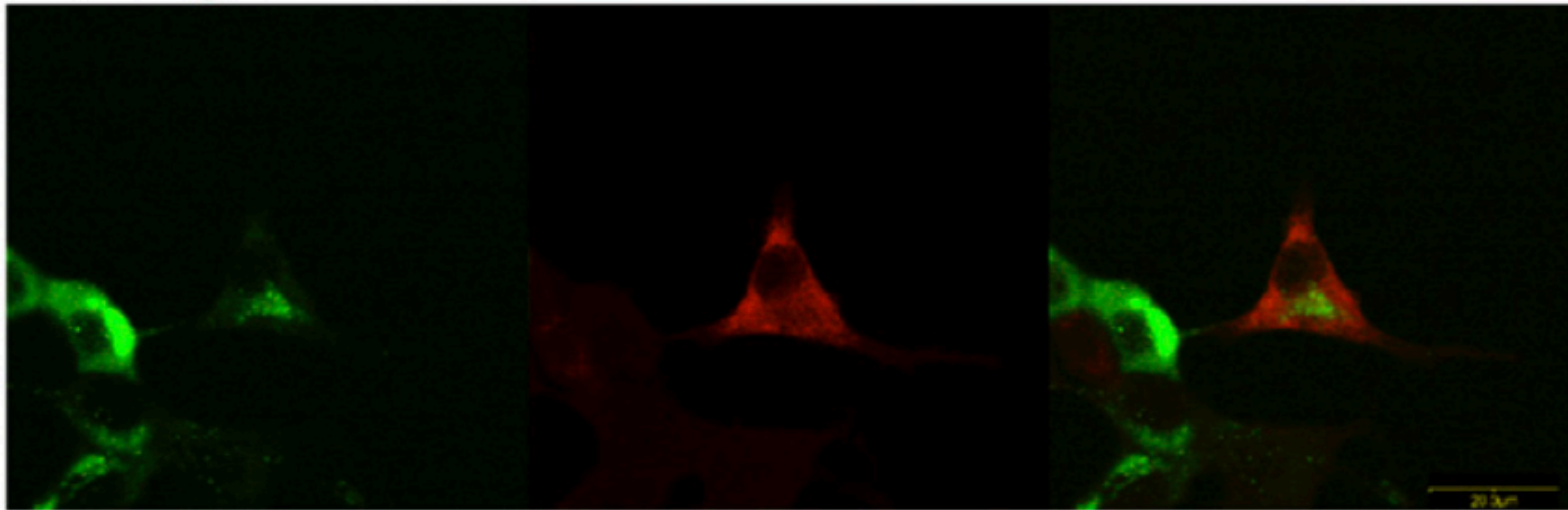
**Figure 1**—Expression of proinsulin “lose one bond” mutants in pancreatic  $\beta$ -cells. **A**: Schematic of the “lose mutants”; all constructs were myc tagged within the C-peptide (shown in red). **B–D**: Indirect immunofluorescence localization of lose mutants in INS1 cells (anti-myc [in red]) compared with that observed for anti-insulin that detects primarily the endogenous *Ins1* and *Ins2* gene products (in green)—a merged image is shown at right. The red arrows indicate the subplasmalemmal distribution of insulin secretory granules. Scale bar = 20  $\mu$ m.



Endogenous

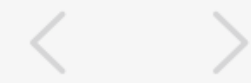
LOSE ONE BOND

MERGE



# Mid Semester SALG

Read online -> [ctools.msu.edu/  
MidSALG-S2023.xlsx](https://ctools.msu.edu/MidSALG-S2023.xlsx)



AA

Not Secure — ctools.msu.edu



## Statistics

## Long answers

ID	Numb	Question	Type	N	Mean	Std dev	Choices...			
246		<b>Your understanding of class content</b>	Category							
247	1	As a result of your work in this class, what GAINS DID YOU MAKE in your UNDERSTANDING of each of the following?	Category							
238843	1.1	CONTINUE: In general, what do you think helped you the most in learning biology in this course, so far, which you'd like to continue?	Long answer	25						
238844	1.2	STOP: So far, what do you think helped you the least in learning biology in this course, that you'd suggest be stopped?	Long answer	24						
238845	1.3	START: What change or new approach do you think would help everyone challenge themselves to study and learn even more?	Long answer	25			<b>1: no gains</b>	<b>2: a little gain</b>	<b>3: moderate gain</b>	<b>4: good gain</b>
201066	1.4	Overall: As of now, how much has the class increased your understanding of cell and molecular biology	Select one	25	<b>4.6</b>	0.57	1: 0%	2: 0%	3: 3%	4: 19%
260		<b>Increases in your skills</b>	Category							
261	2	As a result of your work in this class, what GAINS DID YOU MAKE in the following SKILLS?	Category							
201067	2.1	How much do you think you mastered the techniques of the laboratory so far?	Select one	25	<b>4.6</b>	0.65	1: 0%	2: 0%	3: 5%	4: 19%
61266	2.2	What gains did you make in writing documents in discipline-appropriate style and format	Select one	25	<b>4.1</b>	0.88	1: 3%	2: 0%	3: 5%	4: 38%
272		<b>Class impact on your attitudes</b>	Category							
273	3	As a result of your work in this class, what GAINS DID YOU MAKE in the following?	Category							
61267	3.1	Enthusiasm for the subject of biology	Select one	25	<b>4.4</b>	0.96	1: 3%	2: 0%	3: 5%	4: 19%
61268	3.2	Your confidence in your own ability to pursue laboratory research in the area of molecular biology	Select one	25	<b>4.4</b>	1.00	1: 3%	2: 0%	3: 8%	4: 14%
61269	3.3	Your confidence in your own ability to explain the topics discussed in the course (eg cell biology, photosynthesis, central dogma)	Select one	25	<b>4.4</b>	0.91	1: 3%	2: 0%	3: 3%	4: 24%
283		<b>Integration of your learning</b>	Category							
284	4	As a result of your work in this class, what GAINS DID YOU MAKE in INTEGRATING the following?	Category							
61270	4.1	Beyond just biology, the understanding of how your disease research can impact real world issues and people	Select one	25	<b>4.3</b>	0.94	1: 3%	2: 0%	3: 5%	4: 27%
238846	4.2	Whether in lecture or in lab, Dr. Jennifer Knight's research at UC Boulder has shown that when learning assistants (LAs) *guide* students to find their own answers rather than providing their opinions, students more quickly master the material. This is the method LAs are trained to follow as best they can.	Category							
201074	4.2.1	Why do you predict this approach increases student learning and success?	Long answer	25						
201075	4.2.2	Do you agree with this approach? If not, how would you change the training?	Long answer	25						
238847	4.2.3	Have any LAs successfully helped you? Please provide their name, and then what they did that helped you learn, or what they could do differently.	Long answer	23						
178		<b>The Class Overall</b>	Category							



## Statistics

## Long answers

<b>CONTINUE:</b> In general, what do you think helped you the most in learning biology in this course, so far, which you'd like to continue?	<b>STOP:</b> So far, what do you think helped you the least in learning biology in this course, that you'd suggest be stopped?	<b>START:</b> What change or new approach do you think would help everyone challenge themselves to study and learn even more?	(LAs) *guide* students to find their own answers: Why do you predict this approach increases student learning and success?	Do you agree with this approach? If not, how would you change the training?	Have any LAs successfully helped you? Please provide their name, and then what they did that helped you learn, or what they could do differently.	What aspect(s) of the smaller class size do you think helped your learning in lecture or lab?	How do you think minute lecture mi effected your lear
I have really enjoyed the work that we have to do before class even though it sucks to have to read so much its nice to come into class with some understanding and get try questions answered through class	I really enjoy the class i dont really believe anything has to change to make it better but things could be added to make it better	If there was sometimes a game aspect to answering questions. You did this one time in class early on and i thought it was fun and you can give a prize to the winning team like, some directions given in lab or some tips for the next exam something like that so you dont have to always give out extra credit and those who do the work get rewarded.	I love the idea but sometimes it get frustrating not knowing what's going on. It's really just the amount of group members the groups have that can hinder this learning	Yes it's fun and its a nice way to get to know your TAs	Yes Lauren has been the biggest help all year	Everything, getting to know classmates, teachers, LAs. Its all the best its the reason i wanted to apply for Lyman Briggs	It sometimes is long to labs that all
Definitely working in groups, and having the same group both in lectures and in the lab, has been extremely helpful to my learning. It is extremely nice to be able to reach out to people in my group that can apply their knowledge to both lab and lecture.  Another thing that has been very helpful is acting out biological scenarios in lab, specifically the entire light-dependent reactions. This was entirely helpful and gave me a different point of view where I was able to actually visualize myself inside the cell!	Personally, I feel as though due dates should be more spread out. I often find myself feeling like I am putting this class before all others due to due dates piling up in 145. Because of the harsh grading scale, it has really been affecting my mental health. We are all still learning and even though we are mostly all sophomores, college can still be an adjustment, and the sudden change in rigor may not be helpful to everyone. I feel as though my constant focus on the grading scale and getting a good grade actually hinders my learning more than helps it in some situations. It can be disheartening when you think you did a really good job on an assignment and receive a 2.5 in return. Other than that, I am really enjoying the structure of the course!	I wish there were more "traditional" lectures where Dr. Luckie really explains topics in depth. While the more discussion based lectures are helpful, traditional lectures are also very helpful when learning in-depth and detailed topics while the professor shares their expertise!	I think that this approach increases success because it basically forces students to think really in-depth about the question they are asking. It allows them to dig deep into reasoning and eventually lead to the right answer. This type of thinking probably leads to better recognition of the topics.	Yes! I think that this approach has definitely helped me discover the "why" of many questions I have and has always led me to the right answer.	Lauren specifically is very helpful in lab and creates an environment where she is very approachable and is always willing to help while also guiding your thinking to the right answer!	The smaller class size has definitely helped my learning in the way that I am able to make closer connections with my peers both in the lab and in the lecture. These connections allow for great study groups and further understanding of the material that I would not be able to gain as easily without them.	While I don't normally like the minute lecture, 145 takes a different approach with discussion aspect. This lab extremely easy to get engaged and interested like if we had a 50-minute lecture we would not have gotten through content!
Interacting with my classmates during class. Acting out during	The TopHat questions have	Have more problem-solving in class but also have the teacher	It helps students dig deeper and be able to use class resources	I believe that this approach is helpful however. The LAs need a	Olivia has helped me a lot. She always has a positive attitude	Having a small class size helps my learning because I like having	More content is taught in minute lecture and stu

1. Working in groups
2. Preparing before class
3. Interacting with classmates during class
4. Visual aids/Examples
5. In-class discussions
6. Cold-calling
7. Redo opportunities/Retakes
8. Hands-on activities
9. Focusing on one topic
10. Office hours

Frequency Analysis:

**CONTINUE  
-THIS WORKS FOR ME**

1. Pre-class work/reading - 4
2. Group work/collaboration - 3
3. Hands-on activities/acting out scenarios - 3
4. In-class discussions/participation - 5
5. Visual aids/graphics - 2
6. Redoing assignments/office hours - 3
7. Focusing on mastery of one topic - 1
8. Cold calling/names - 2
9. Independent learning - 1
10. Art class examples/theater performances - 2

# START -THIS MIGHT WORK

Themes:

1. Active Learning: Incorporating game aspects, problem-solving activities, drawing out activities, and more traditional lectures with in-depth explanations.
2. Review and Feedback: Review sessions before exams, notes to write down in presentations, and more questions similar to the exam that can be worked on as a class.
3. Grading: Different grading scales, higher stakes for TopHat questions, and verbal finals for other exams.
4. Accessibility: More video lectures instead of reading and taking good enough notes.
5. Office Hours: Additional office hours.
6. Mixed Opinions: Some students did not have any opinions on the matter.

Negative feedback was present for grading-related suggestions (higher stakes for TopHat questions and different grading scales) and the suggestion to have more video lectures instead of reading.

# STOP

## -THIS HELPS ME LEAST

Student answers with co

1. NA - "I really enjoy the class i don't really believe anything has to change to make it better but things could be added to make it better."
2. TM, GD - "Personally, I feel as though due dates should be more spread out. And the harsh grading scale..."
3. TM - "The TopHat questions have helped me the least in my learning."
4. TM - "Nothing has really been that bad in the class. I didn't really like a lot of the online stuff that we did."
5. TM, TB - "I do not suggest that we stop anything, everything in this course has pushed me to be my best student self. However I do not know how I feel about the Tophat quizzes."
6. TM - "Using the microphone."
7. TM - "The clicker questions."
8. TM - "When we go over topics for too long and are just restating the same things not adding anything new, this just makes it hard for me to focus as I have a tendency to zone out."
9. TM - "I wish there was review sessions with la's like Dr. Lawrence had."
10. TM - "I think the talking in class is good but I think we are losing a lot of time by just listening to students try to work through concepts."
11. TM - "I think the speed we're going at is something that should be improved."
12. TB - "The OSB portion of the biology textbook helped me least