

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.



Exam sequence

- **Exam I: multiple-choice [low level knowledge]**
- **Exam II: long form essay [higher Bloom scale]**
- **Verbal Final: verbal format [highest Bloom]**
[Traditional Final: multiple-choice format]

Announcements

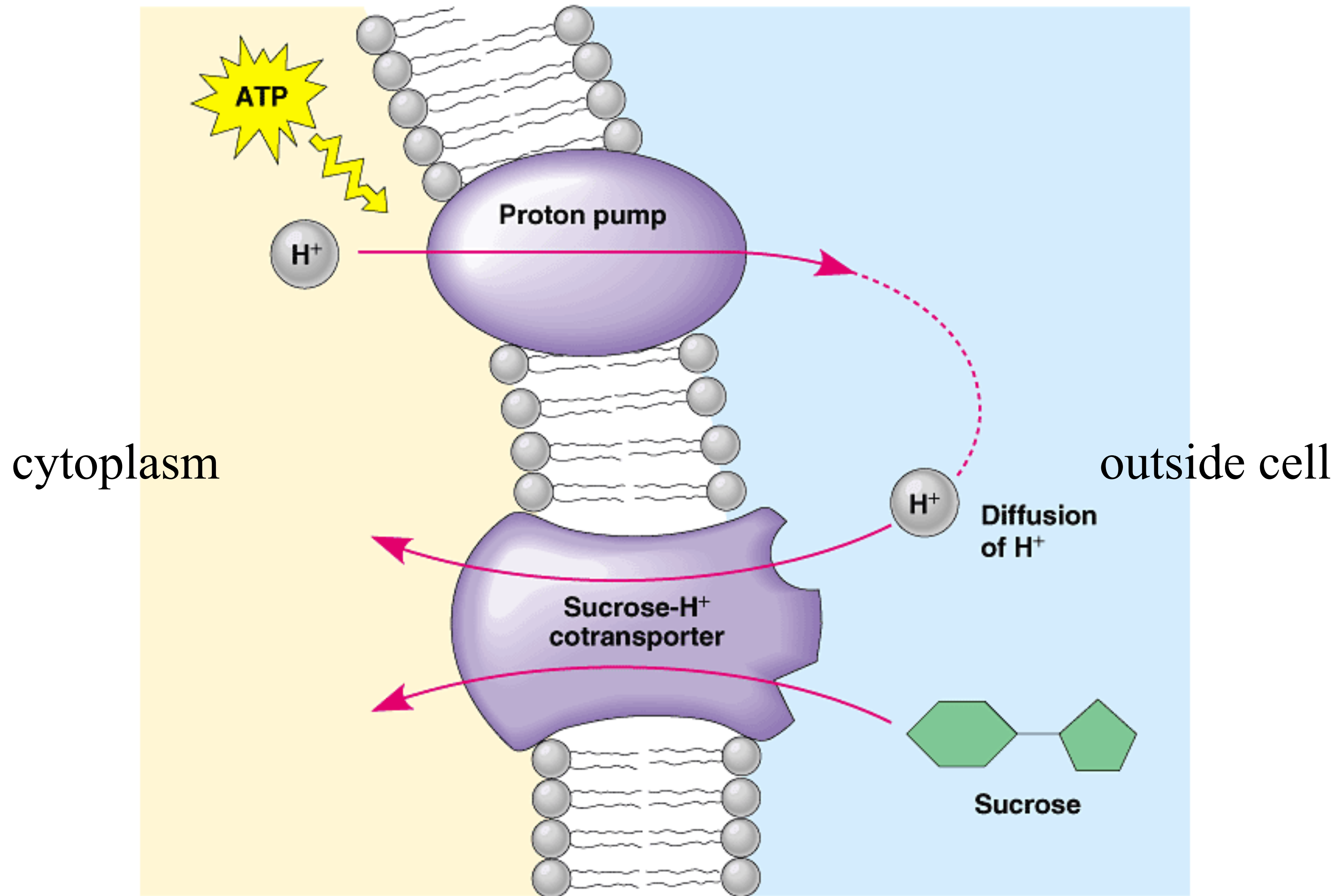
1. Turn in your Take-home **Exam** now (please B-PIDS only, on your hard copy of text and illustration answers, with cover sheet initialed).
2. No **Office Hours** today (because we will be grading exams)
3. Questions about In-class Exam on Wednesday, process or wording of exam questions, etc?
4. MidSemester Course feedback is now available to all online

All comments from students in Mid-semester course feedback (n=34)

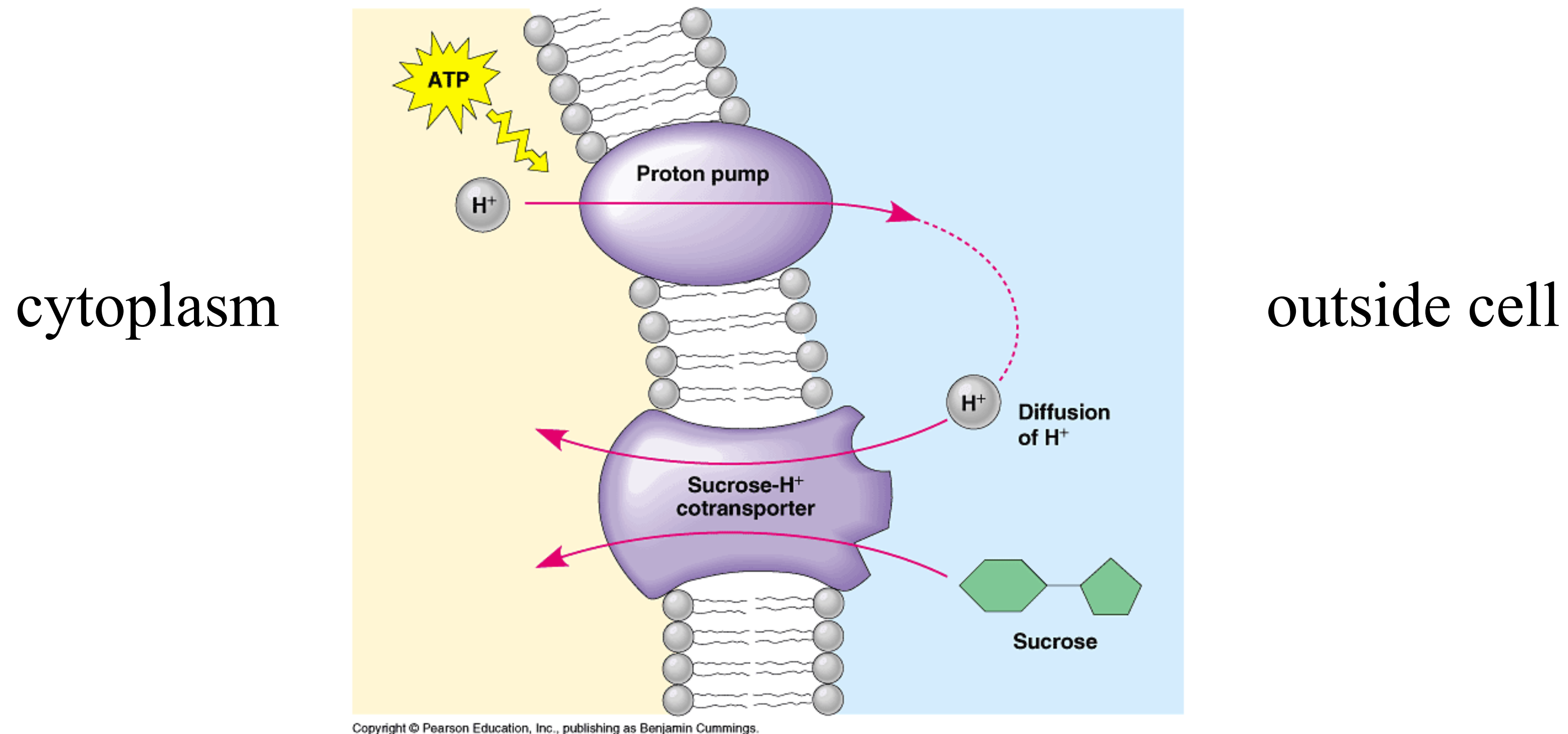
<http://ctools.msu.edu/MidSALG-S2025.xlsx>

	A	B	C
1	Q1	Q2	Q3
2	START: What change or new approach do you think would help everyone challenge themselves to study and learn even more?	STOP: What do you think is helping you the least in learning biology in this course?	CONTINUE: In general, what do you think is helping you the most in learning biology in this course?
3	Start bump points at the beginning of the semester rather than half way through.	Stop the classes were students are allowed to vote on what will be done in class for the day. Those classes tend to be less productive compared to normal class.	Continue the unique class setup where students learn about the subject via textbook before going over the content in class.
4	I think having more hands on activities or real life examples would help everyone challenge themselves to study and learn more. When we can connect what we're learning to something practical, it makes it more interesting and easier to remember.	What's helping me the least in learning biology is just straight memorization without really understanding the concepts. Sometimes it feels like I'm just trying to remember facts for the test instead of actually learning how things connect.	What's helping me the most is using/creating the visuals in class. Seeing how things apply in real life or working through visuals makes it easier to understand, remember, and work through the material.
5	Maybe graded assignments instead of just exams.	The lab course load is a lot on top of learning biology in lecture.	The professor and LA's are very helpful, and the course is taught in a very interactive manner.
6	I think that doing professor interviews 1 on 1 would be more beneficial to students who are less outgoing. In groups, some students can hide or their voices are masked. In 1 on 1 or 2 on 1 students will be challenged to learn more. I do understand that this is difficult with time though.	I think what is causing me to learn the least in class is the proposal talk. It is still helpful to my learning but if I HAD to pick one thing.	I think that the verbal final and whiteboard learning have been the most helpful. I learn best when I think out loud, and I like to lean away from traditional tests. The group exam, verbal final, and prof. Interview are all the best learning techniques. They are different and promote learning rather than multiple choice recognition.
7	I would like more opportunities to work with other groups to solve your common research or lecture problems.	The amount of time I have to try and corral my groupmated to try and work on things outside of class has been a hassle that seems almost mandatory but tends to not be very productive.	I love drawing the mechanism and diagrams for problems we are looking at in lecture and lab, especially the "well what if X was removed from the system, then what would happen to X process?" Hypotheticals
8	I think that doing 1 on 1 ULA interviews would help to prepare even more, but would be a little bit more time consuming.	I don't think there is anything that is hindering our learning, however, I would say the group exams are not the best and bump points are a little bit better.	I really like the idea of the verbal final, acting out all large processes in class, all the activities that go along with learning.
9	I would say another interview would help. We already have an interview in lab and the verbal final, but these are great ways to actually understand the material rather than memorizing every word of the textbook.	I would say there isn't much, but if I had to pick, I'd say lab presentations. I feel that the papers and interviews with the LAs and Dr. Luckie are the best for learning. I understand that the presentations are important for sharing results and are a part of any lab, but I just feel they don't contribute to my learning as much.	I believe that studying before class is the most helpful tool. Having to do the reading before class seemed daunting at first, but it really helps me personally keep up with the class and makes the exams seem a lot easier. The class is also straightforward in a way that if you do the work, it will reflect in your grade. I also like being able to actually understand the lecture rather than being confused about topics.
	I think a few approaches should be made to allow everyone to challenge themselves better. First, you should offer small grading based on whether the trifecta was complete. That way, students will be more motivated to learn the information and come to class more prepared. Next, you should allow students to retake the individual portion of your exams and provide a paragraph explanation for each	The top hat questions are helping me learn the least because I feel like	I'm learning the best in this class from the verbal final. By having us draw and

“Pop Quiz”: **Reward** for those who remember or wrote in notebook.
(clicker questions, 60 seconds each, handwritten notes can be used)



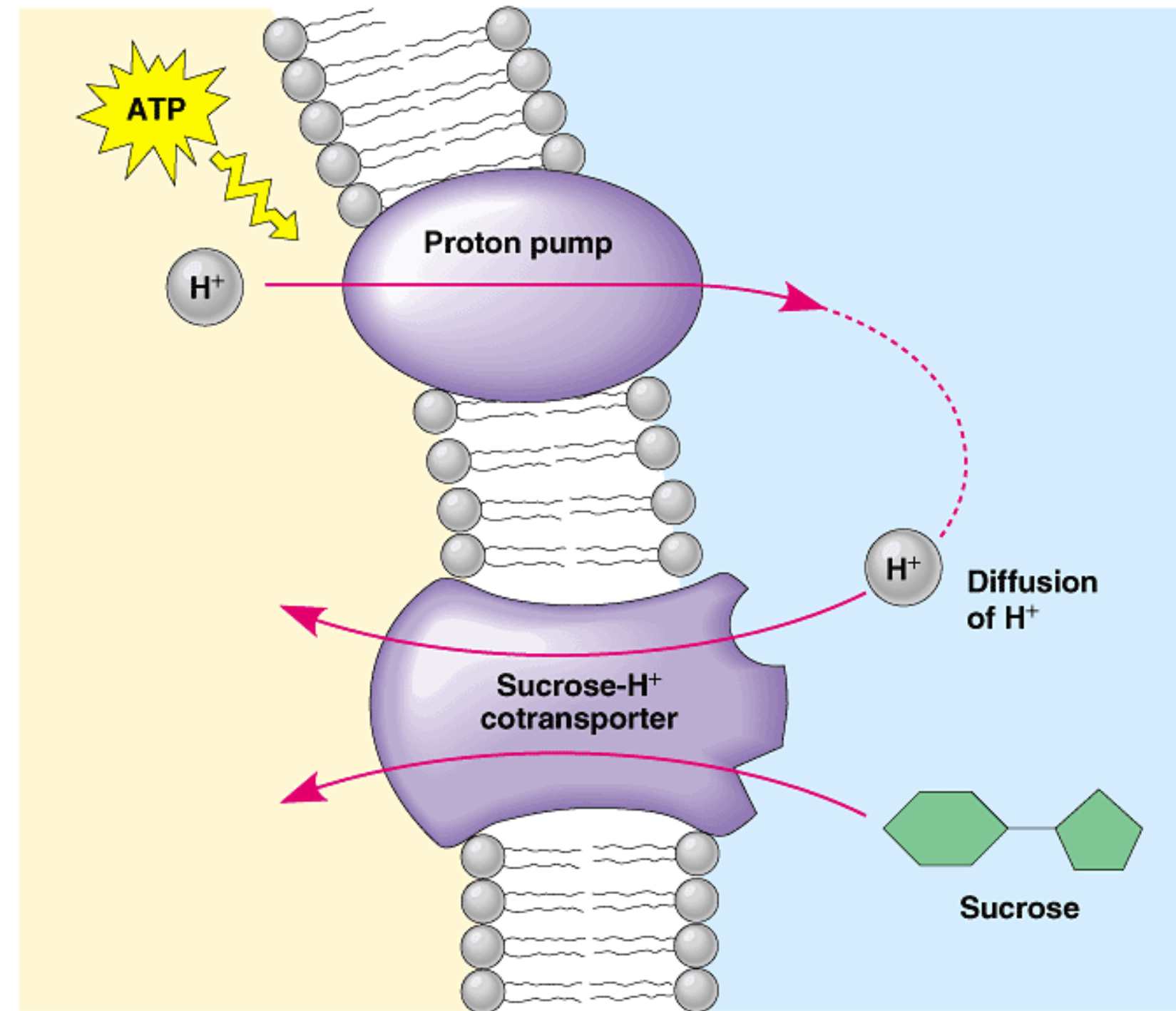
**Which change would increase the rate of sucrose absorption?
Alter: 1. [sucrose]? 2. [ATP]? 3. pH? (but on which side?)**



Based on the model of sucrose uptake shown, which of the following treatments would increase the rate of sucrose transport into the cell.

- Decreasing extracellular sucrose concentration.
- Decreasing extracellular pH
- Decreasing cytoplasmic pH
- Adding an inhibitor that blocks the creation of ATP.
- Adding a substance that makes the membrane more permeable to H⁺

cytoplasm



outside cell

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Predict: How would severely decreasing extracellular sucrose concentration alter extracellular pH?

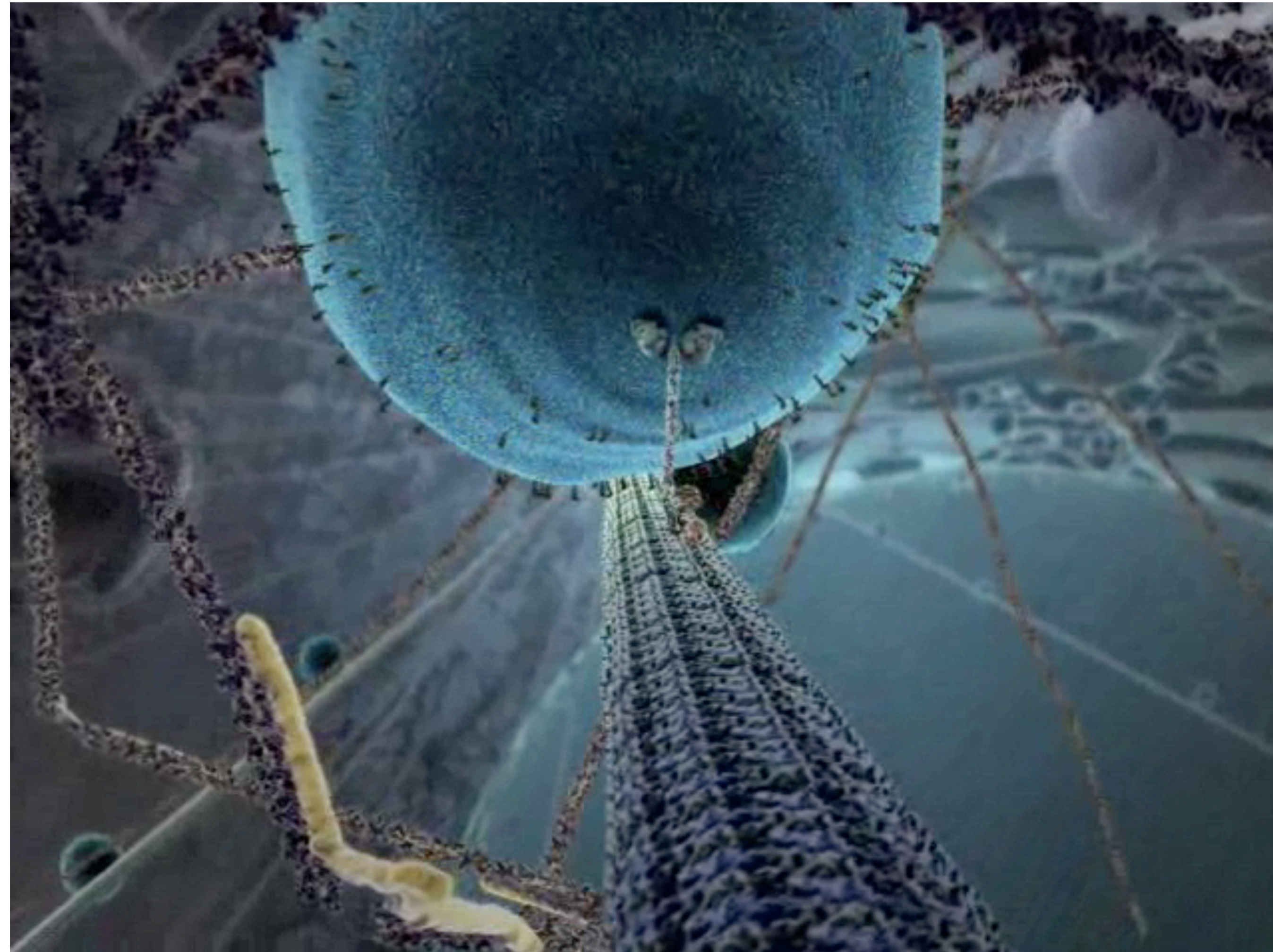
Cell Biology *Post-test*

(get your paper ready)

Structure

Function

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.



Which would you prefer to do next?

A.

10:12 AM Mon Oct 29 trunity.org

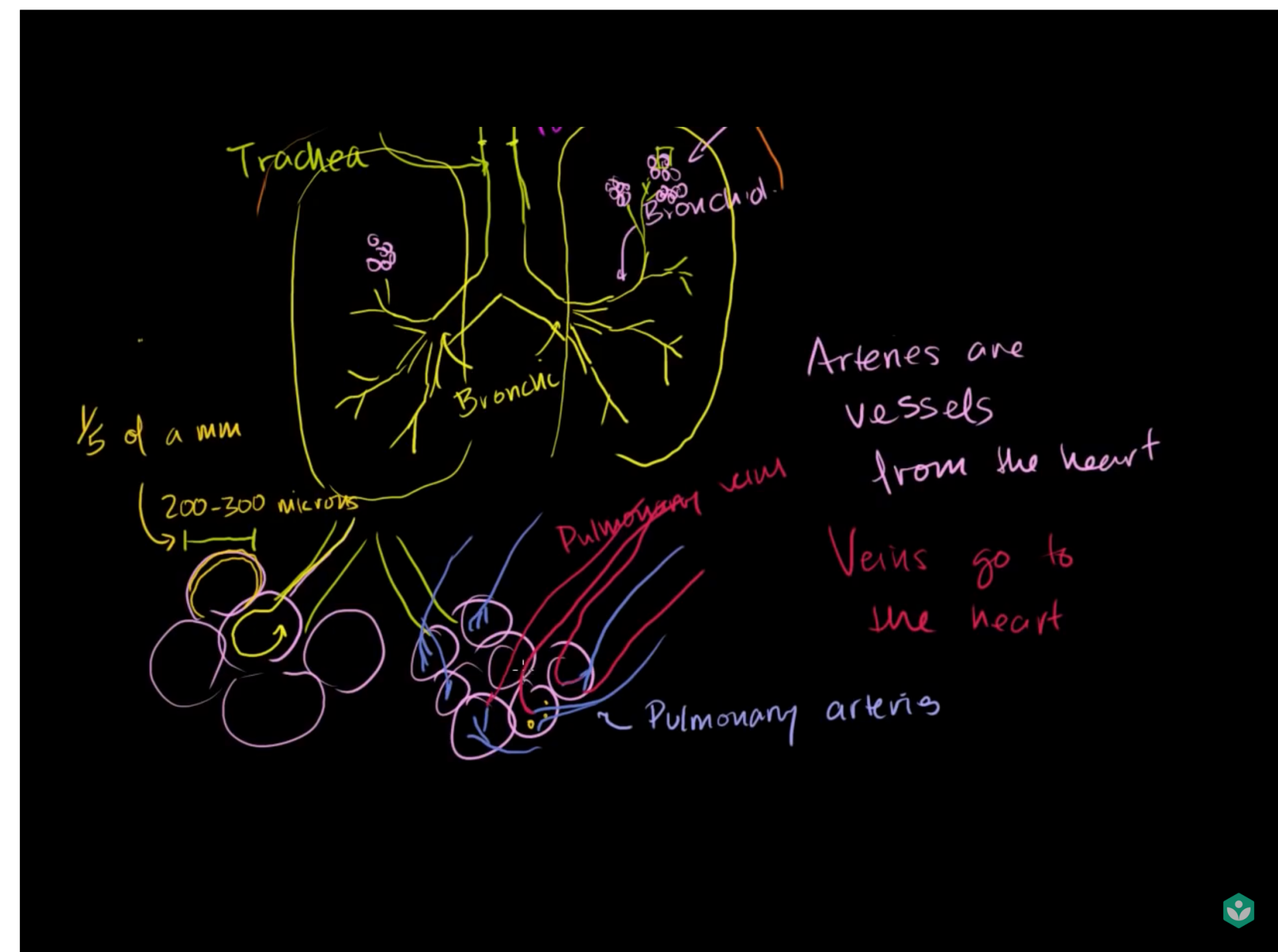
Create

Mammalian Systems

In mammals, pulmonary ventilation occurs via inhalation (breathing). During inhalation, air enters the body through the **nasal cavity** located just inside the nose (**Figure 6**). As air passes through the nasal cavity, the air is warmed to body temperature and humidified. The respiratory tract is coated with mucus to seal the tissues from direct contact with air. Mucus is high in water. As air crosses these surfaces of the mucous membranes, it picks up water. These processes help equilibrate the air to the body conditions, reducing any damage that cold, dry air can cause. Particulate matter that is floating in the air is removed in the nasal passages via mucus and cilia. The processes of warming, humidifying, and removing particles are important protective mechanisms that prevent damage to the trachea and lungs. Thus, inhalation serves several purposes in addition to bringing oxygen into the respiratory system.

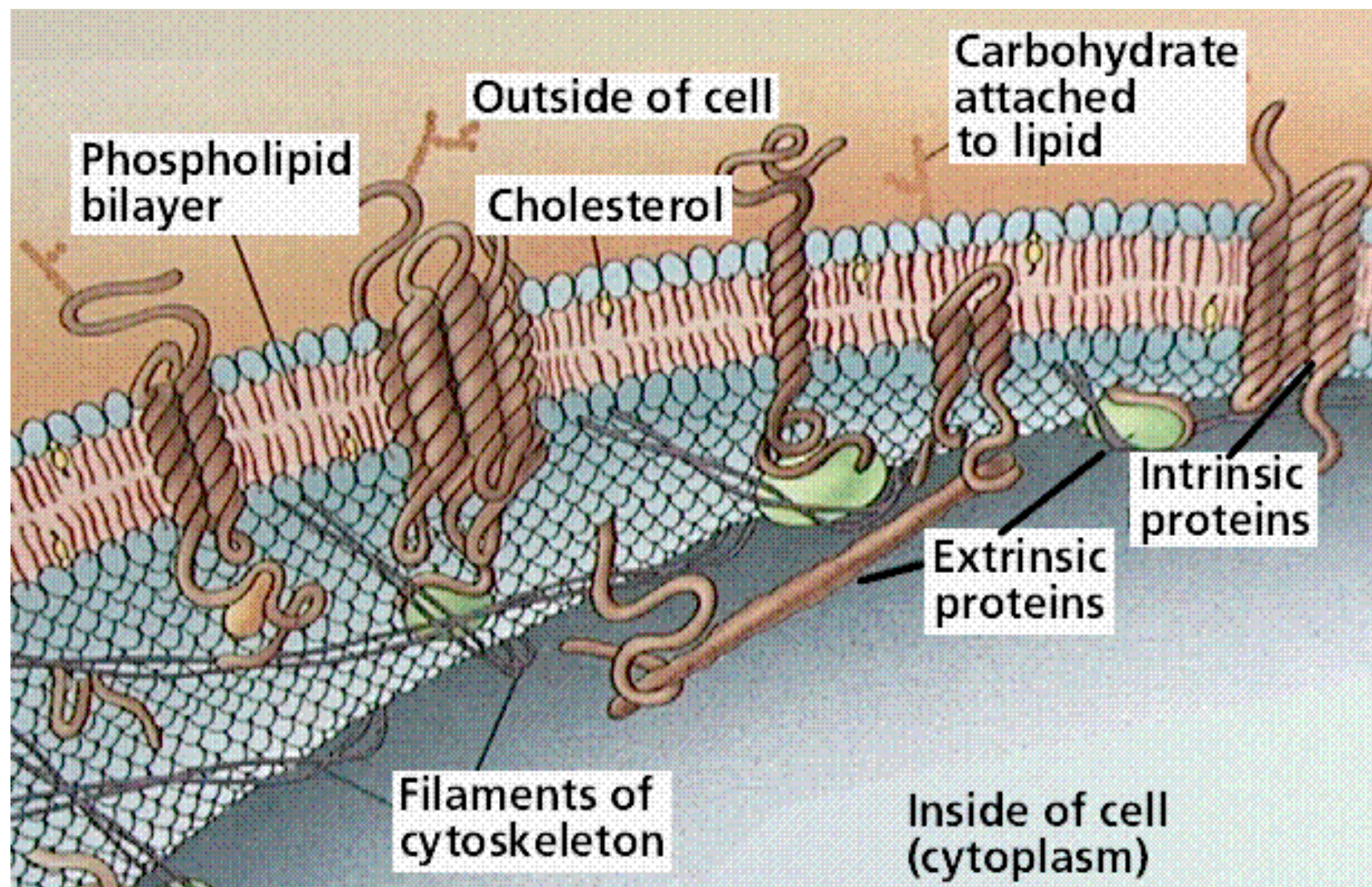
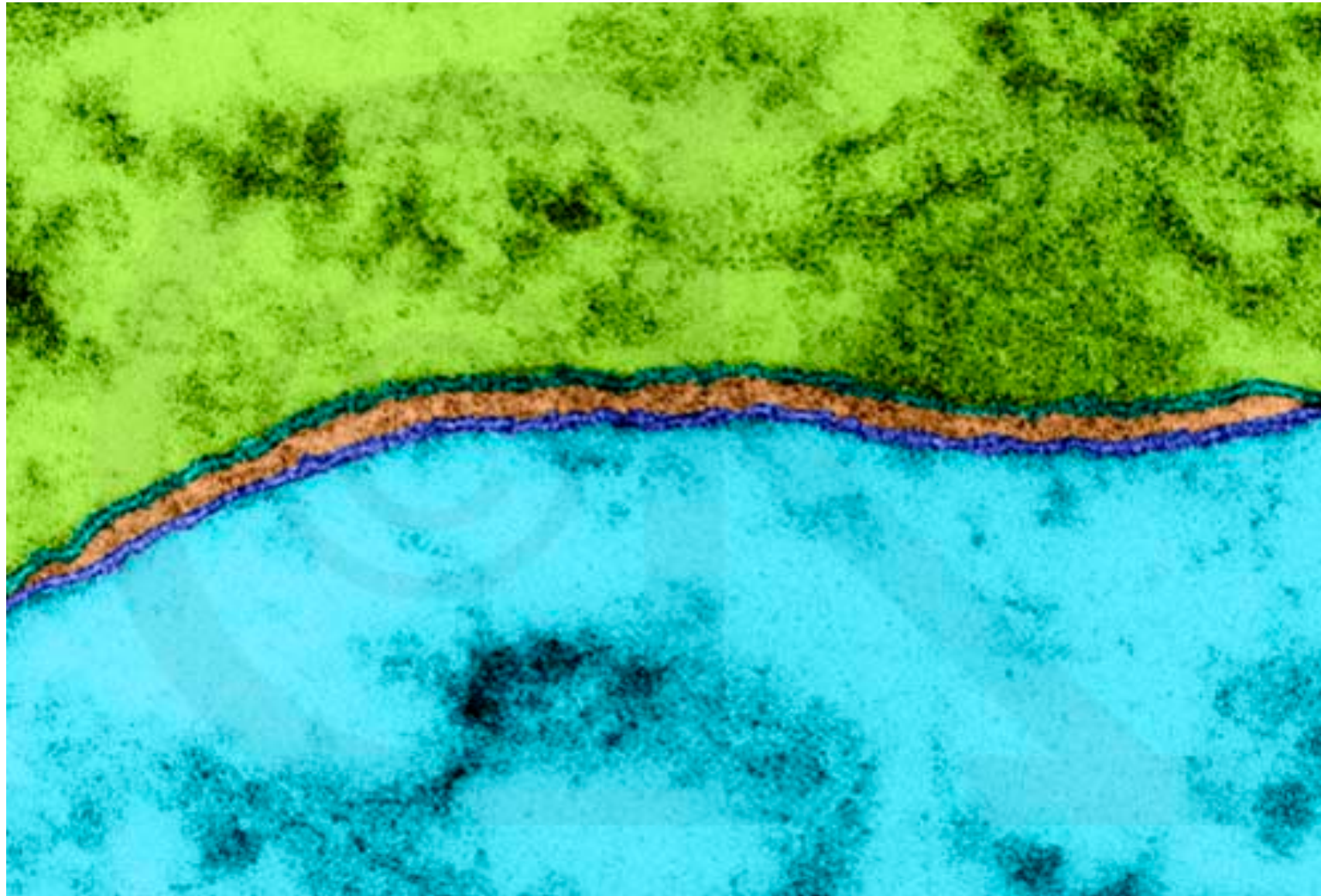
Art Connection:

Powered by Trunity



Respiratory System (OSB) (2350 words). Take notes on the second half of the reading, starting at the section "Mammalian Systems".

2. _____ (flipped classroom) Watch the really helpful **20-min lecture from the Khan Academy** provided where he gives you an explanation of the topics of ventilation and respiration. Add to your notes any interesting points he makes that helped you better understand what they are all about.
3. _____ **Advanced**: Take a sneak peek at the images and movies in this chapter's section on "Breathing" on the mechanics of breathing particularly related to humans.



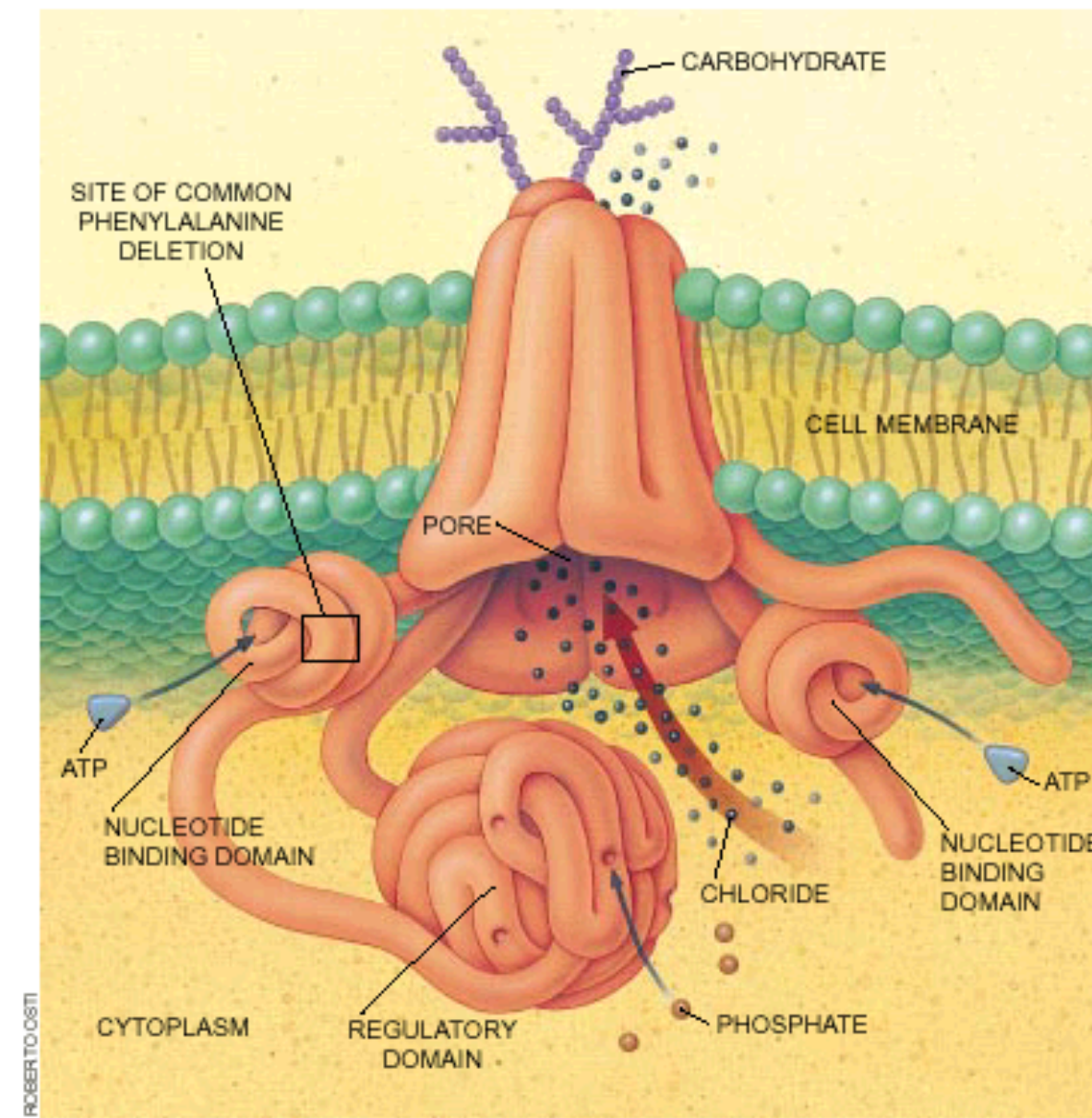
ABC Transporter Family

Clinical Relevance

MDR- Cancer

SUR- Diabetes

CFTR- Cystic Fibrosis



SCIENTIFIC AMERICAN *December 1995*

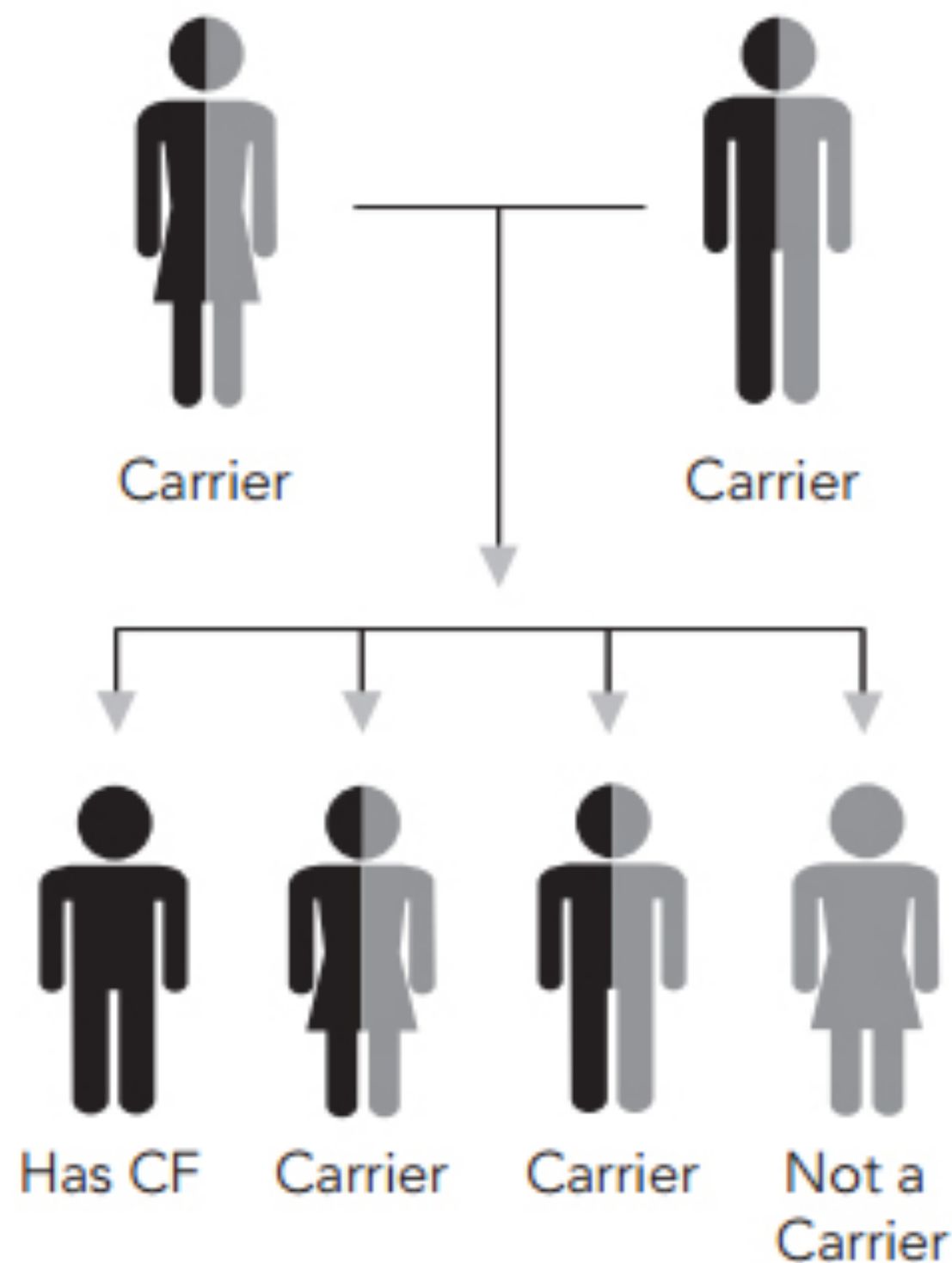
Cystic Fibrosis



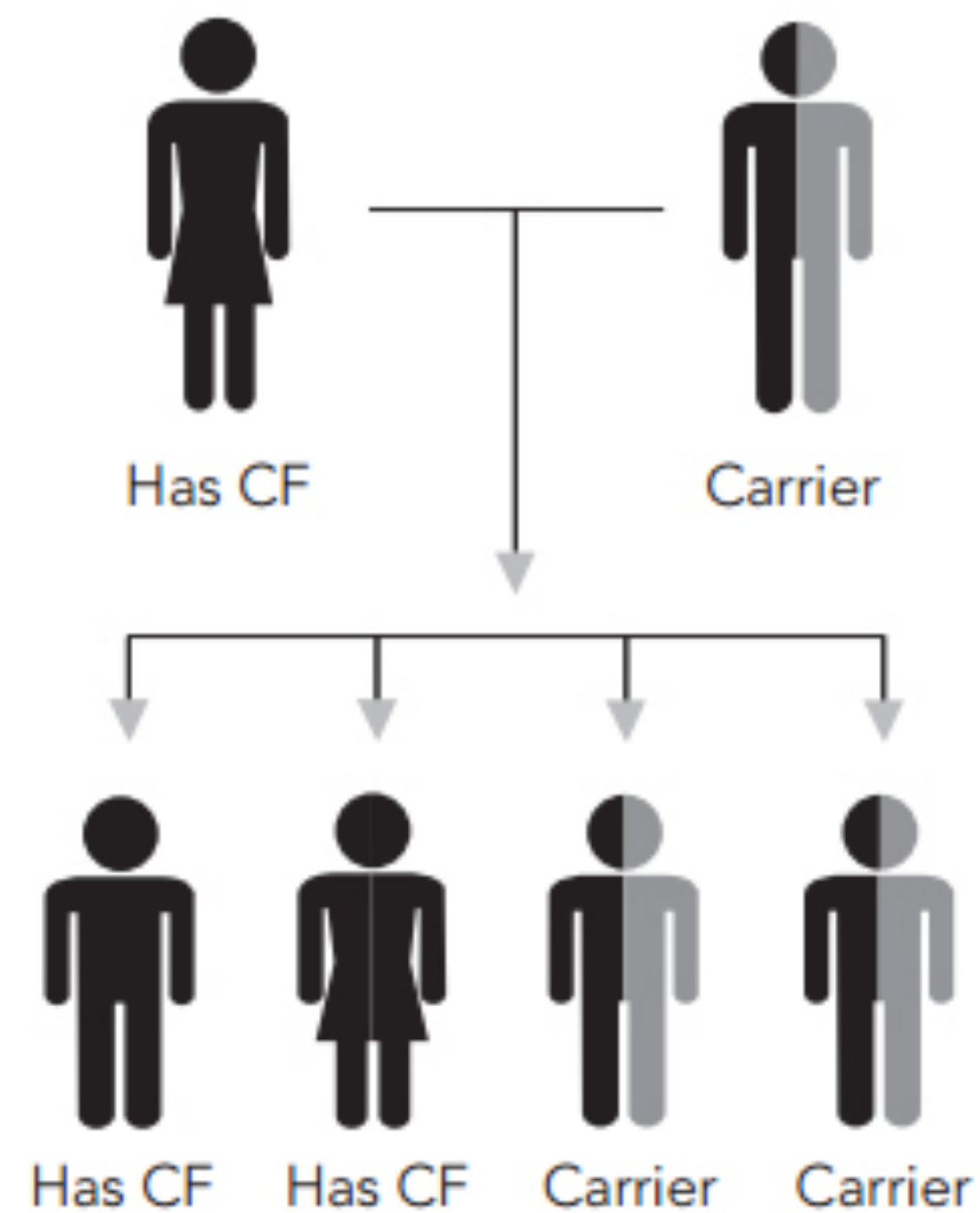
How a Person Gets CF

To have CF, you must get one copy of the CF gene from each parent.
That means that each parent must be a carrier of the CF gene.

When two people who are carriers have a child, there is a 25 percent chance of having a child with CF.



When one parent has CF and one parent is a carrier, there is a 50 percent chance of having a child with CF.

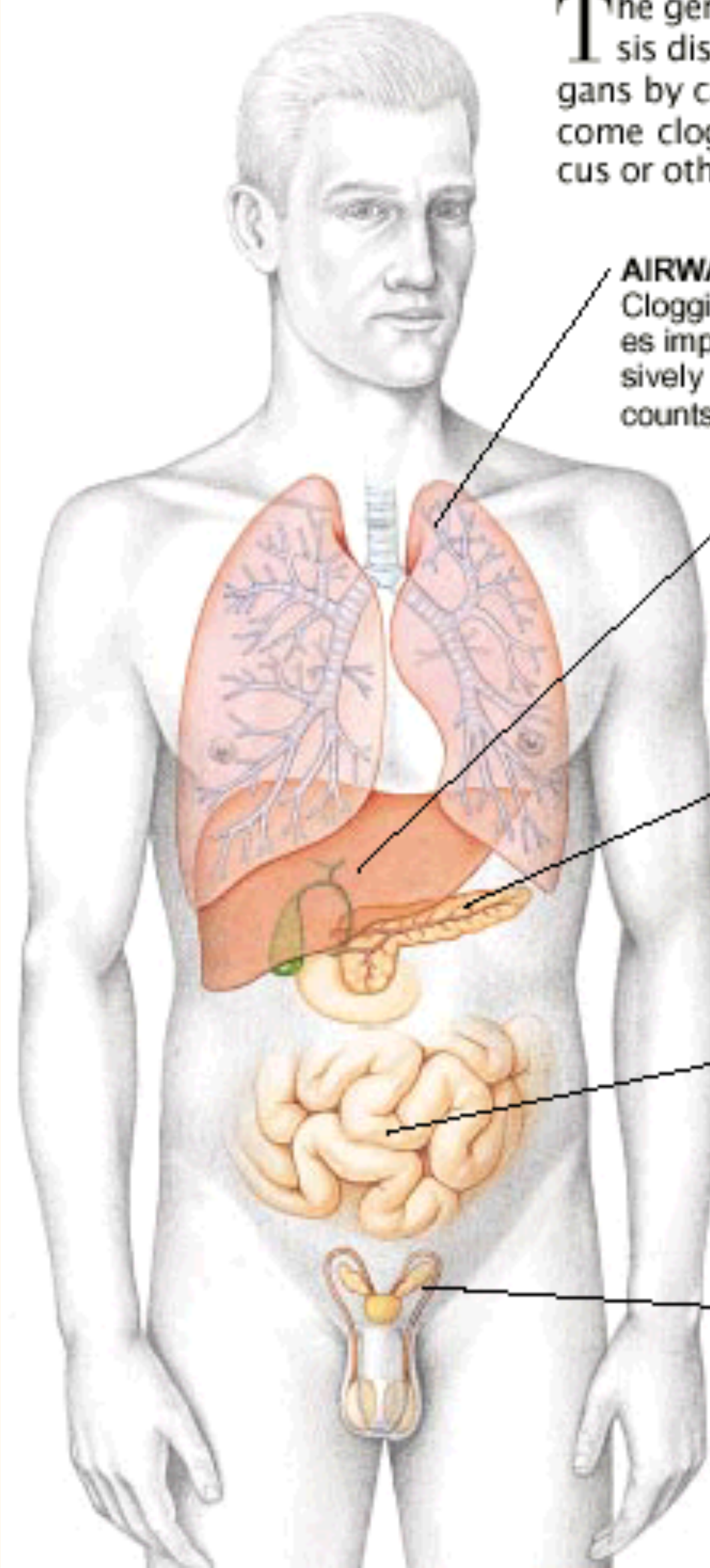


Exercise #1:

'What *causes* the disease cystic fibrosis?'

Organs Affected by Cystic Fibrosis

The genetic defect underlying cystic fibrosis disrupts the functioning of several organs by causing ducts or other tubes to become clogged, usually by thick, sticky mucus or other secretions.



AIRWAYS

Clogging and infection of bronchial passages impede breathing. The infections progressively destroy the lungs. Lung disease accounts for most deaths from cystic fibrosis.

LIVER

Plugging of small bile ducts impedes digestion and disrupts liver function in perhaps 5 percent of patients.

PANCREAS

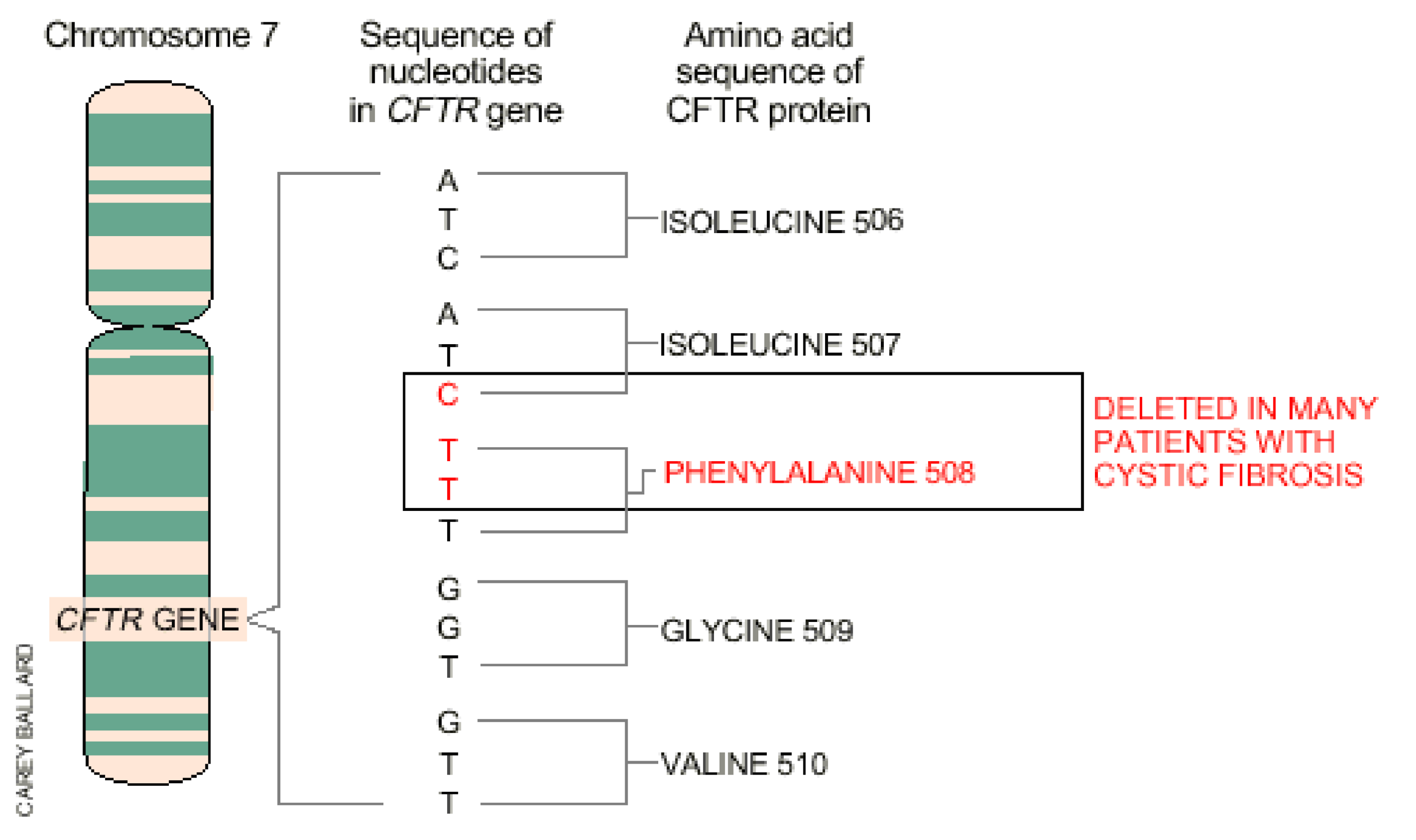
Occlusion of ducts prevents the pancreas from delivering critical digestive enzymes to the bowel in 85 percent of patients. Diabetes can result as well.

SMALL INTESTINE

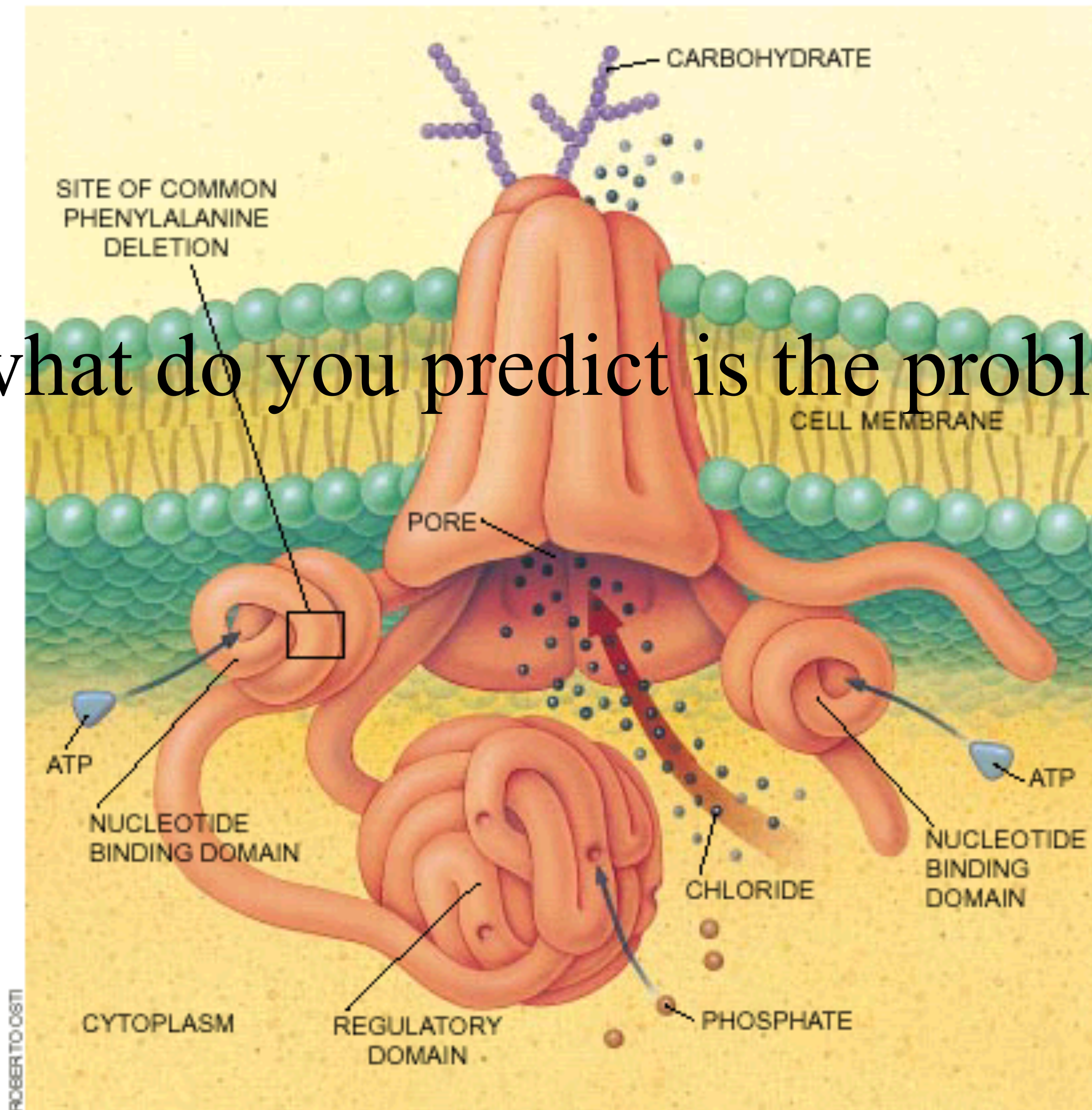
Obstruction of the gut by thick stool necessitates surgery in about 10 percent of newborns.

REPRODUCTIVE TRACT

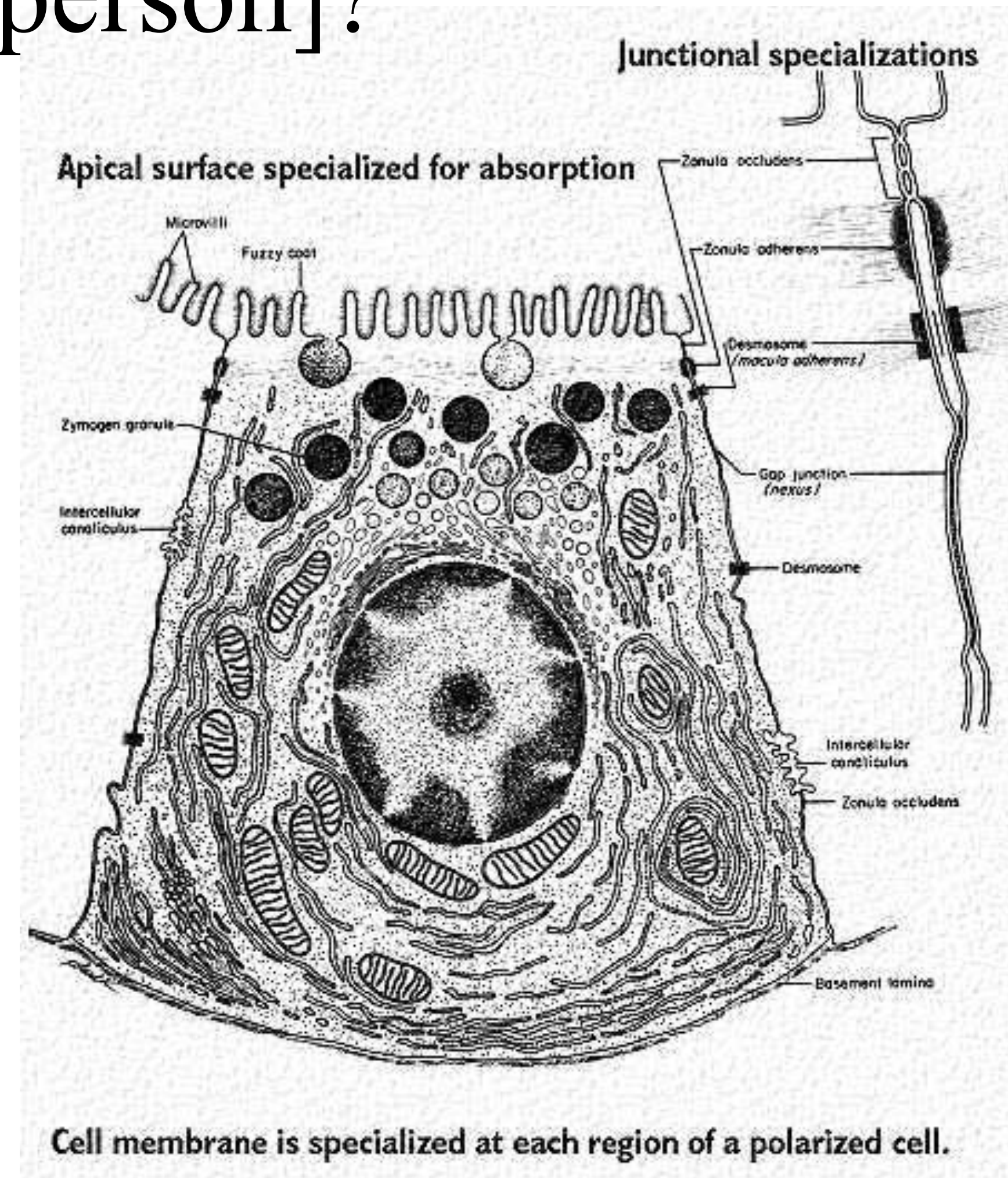
Absence of fine ducts, such as the vas deferens, renders 95 percent of males infertile. Occasionally, women are made infertile by a dense plug of mucus that blocks sperm from entering the uterus.



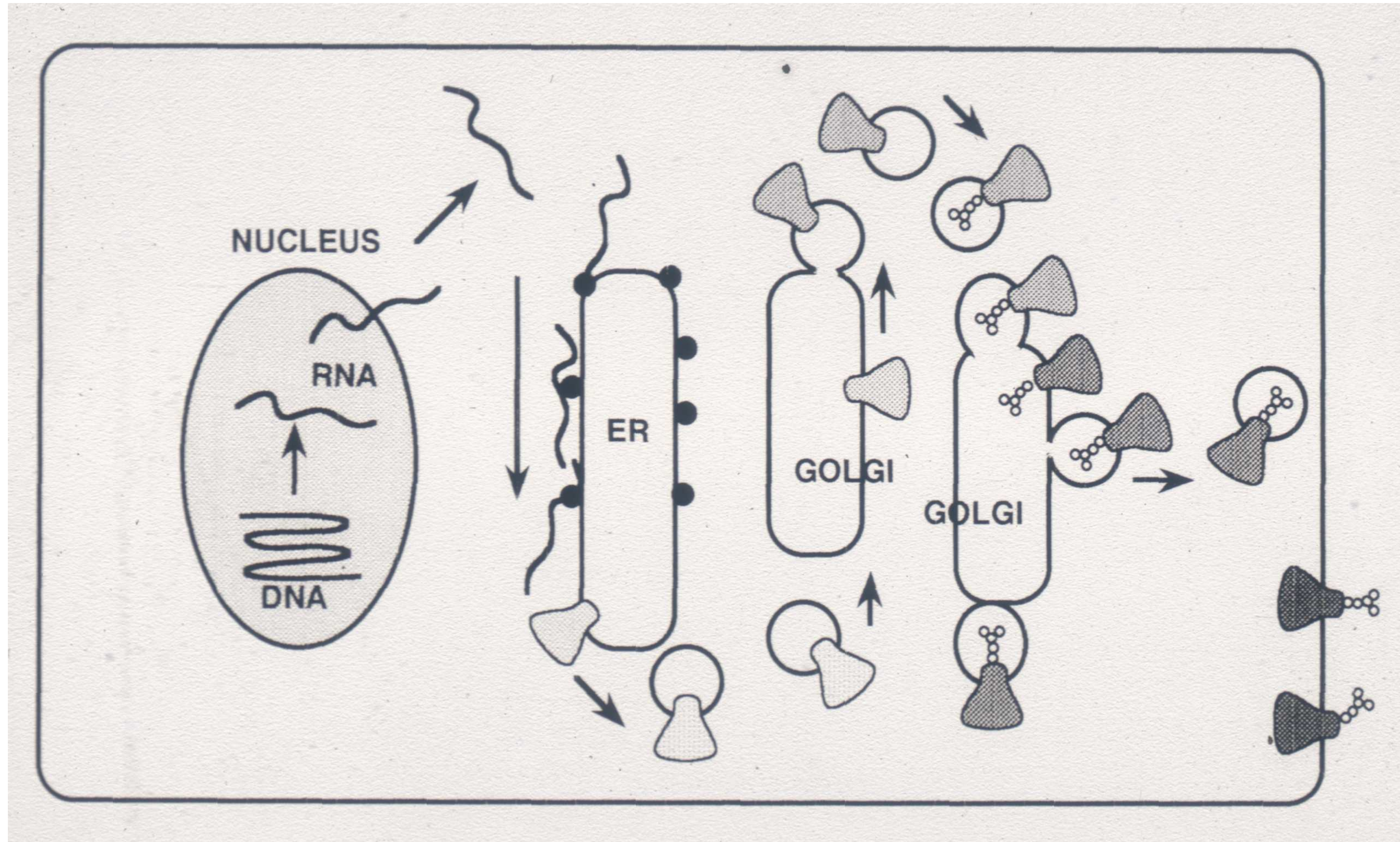
So what do you predict is the problem?



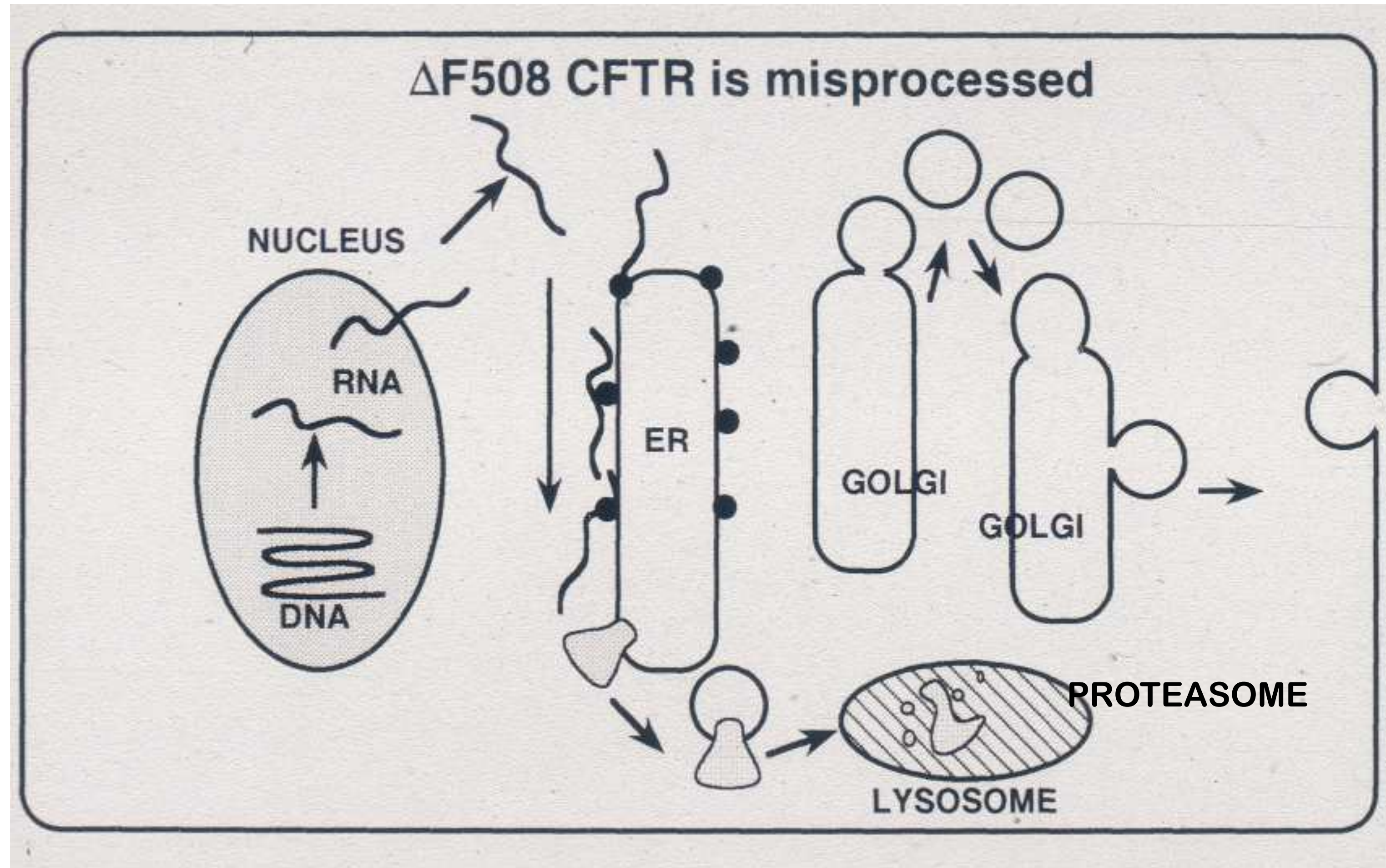
Where are the CFTR channels found normally [in a healthy person]?



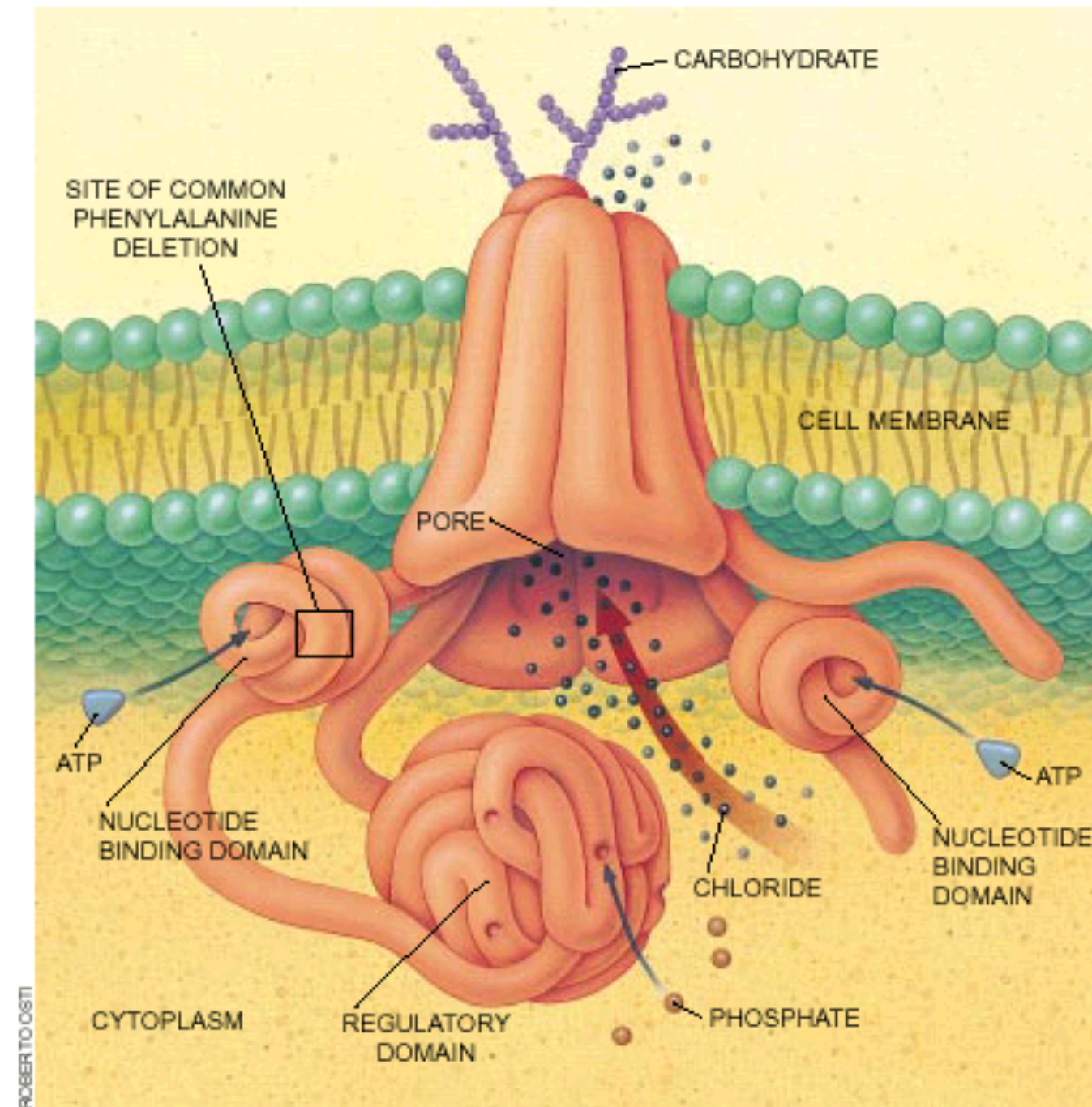
biosynthesis of normal wild-type CFTR



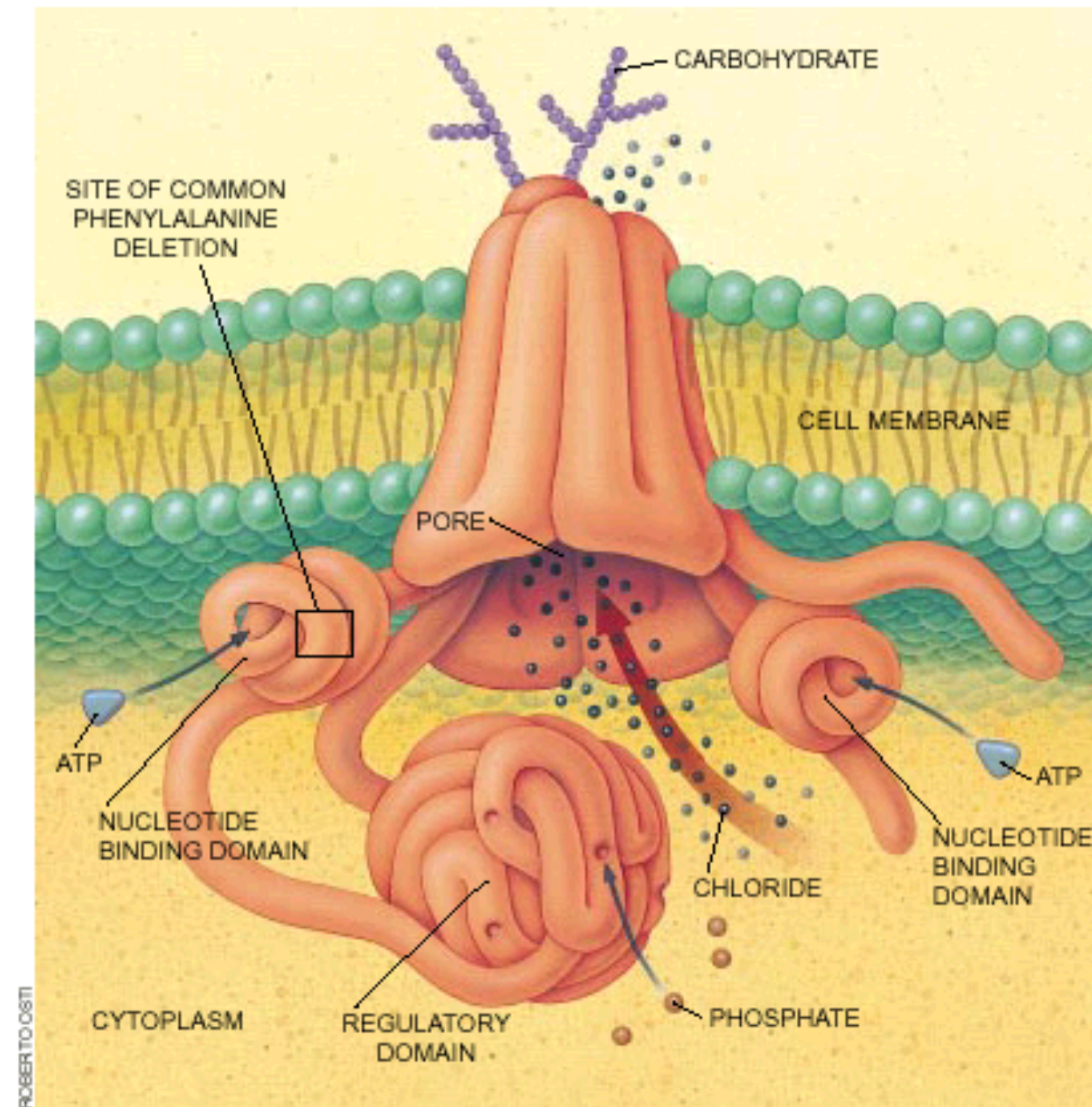
biosynthesis of mutant CFTR



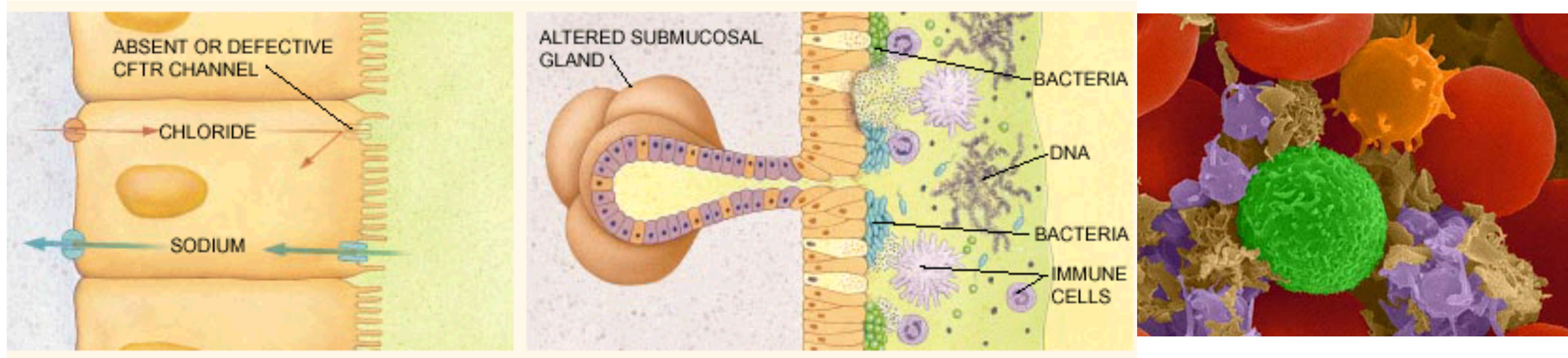
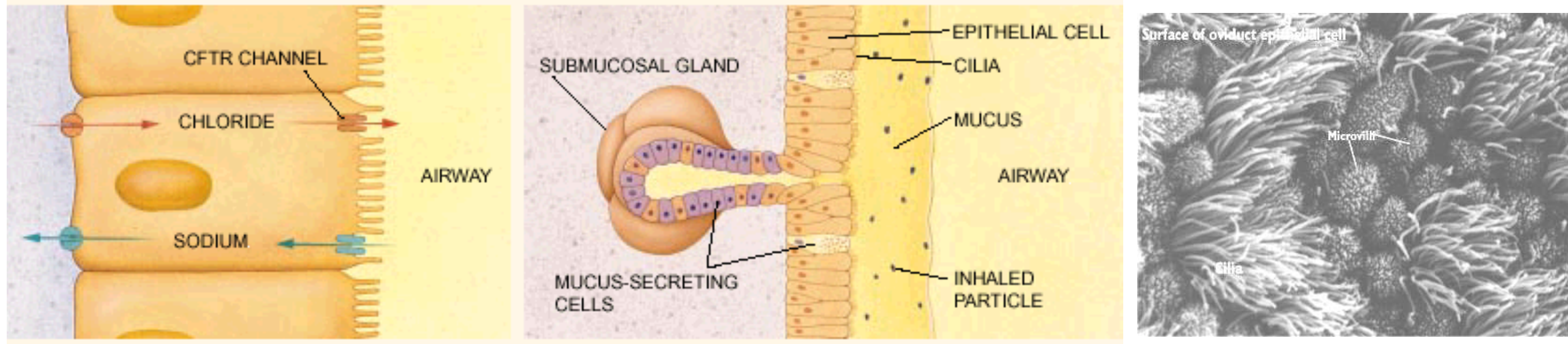
How many CFTR channels are on the surface of a cell of a CF patient??
(normal=100)



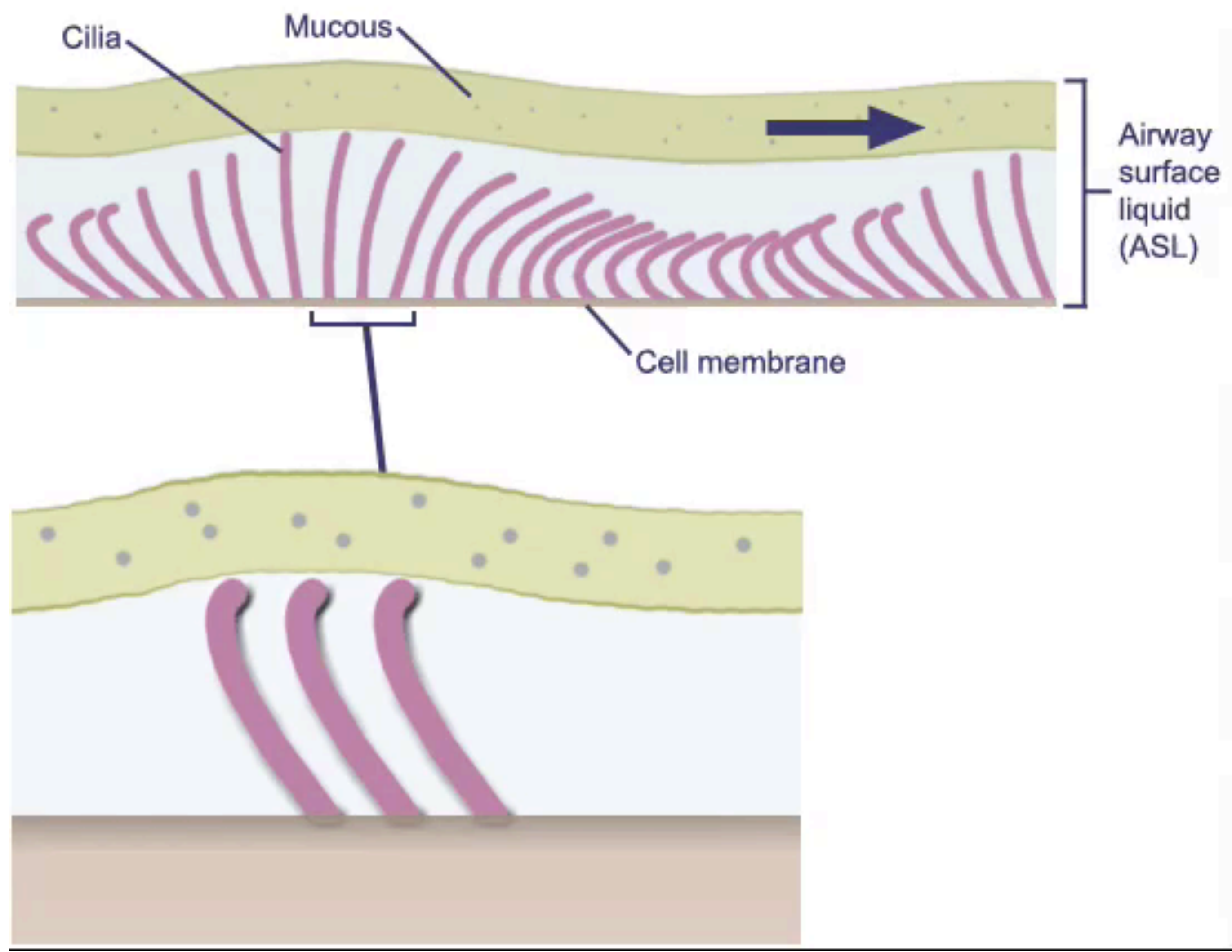
How many CFTR channels are on the surface of a cell of a **CF carrier** [heterozygote]??
(normal=100)



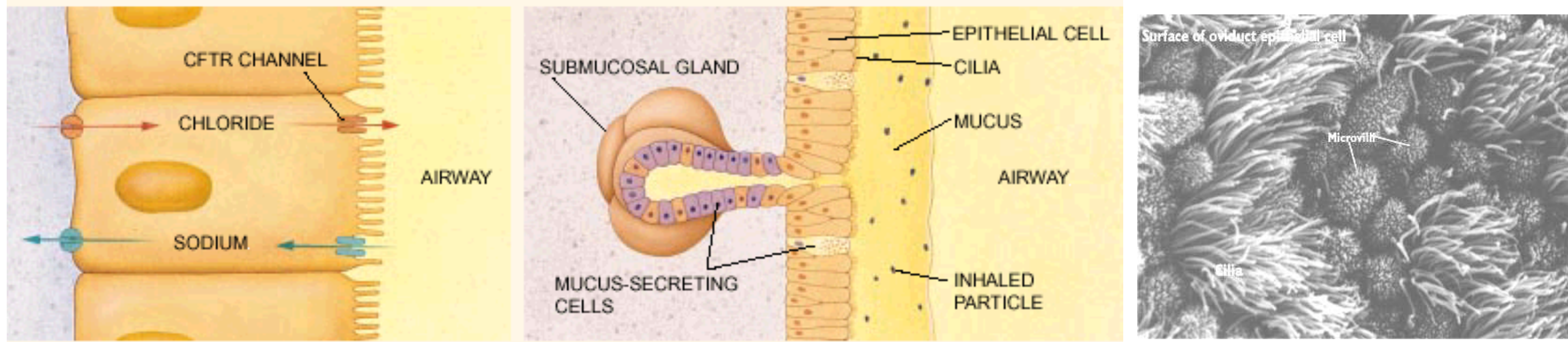
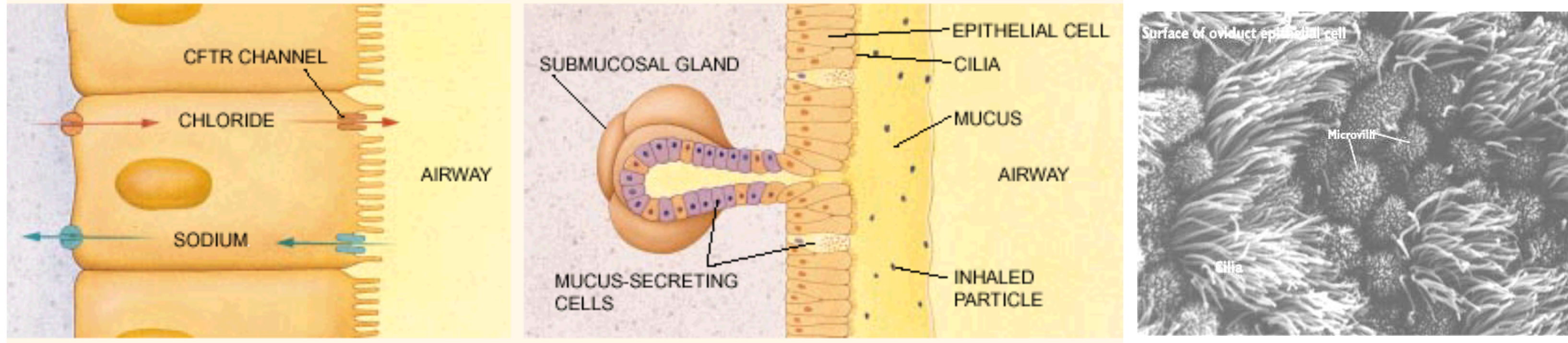
Healthy (normal)



Sick (cystic fibrosis)



Healthy (normal)

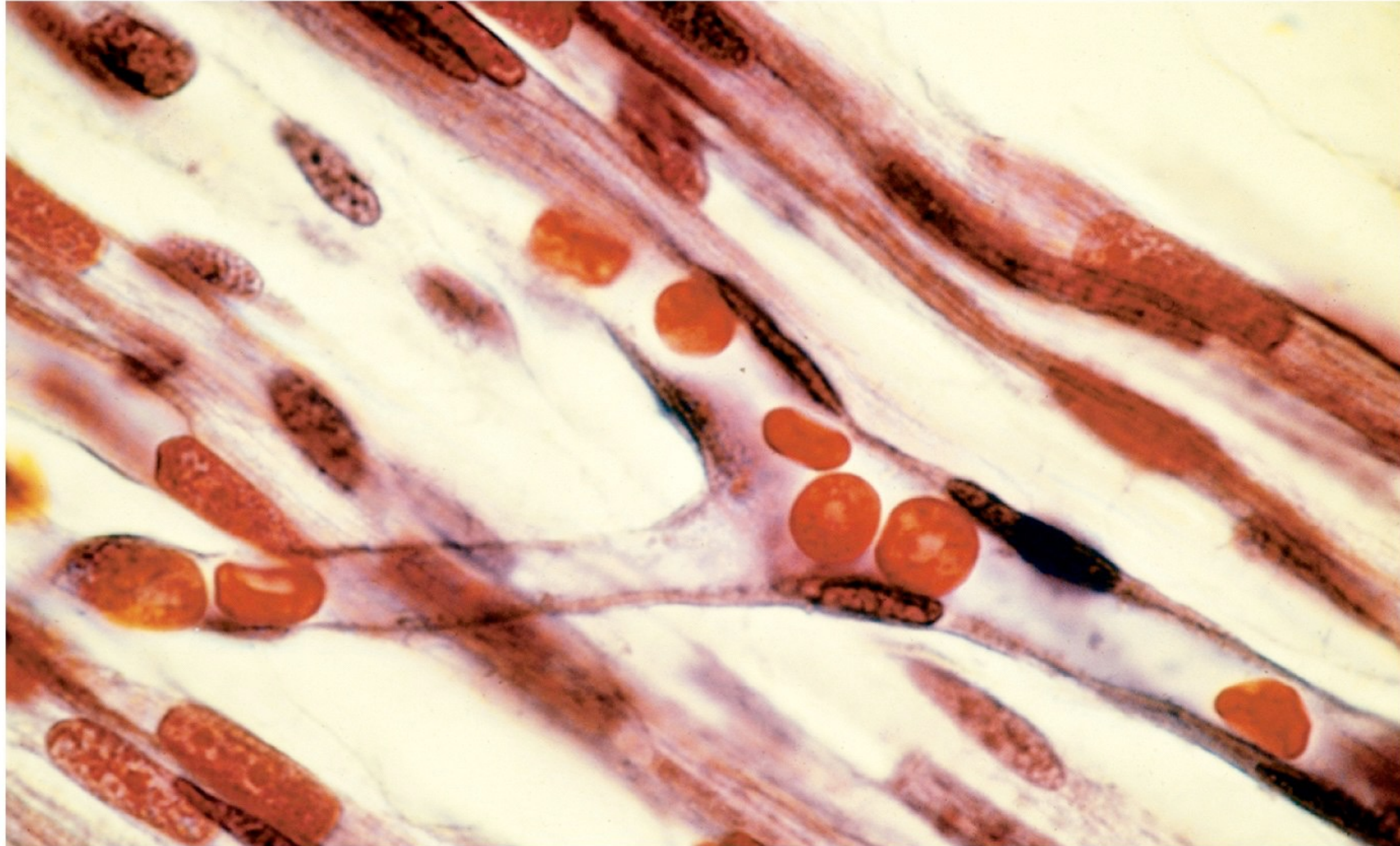


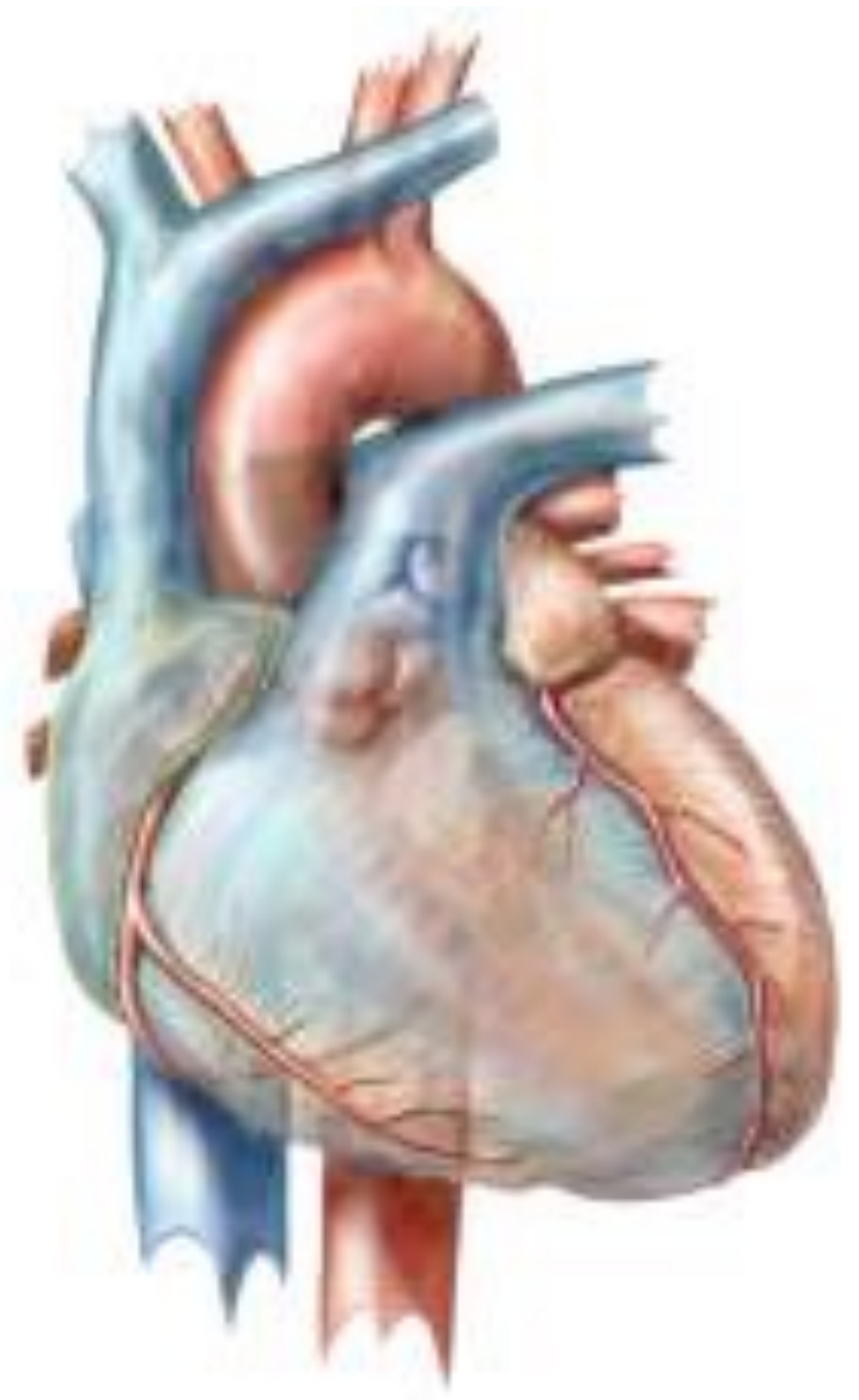
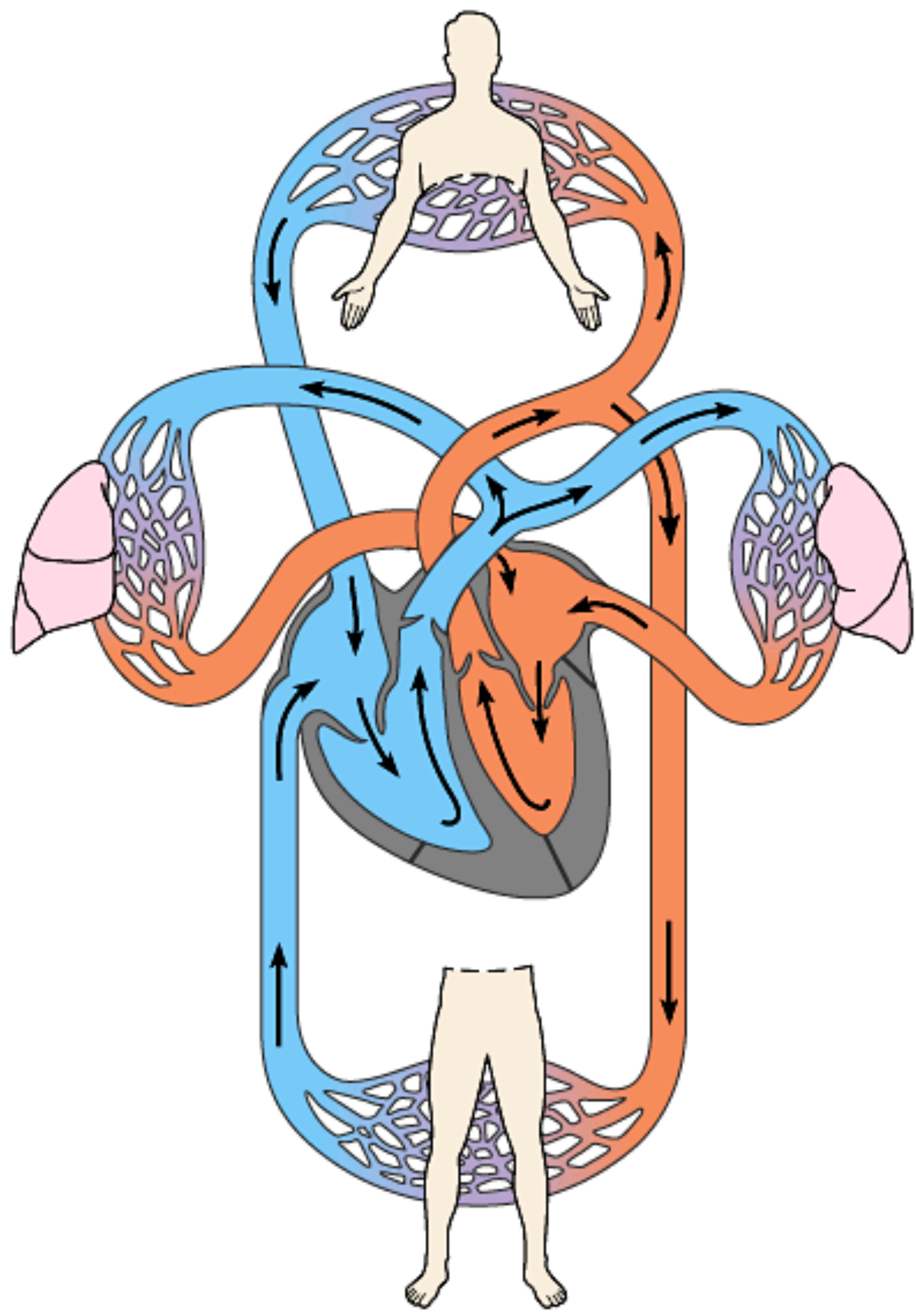
Sick (cilia dyskinesia)

Which would you prefer to do next?

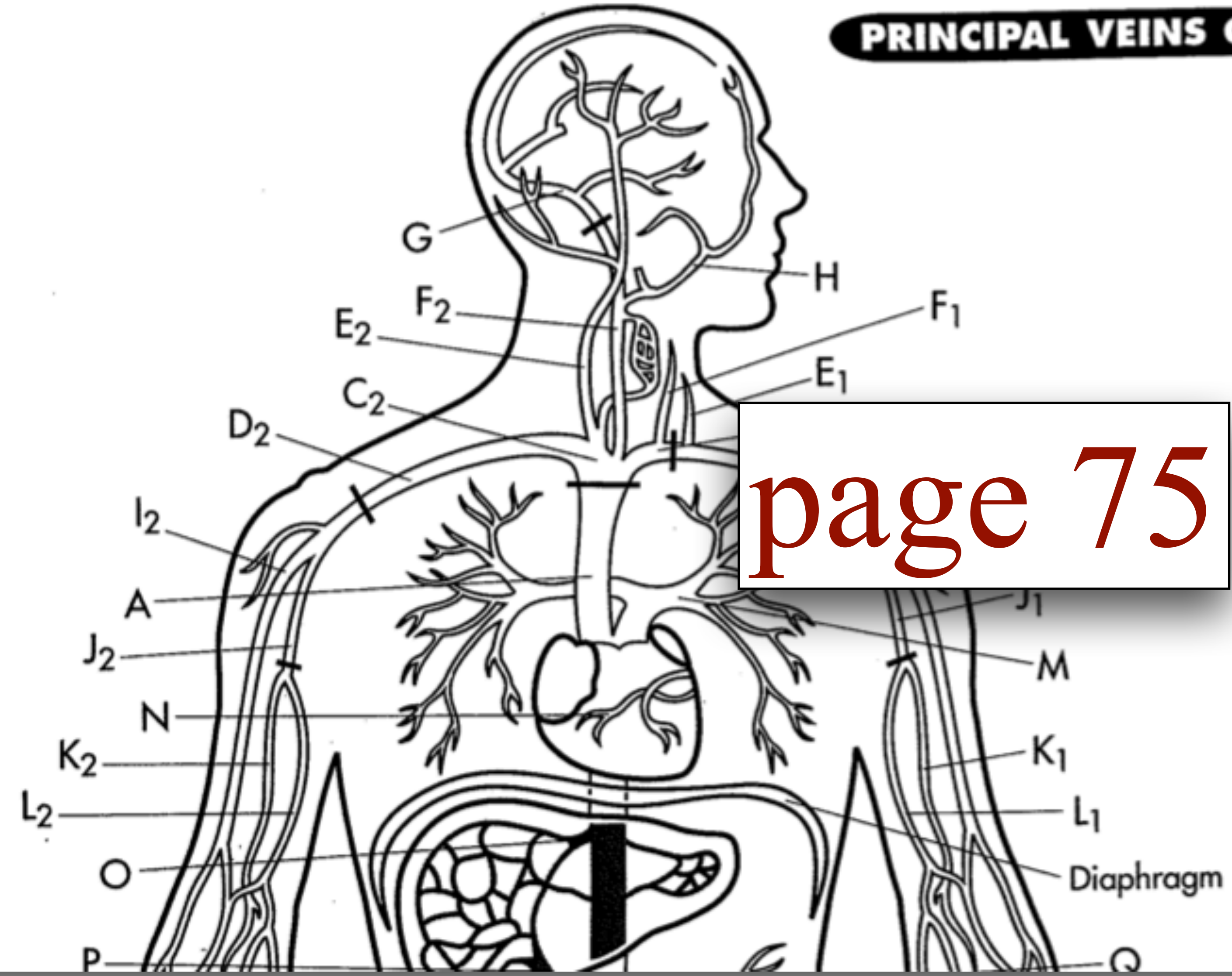
A.

Capillaries are small and extremely thin walled.



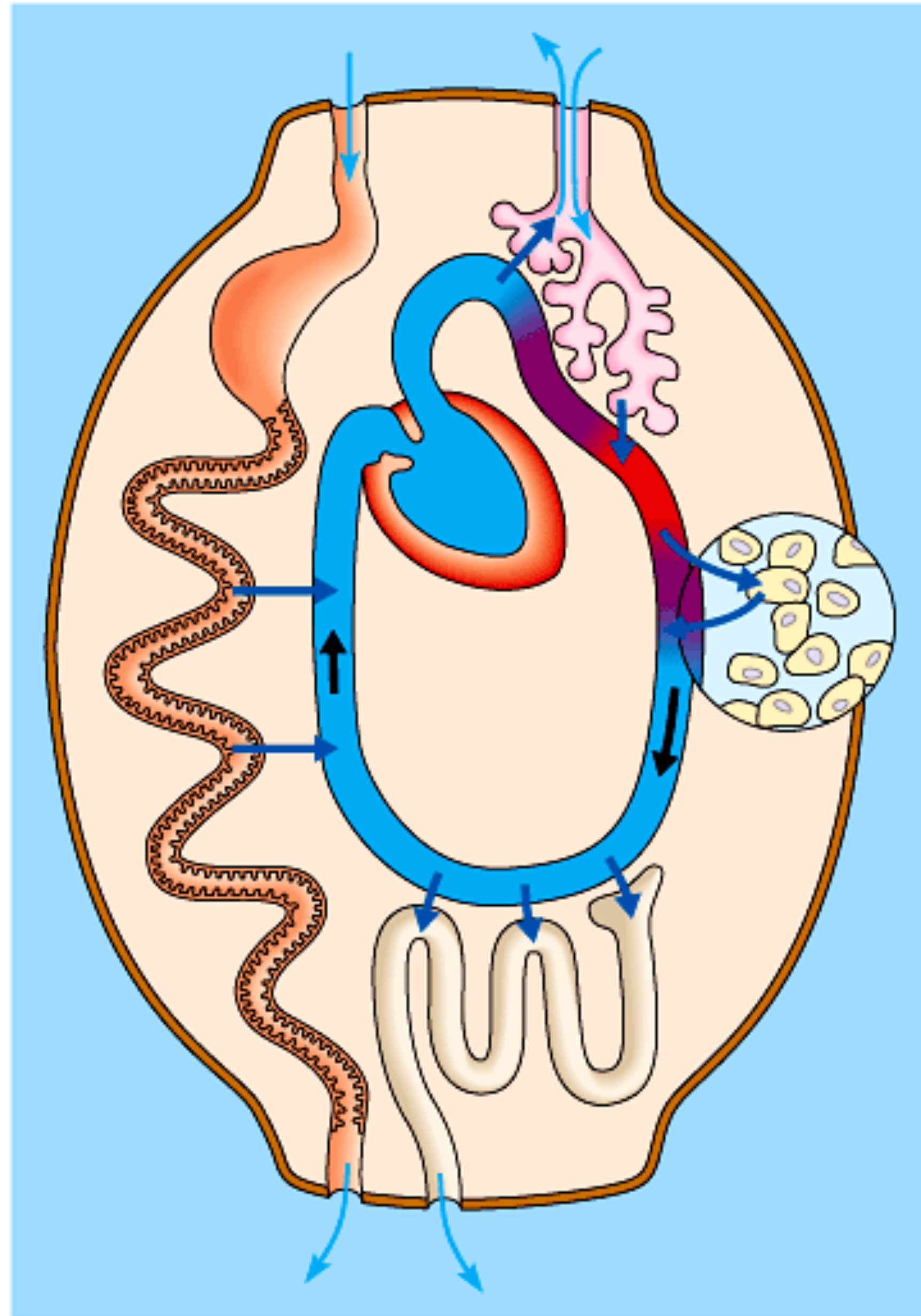


PRINCIPAL VEINS OF THE BODY

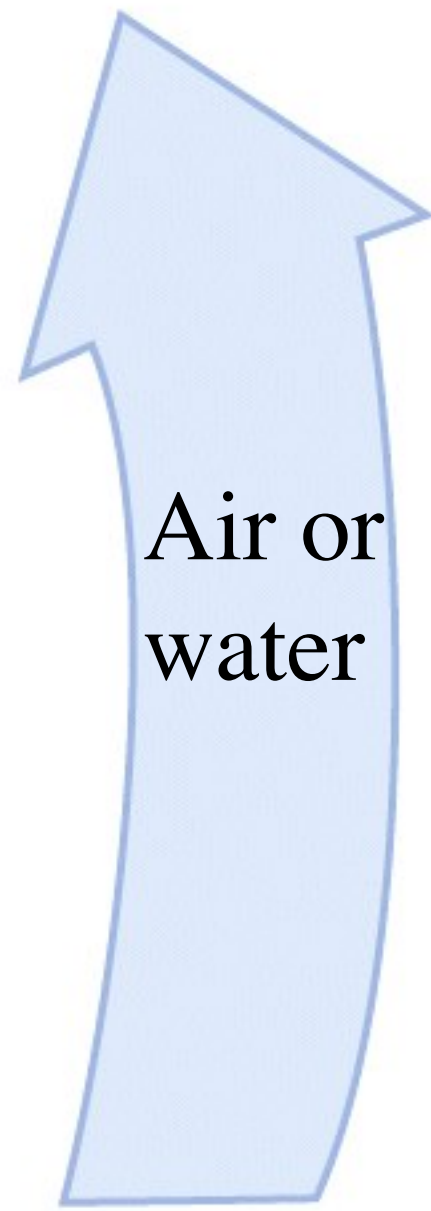


page 75

The Basics

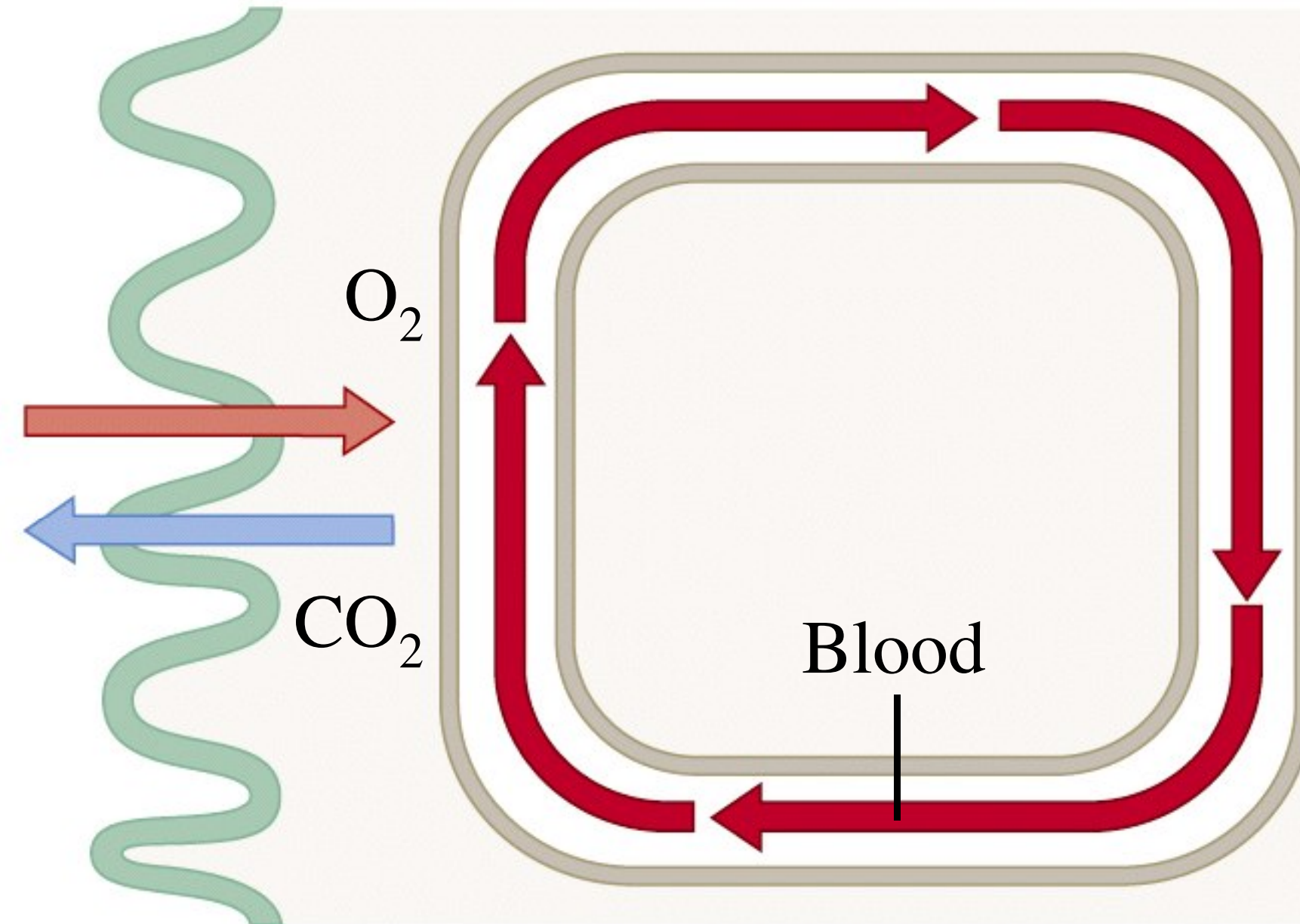


Ventilation



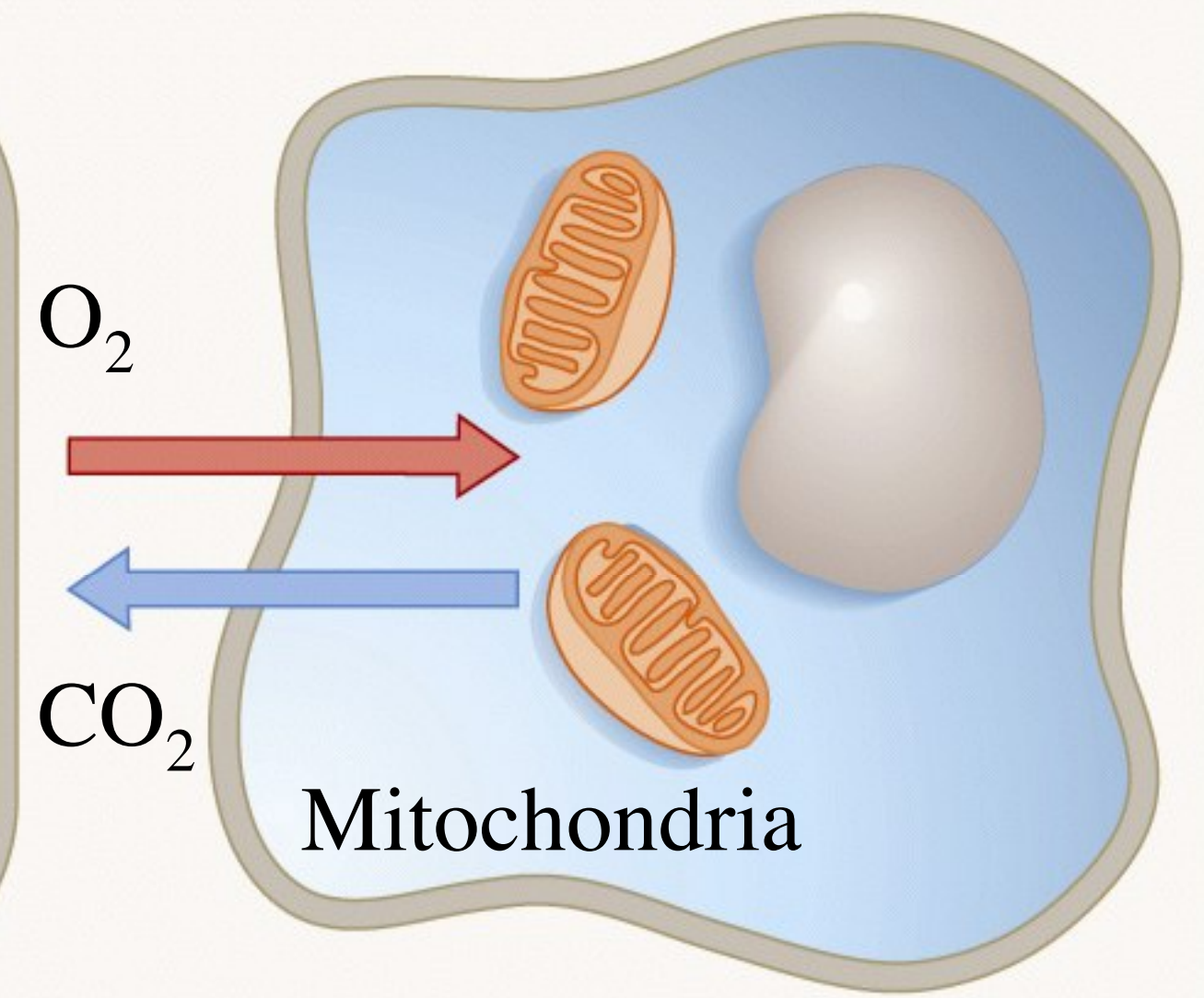
Environment

Circulation



Circulatory system

Respiration



Cell

O_2
 CO_2

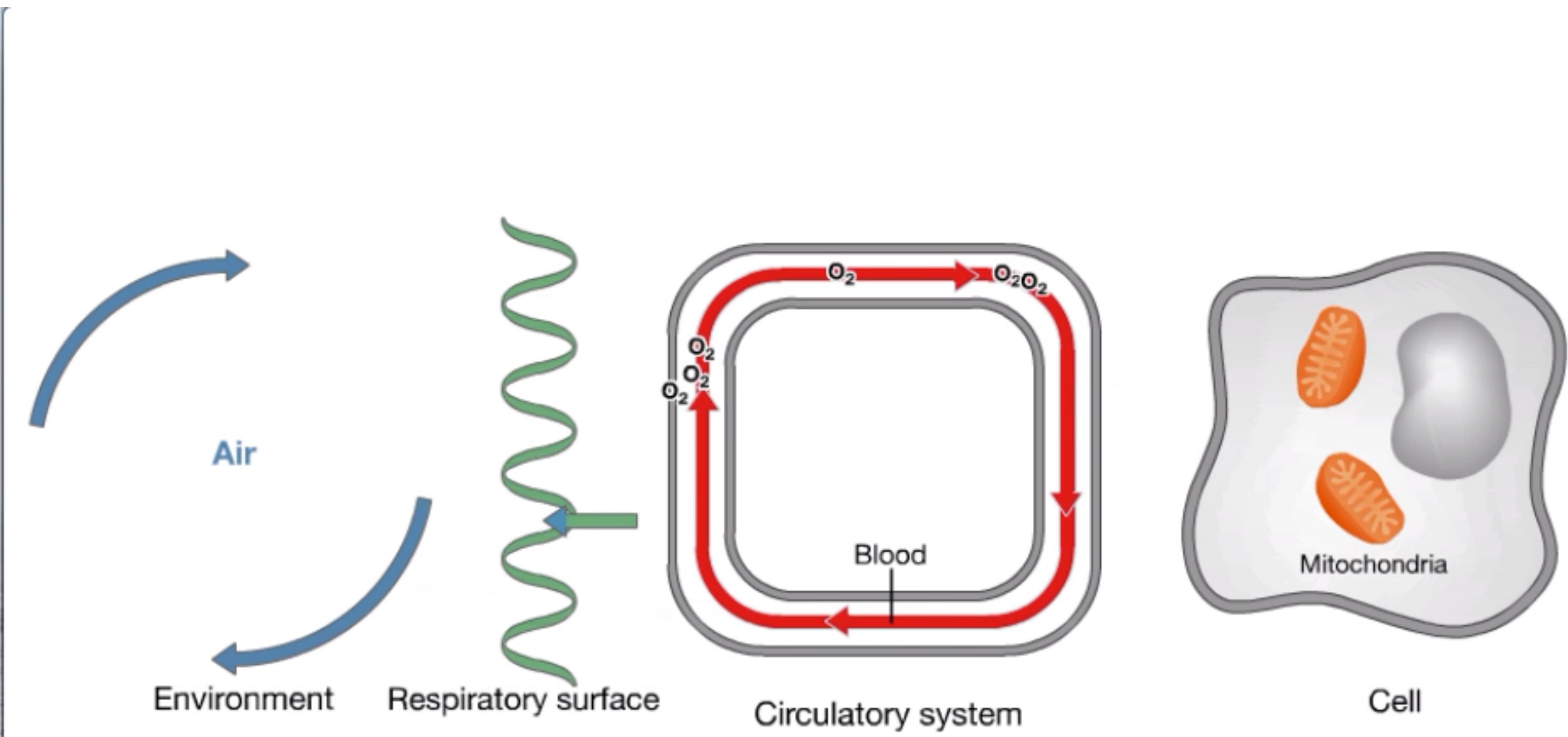
O_2
 CO_2

Air or
water

Blood

Mitochondria

Ventilatory
surface

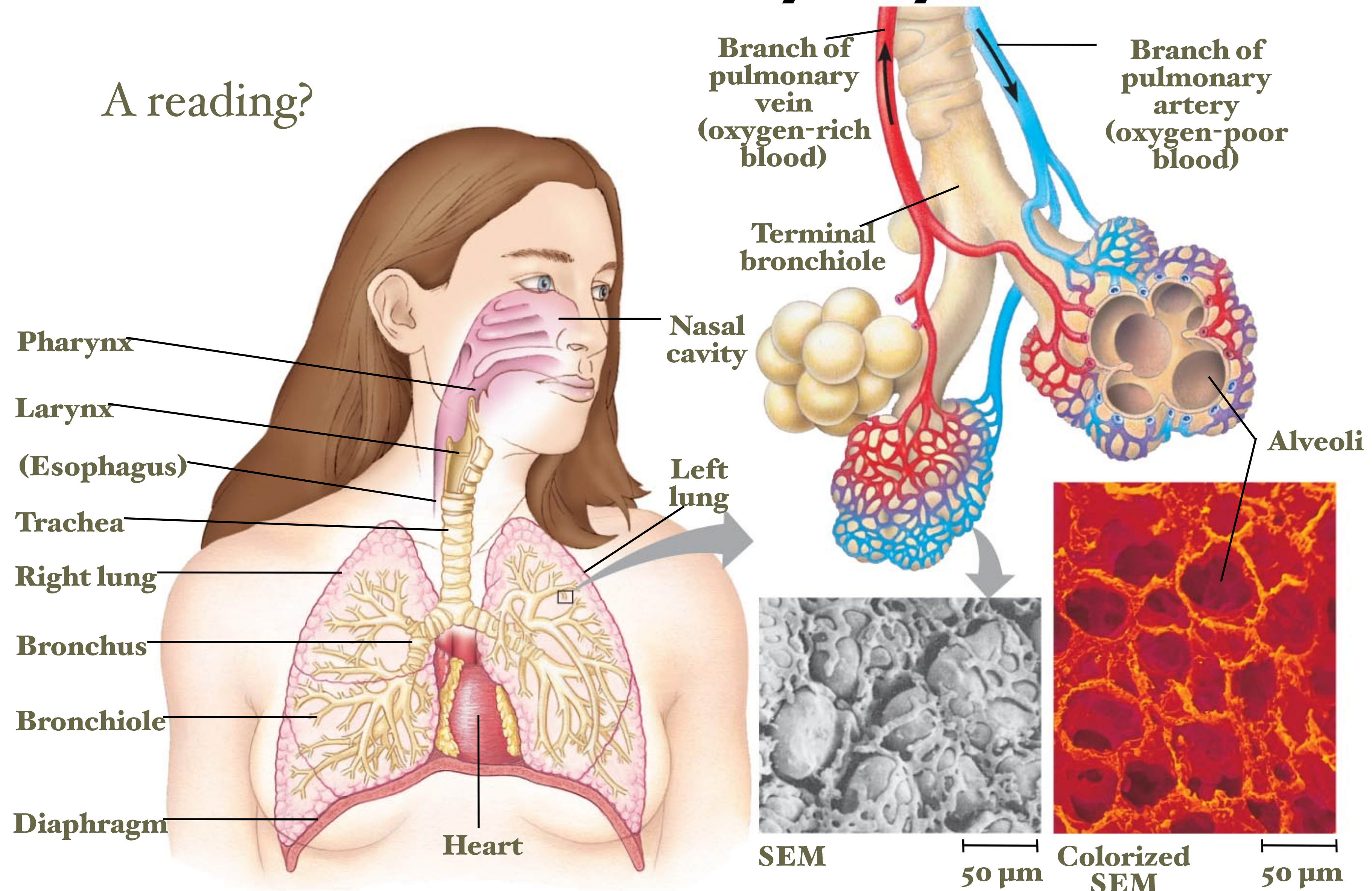


What is unique about blood in pulmonary arteries compared with blood in other arteries?

- a) Blood in pulmonary arteries is always blue; it is red in all other arteries.
- b) It is moving away from the heart.
- c) It is moving toward the heart.
- d) It is the same as blood in other arteries.
- e) It is loaded with carbon dioxide.

The Pulmonary System

A reading?



A reading . . .

Air enters through the nostrils and is then filtered by hairs, warmed, humidified, and sampled for odors as it flows through a maze of spaces in the nasal cavity. The nasal cavity leads to the pharynx, an intersection where the paths for air and food cross. When food is swallowed, the **larynx** (the upper part of the respiratory tract) moves upward and tips the

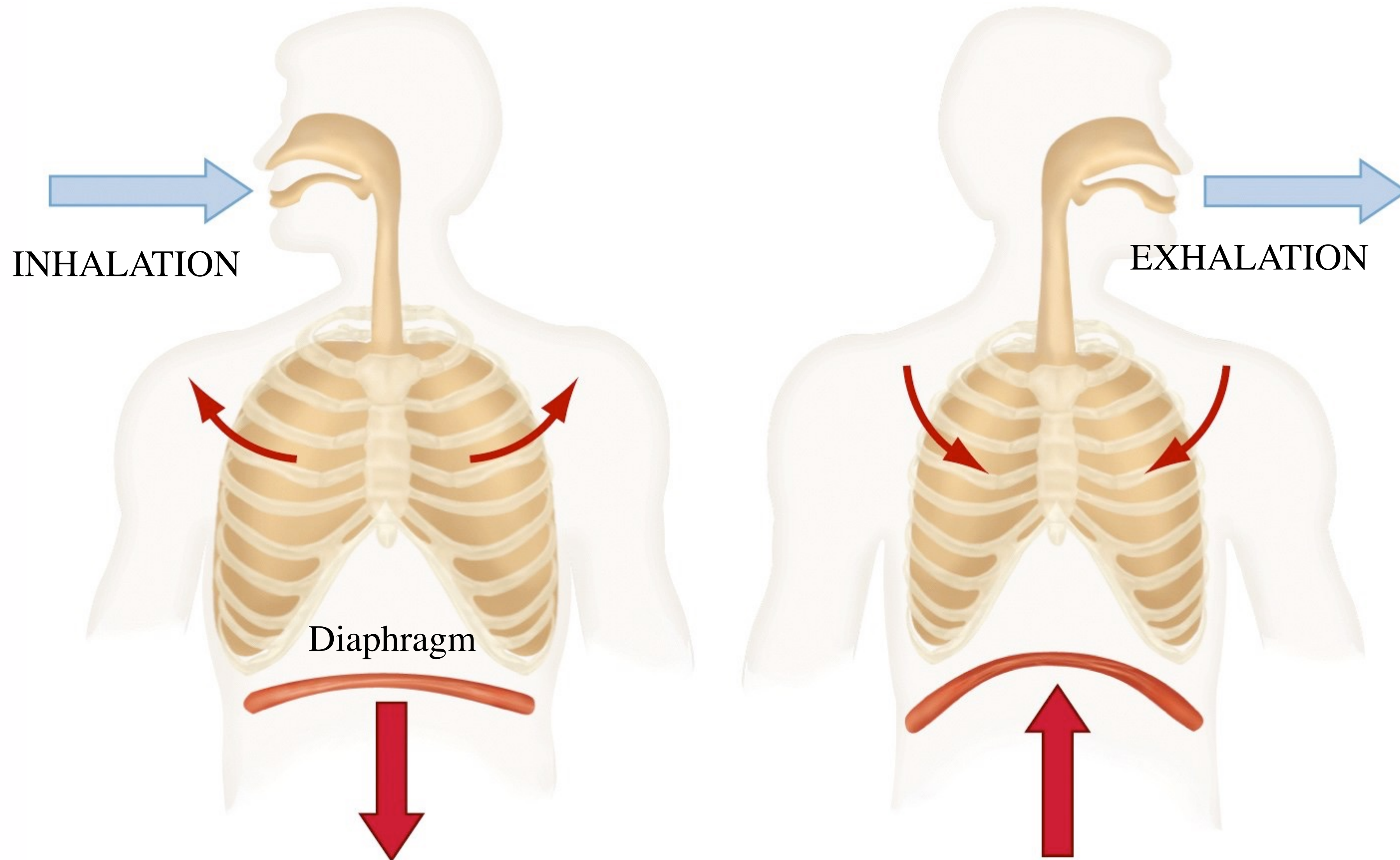
In negative pressure breathing, inhalation results from

- a) forcing air from the throat down into the lungs.
- b) contracting the diaphragm.
- c) relaxing the muscles of the rib cage.
- d) using muscles of the lungs to expand the alveoli.
- e) contracting the abdominal muscles.

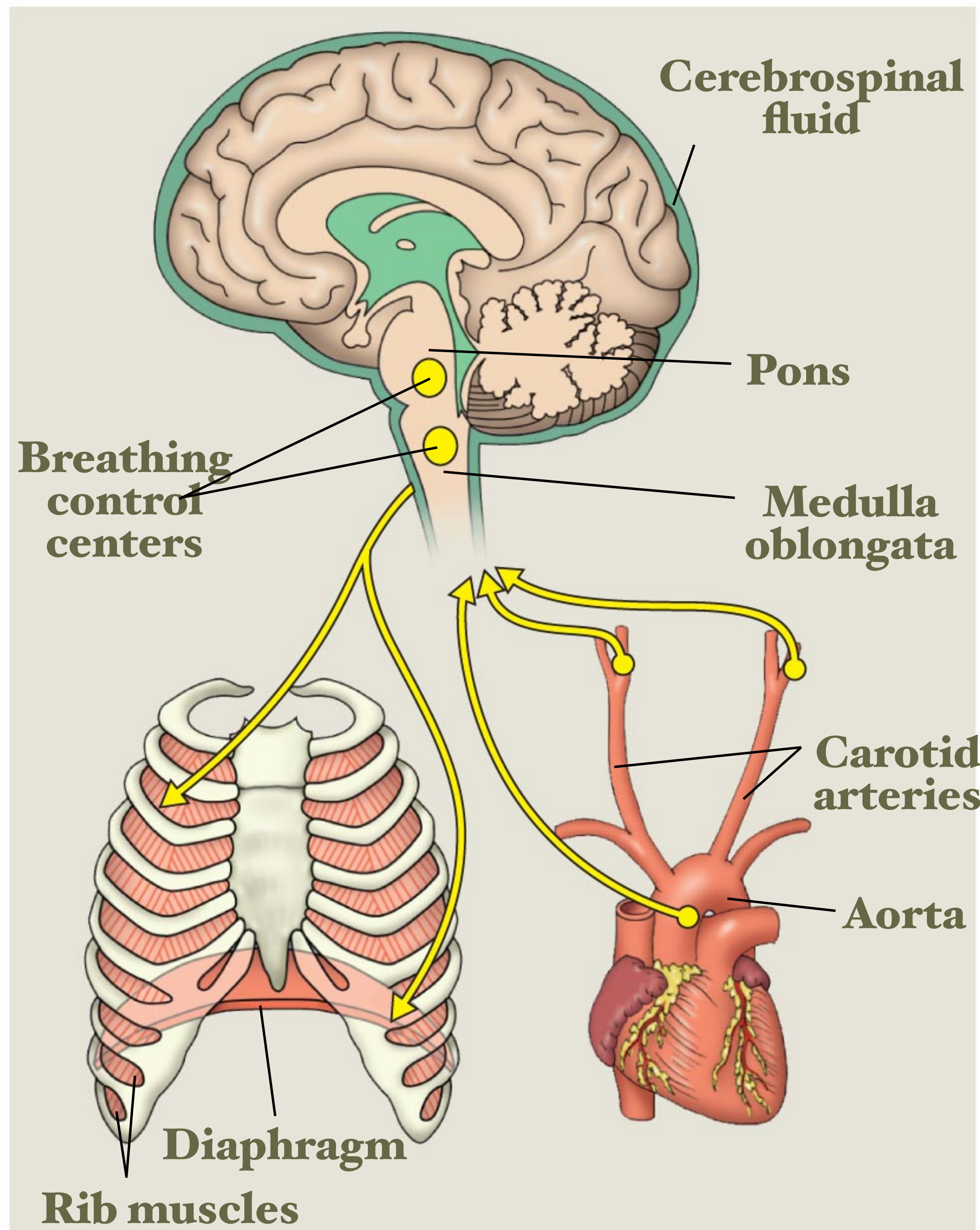
When you hold your breath, which of the following blood gas changes first leads to the urge to breathe?

- a) rising O₂
- b) falling O₂
- c) rising CO₂
- d) falling CO₂
- e) rising CO₂ and falling O₂

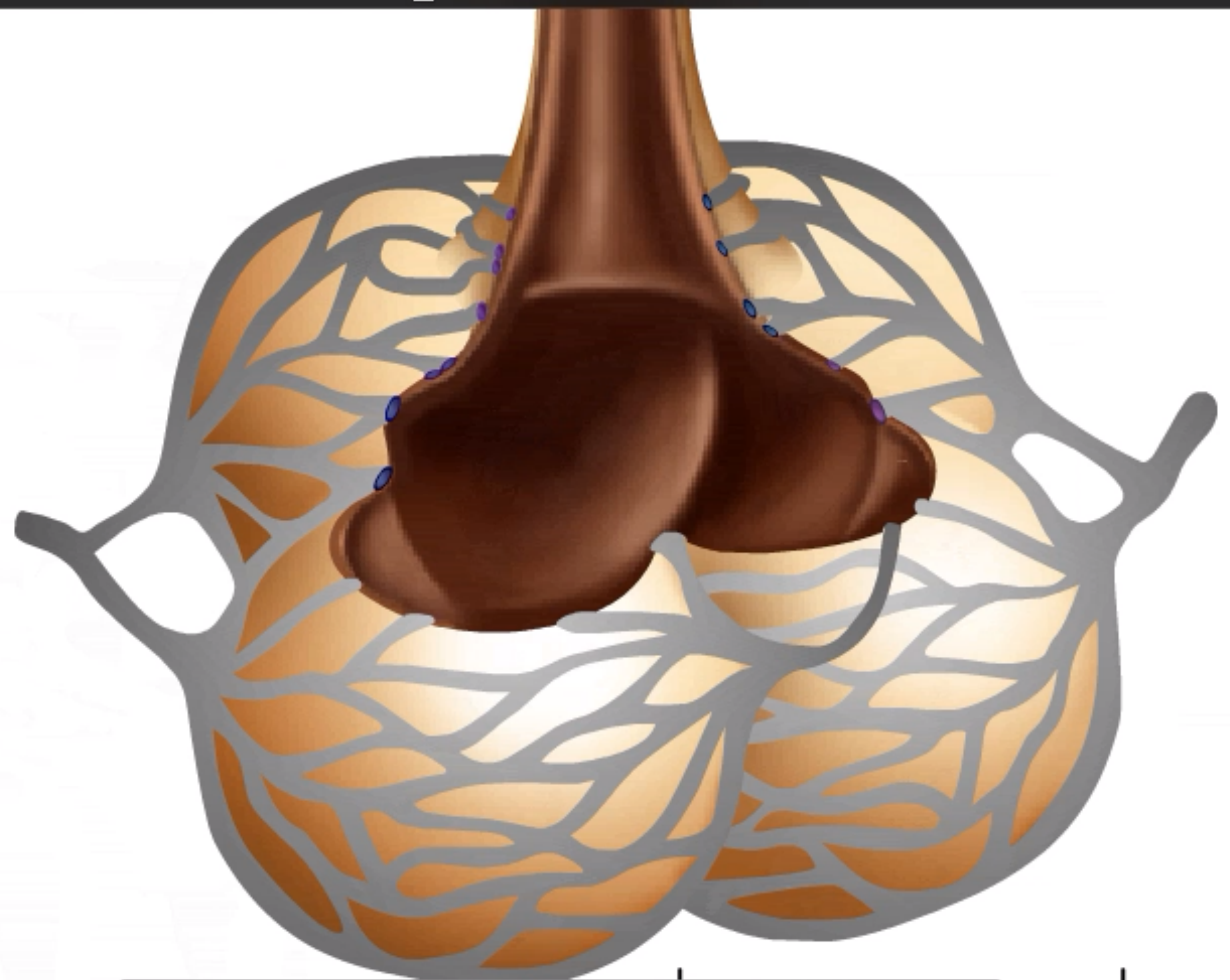
Lungs expand and contract in response to changes in pressure inside the chest cavity.



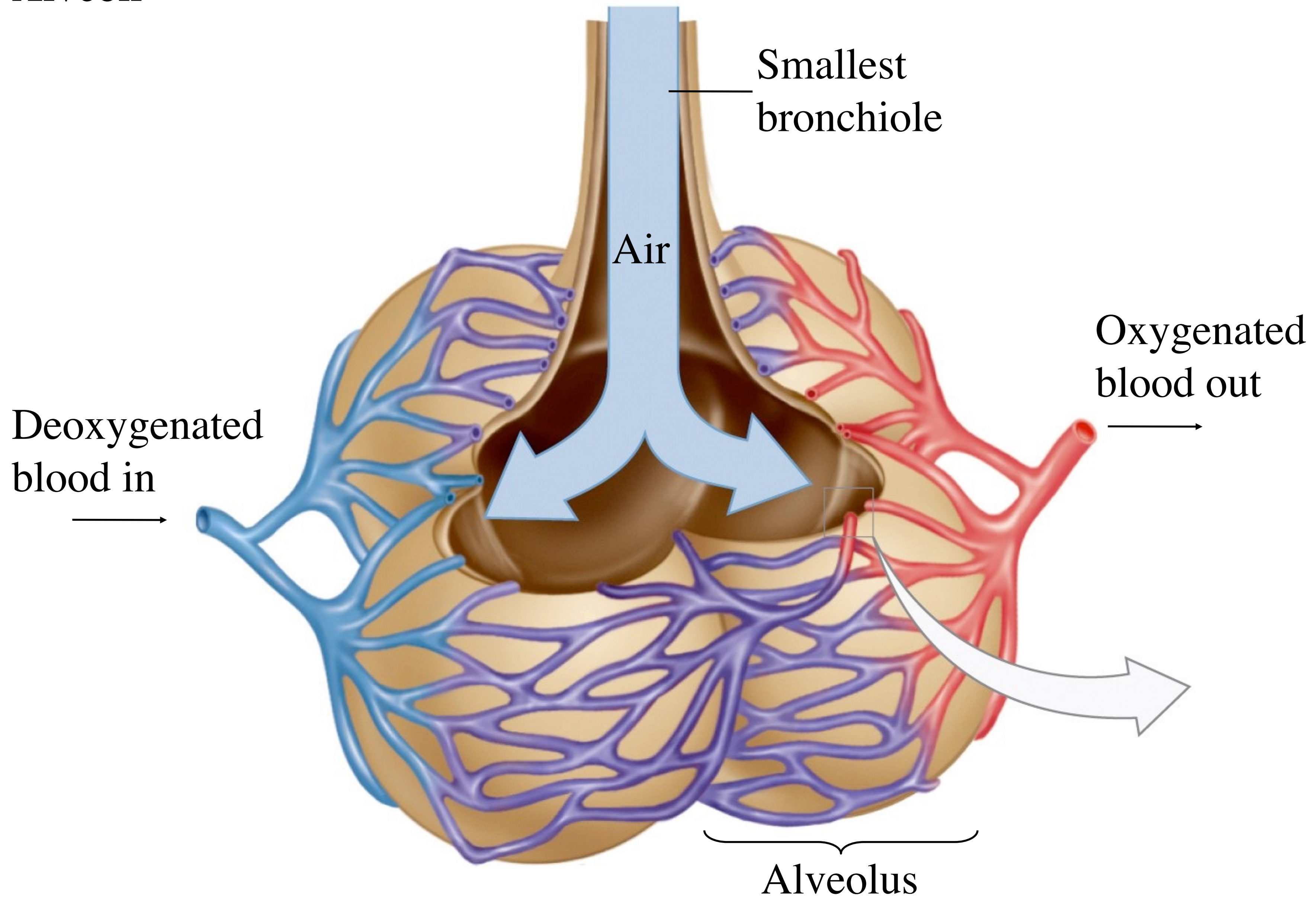
[CO₂]



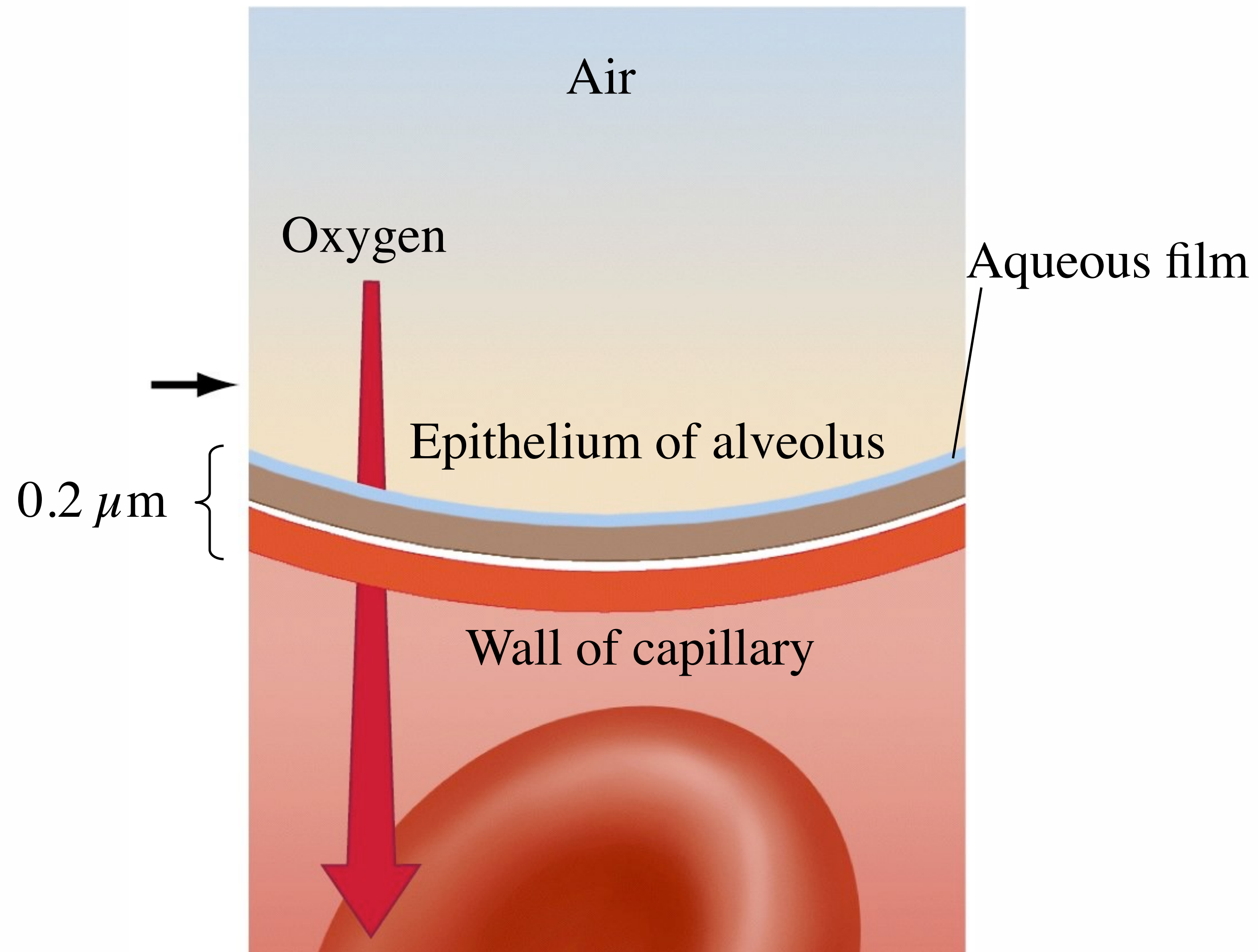
pH



Alveoli

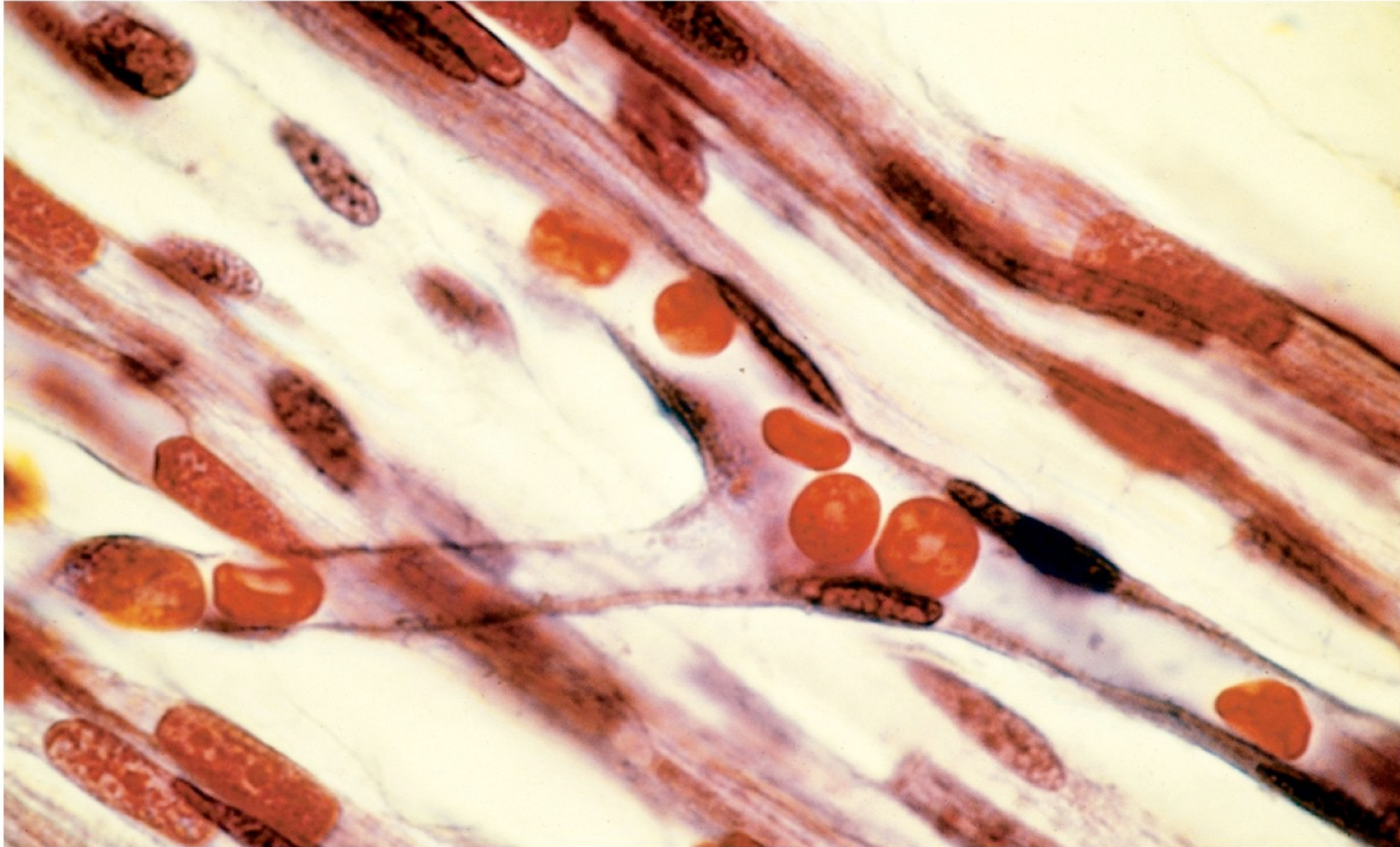


Fick's Law at the lungs (the alveolar ventilatory surface)

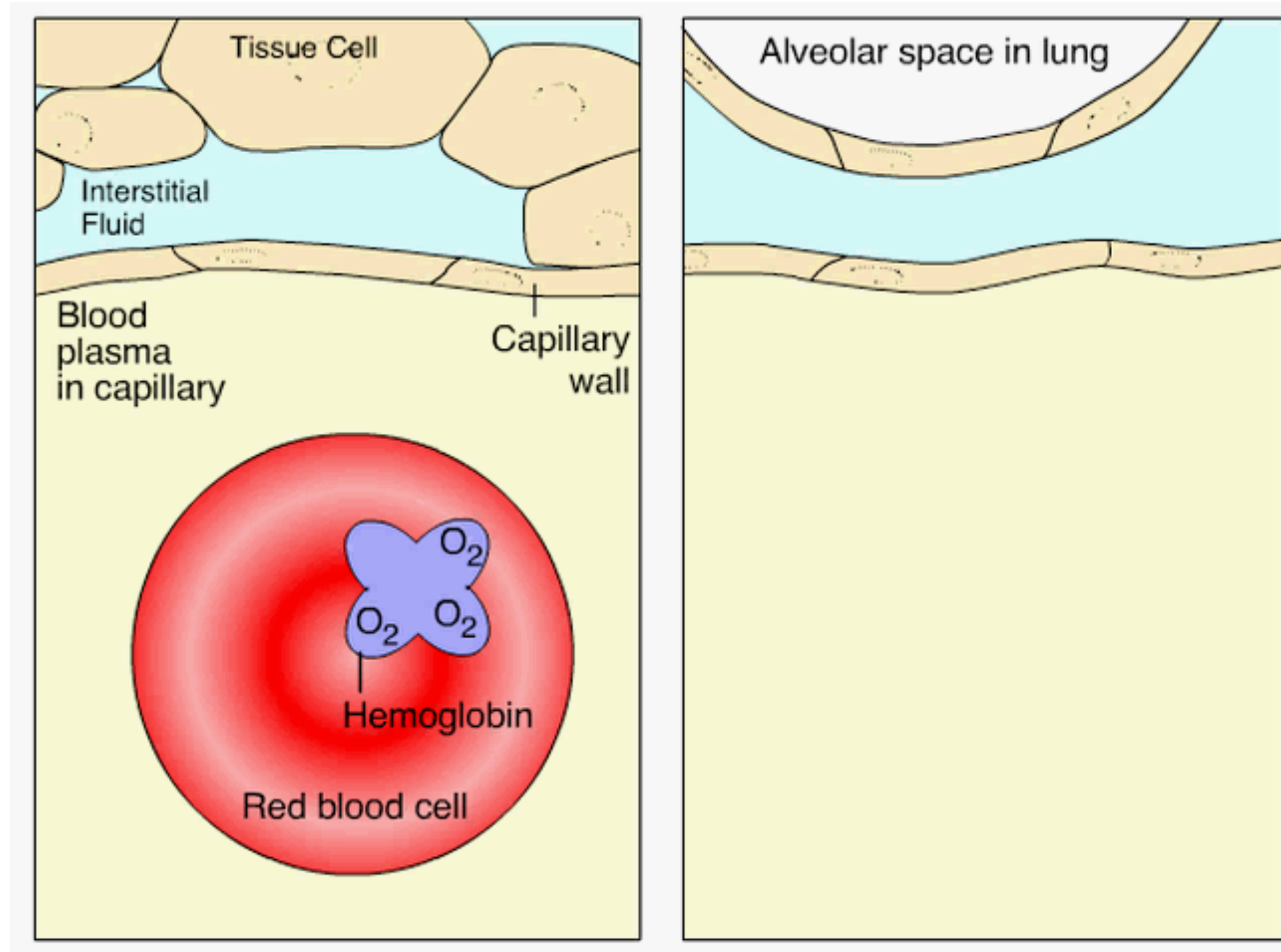


$$\text{Rate of diffusion} = k \times A \times \frac{(P_2 - P_1)}{D}$$

Capillaries are small and extremely thin walled.

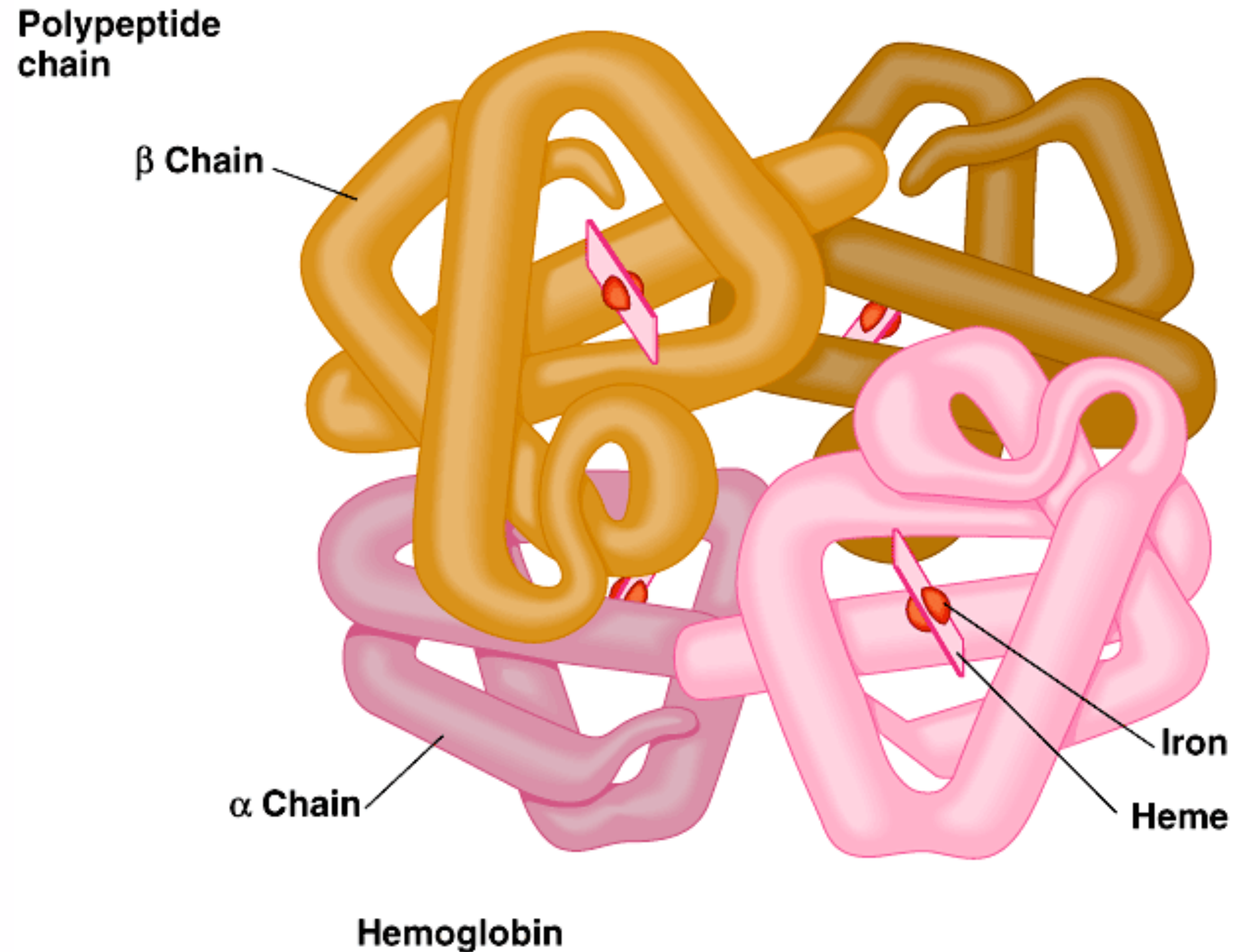


Gas Exchange



Hemoglobin

The Body's Oxygen Shuttle (and more)



At the tissue (the capillary bed by active muscle)

