



# what makes a good figure?



creating effective explanations of complex concepts

Martin Krzywinski  
Canada's Michael Smith Genome Sciences Centre

<https://mk.bcgsc.ca>  
[martink@bcgsc.ca](mailto:martink@bcgsc.ca)



i

**philosophy**



ii

**practise**





**what to draw**

how to draw it

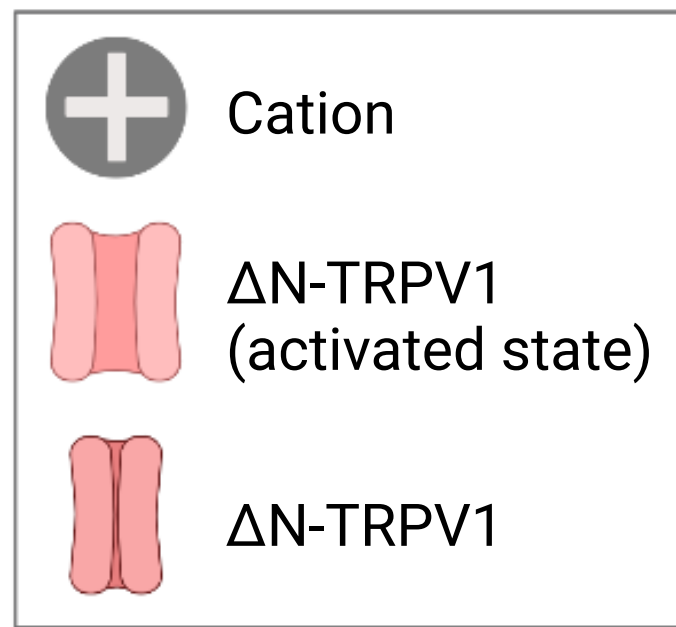




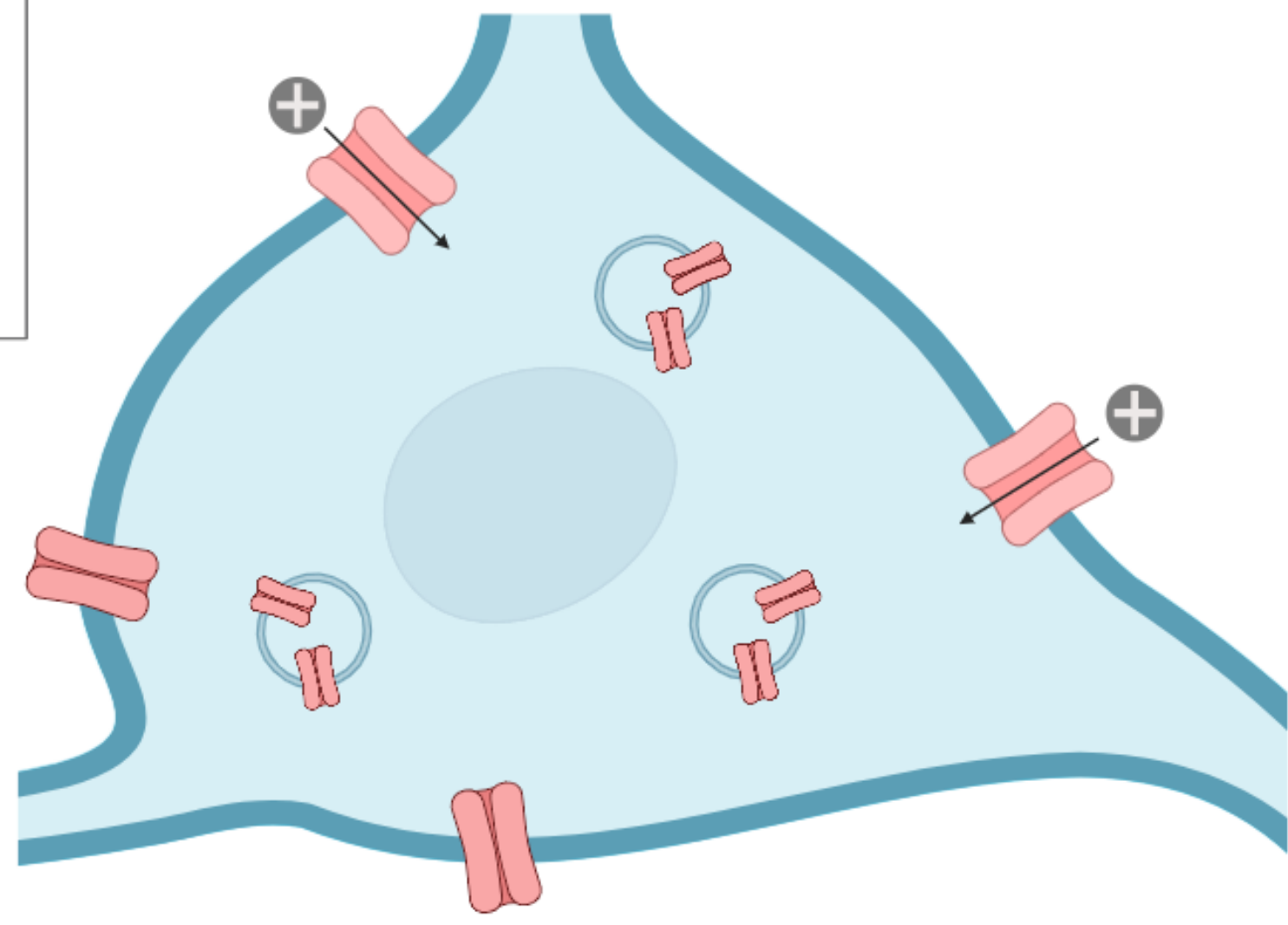
**what is it about?**

draw (only) that

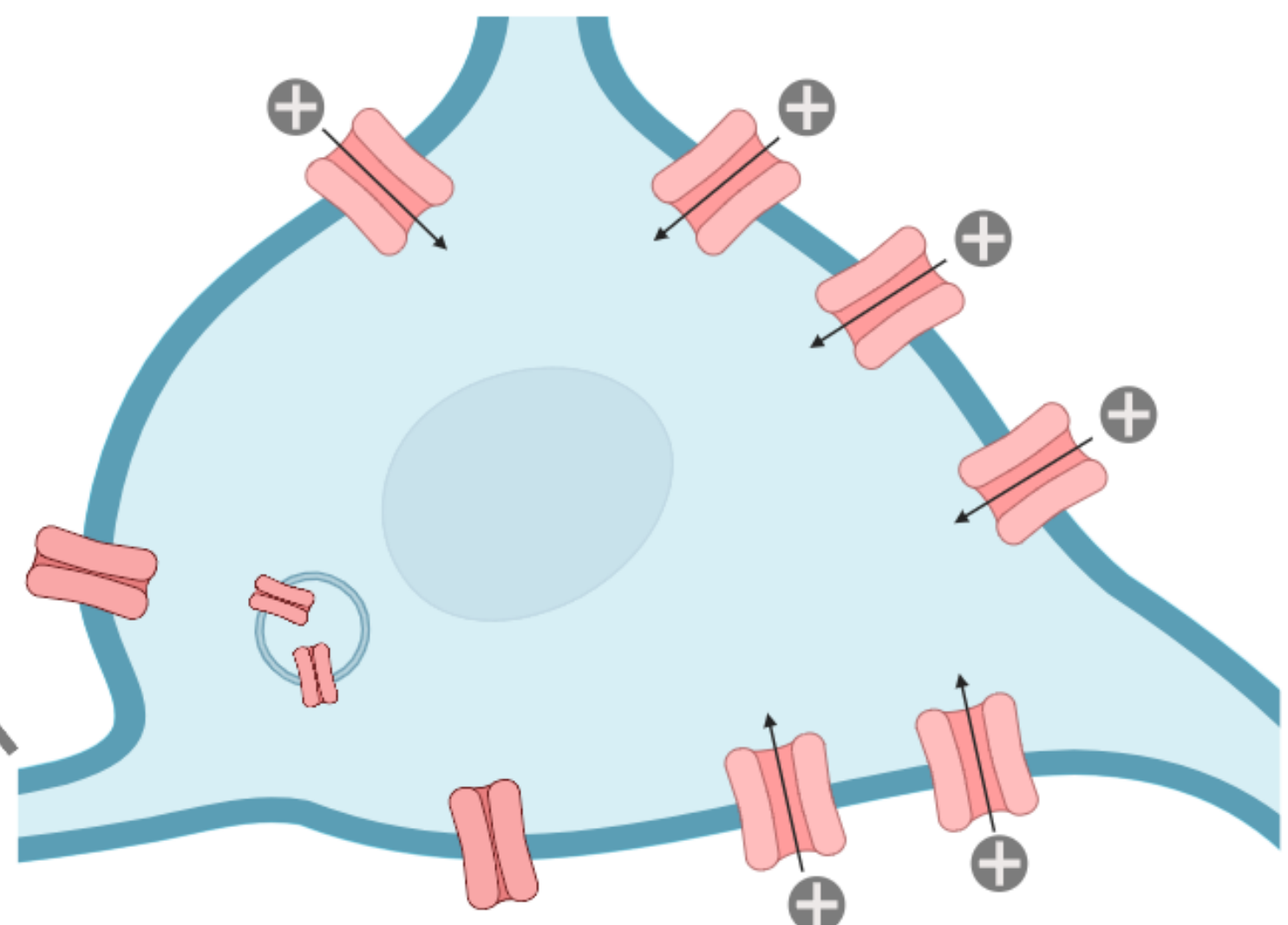




**Basal state**  
(lower electrical activity)

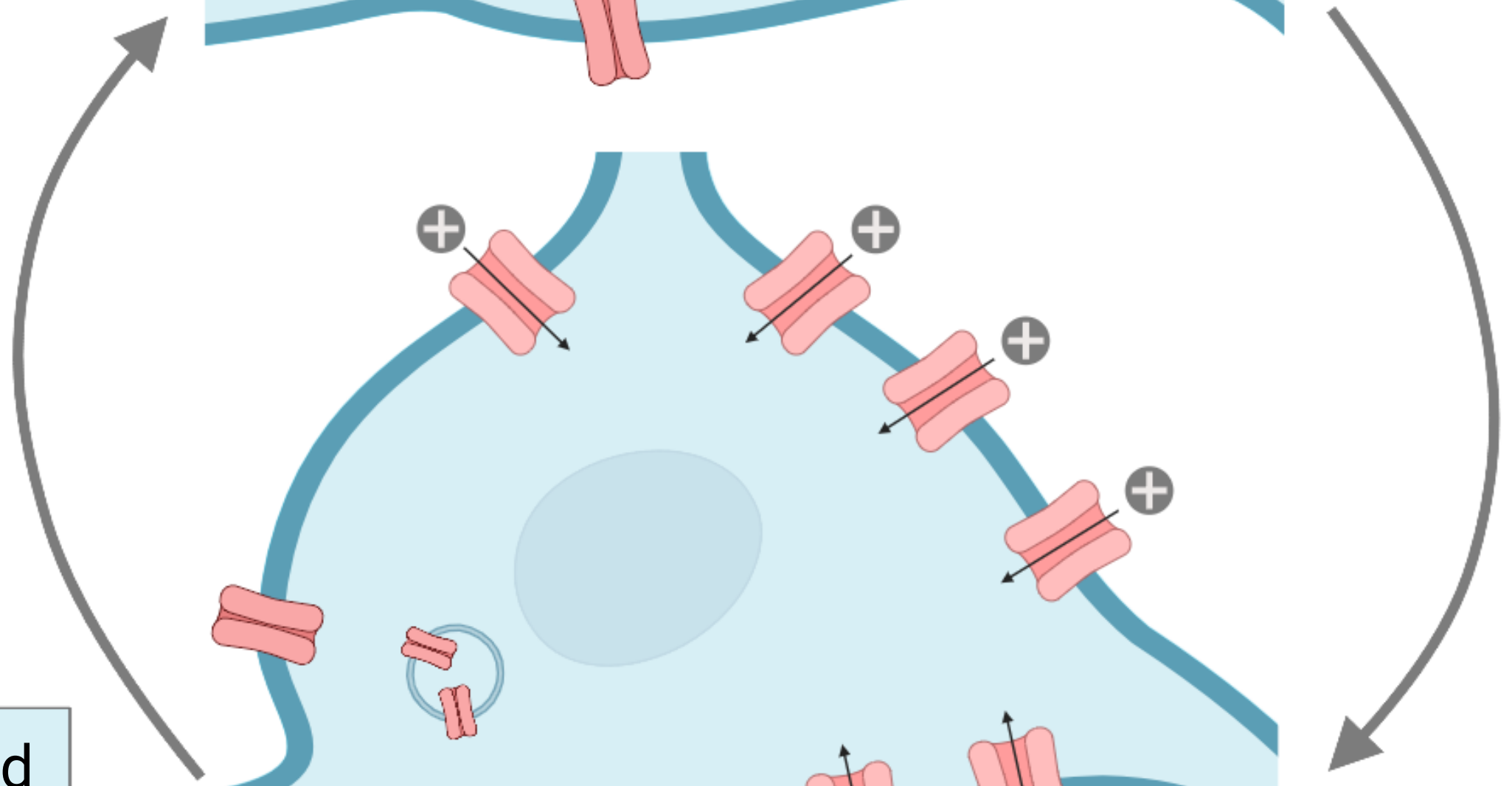


Elevated external osmolality

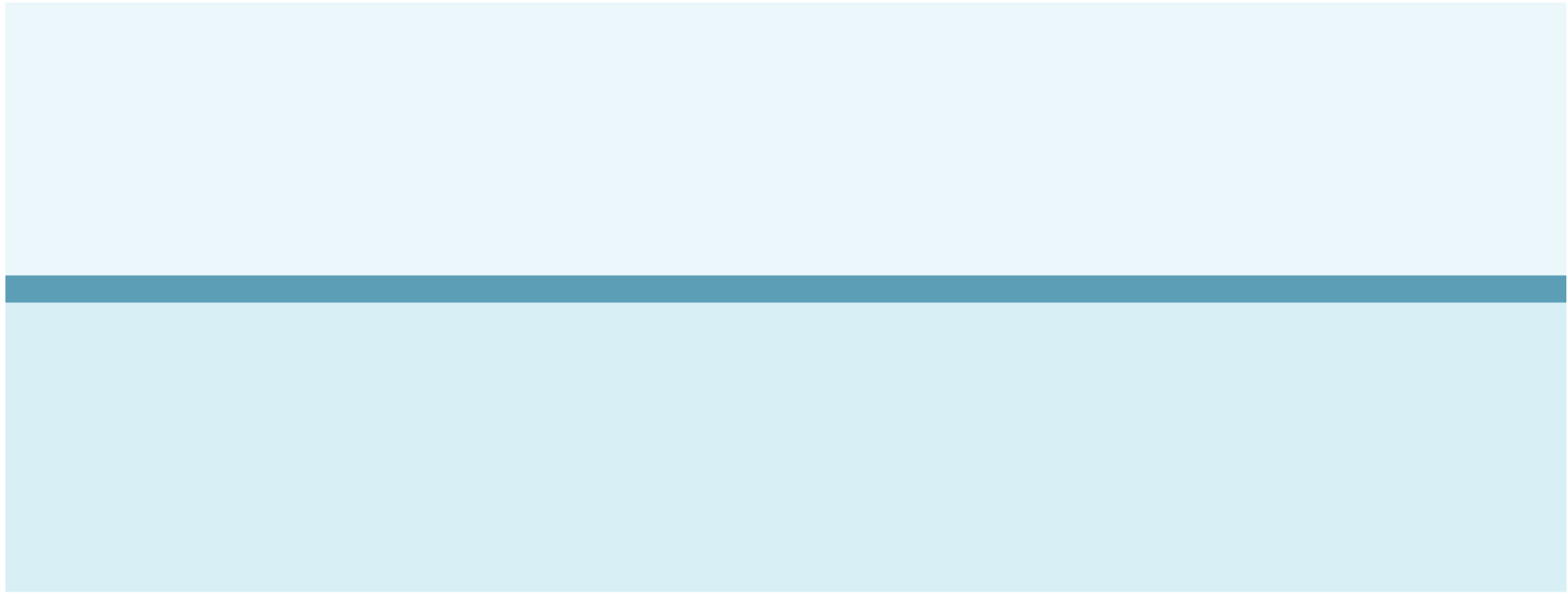
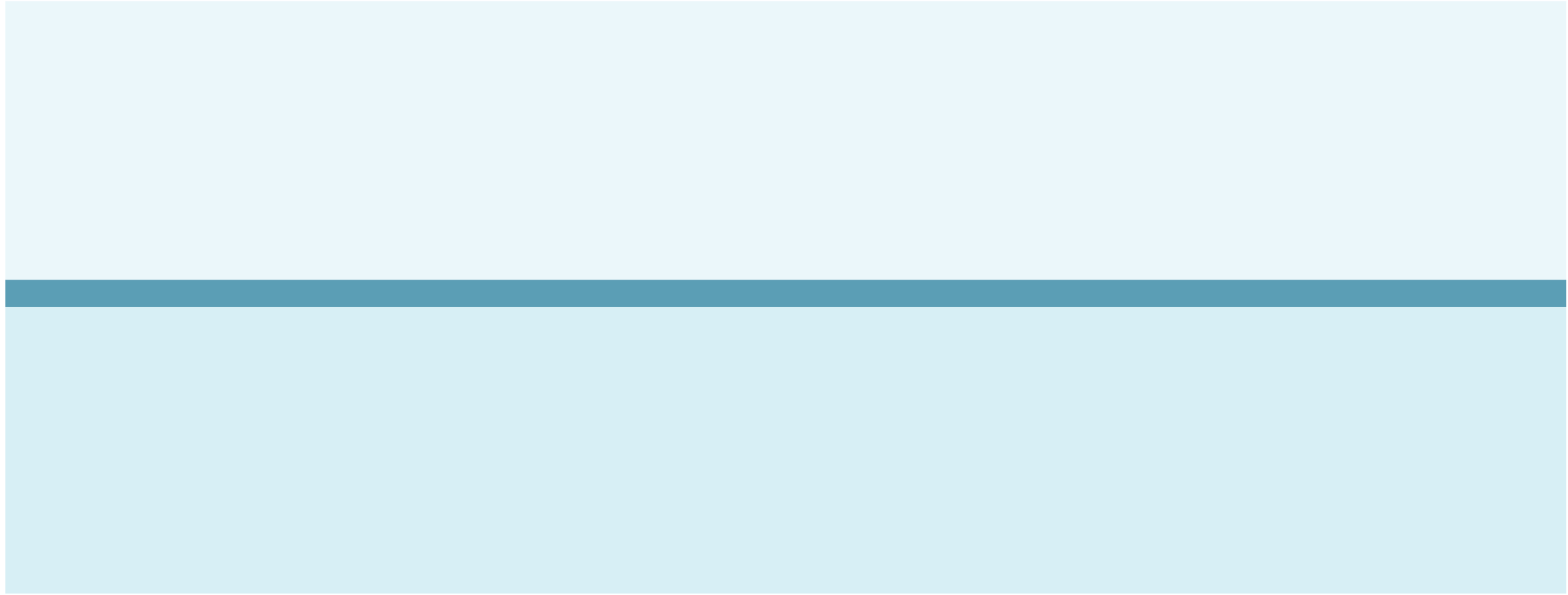


Decreased external osmolality

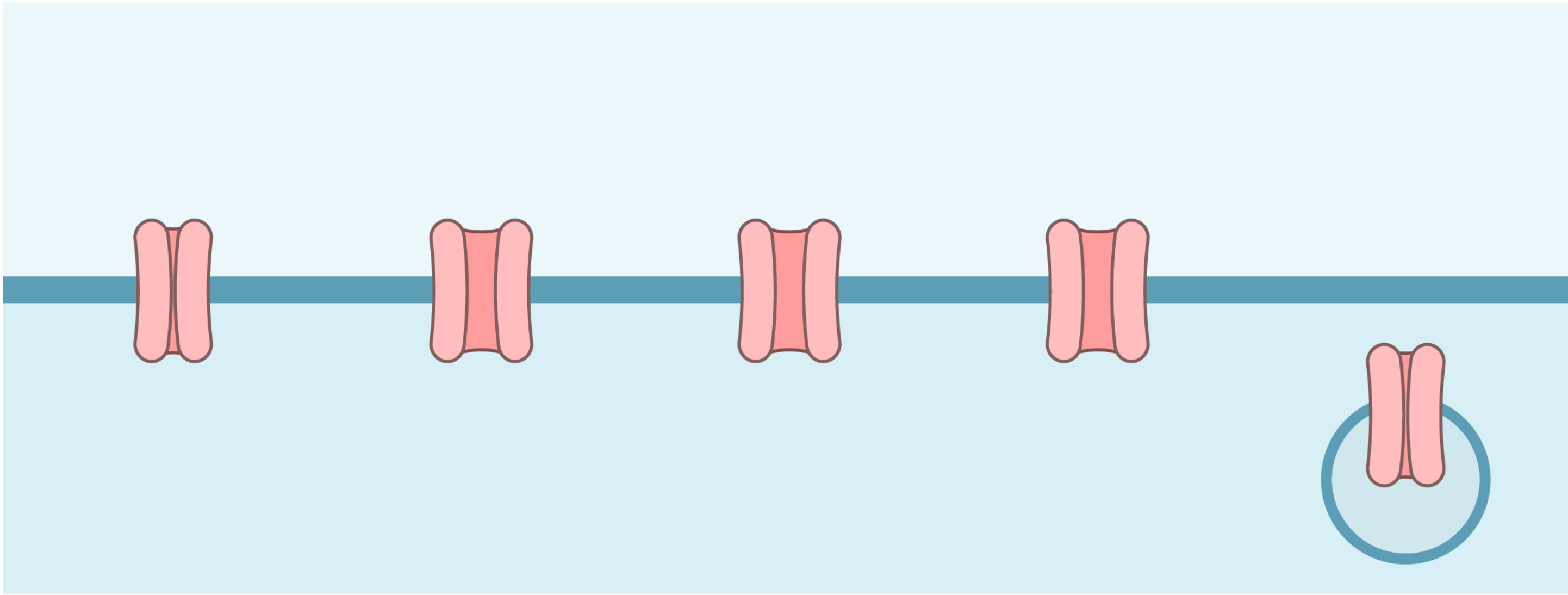
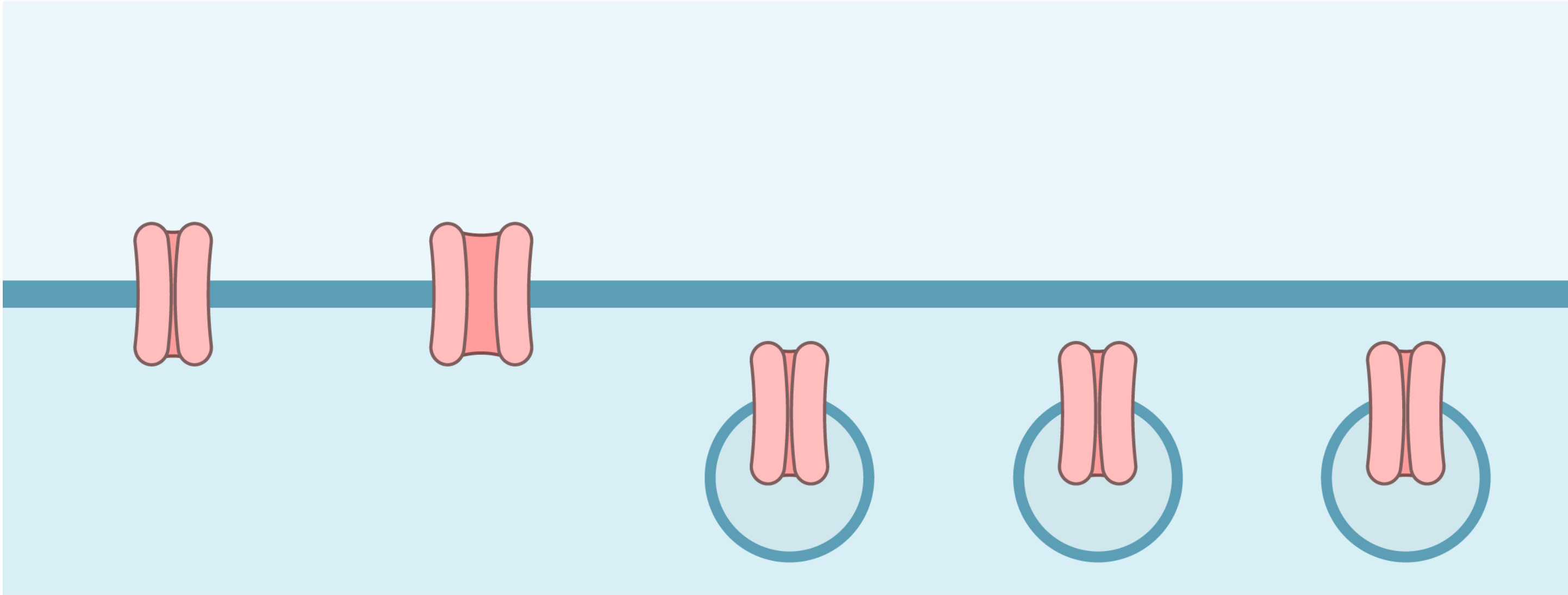
**Osmotically activated state**  
(higher electrical activity)

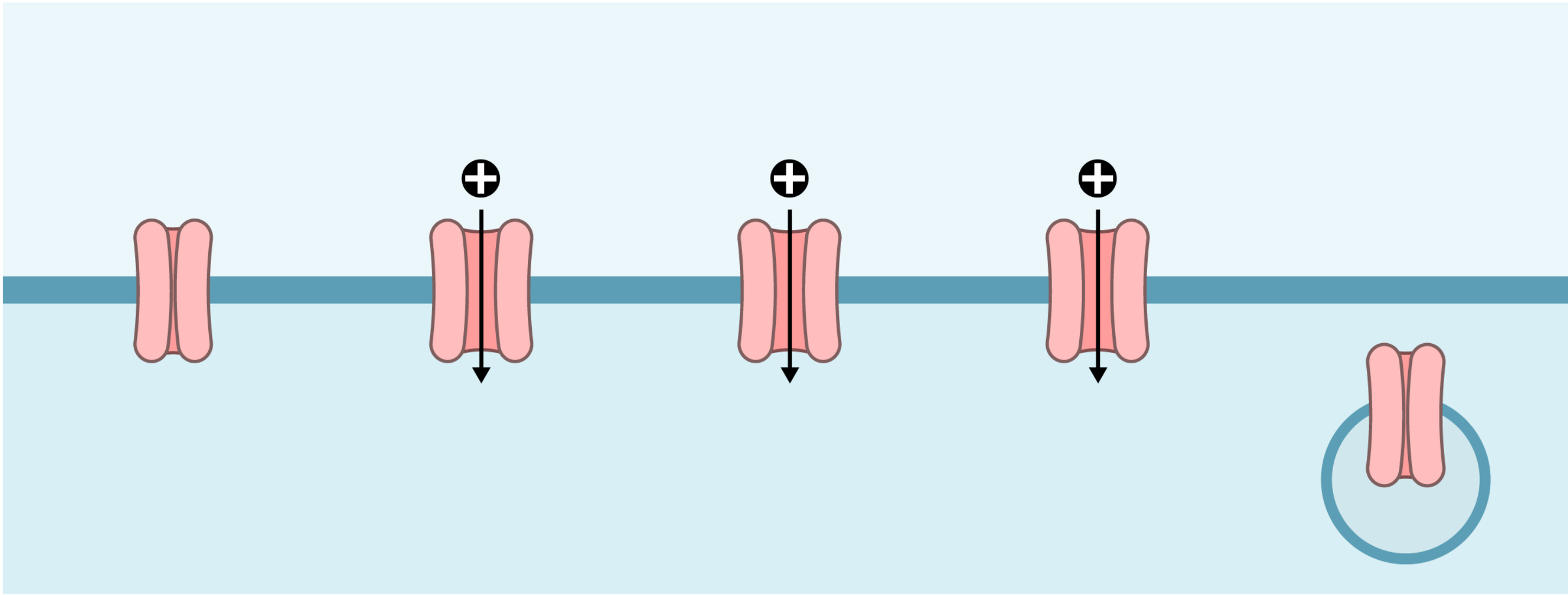
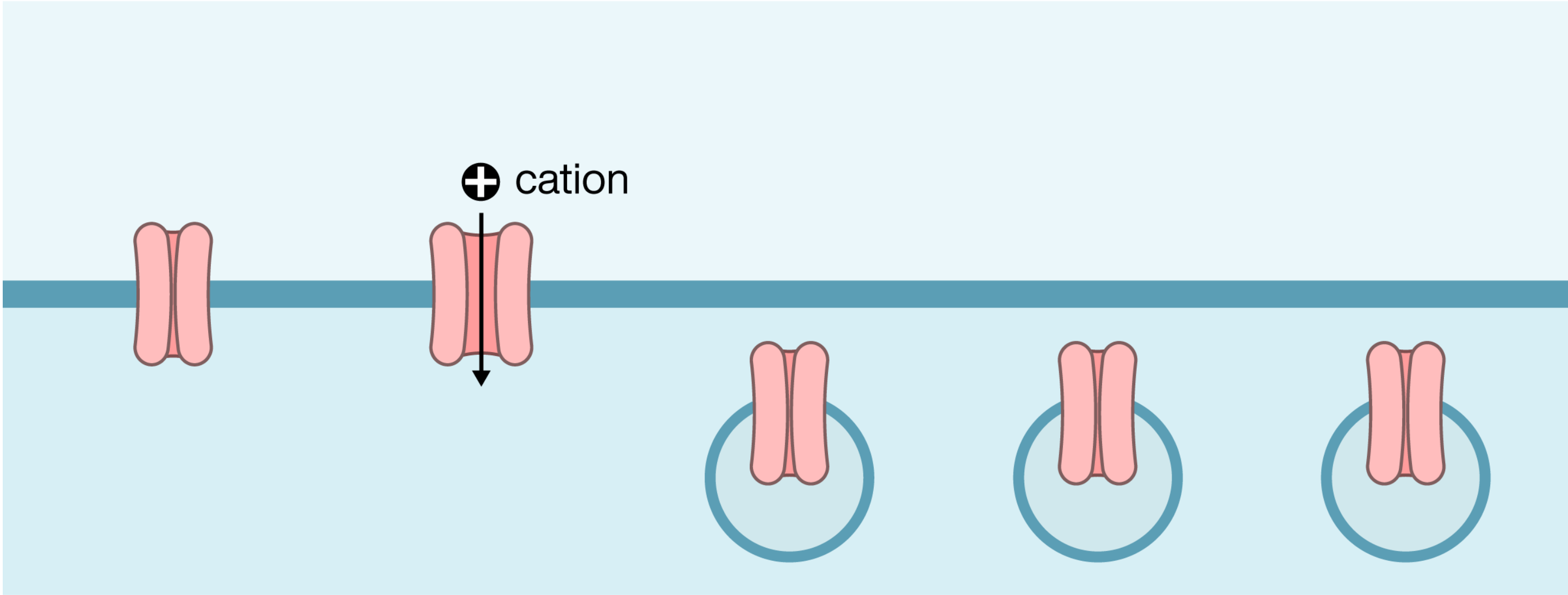




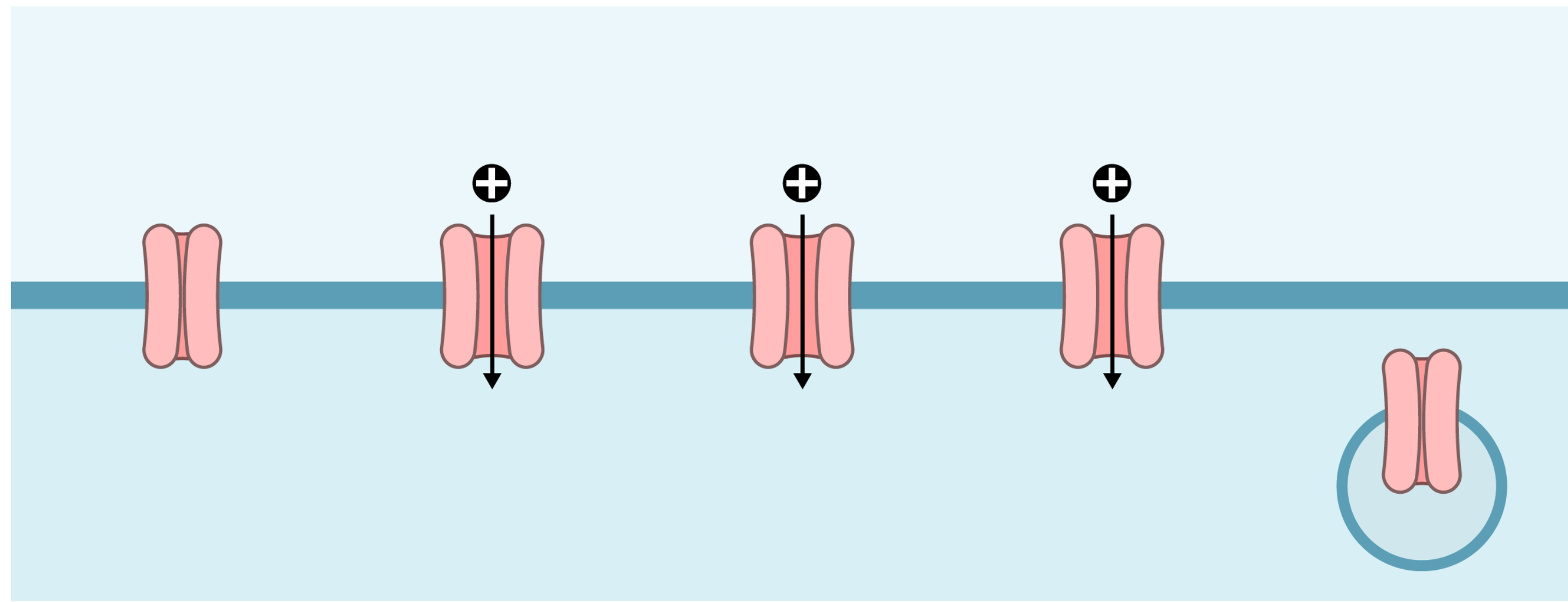
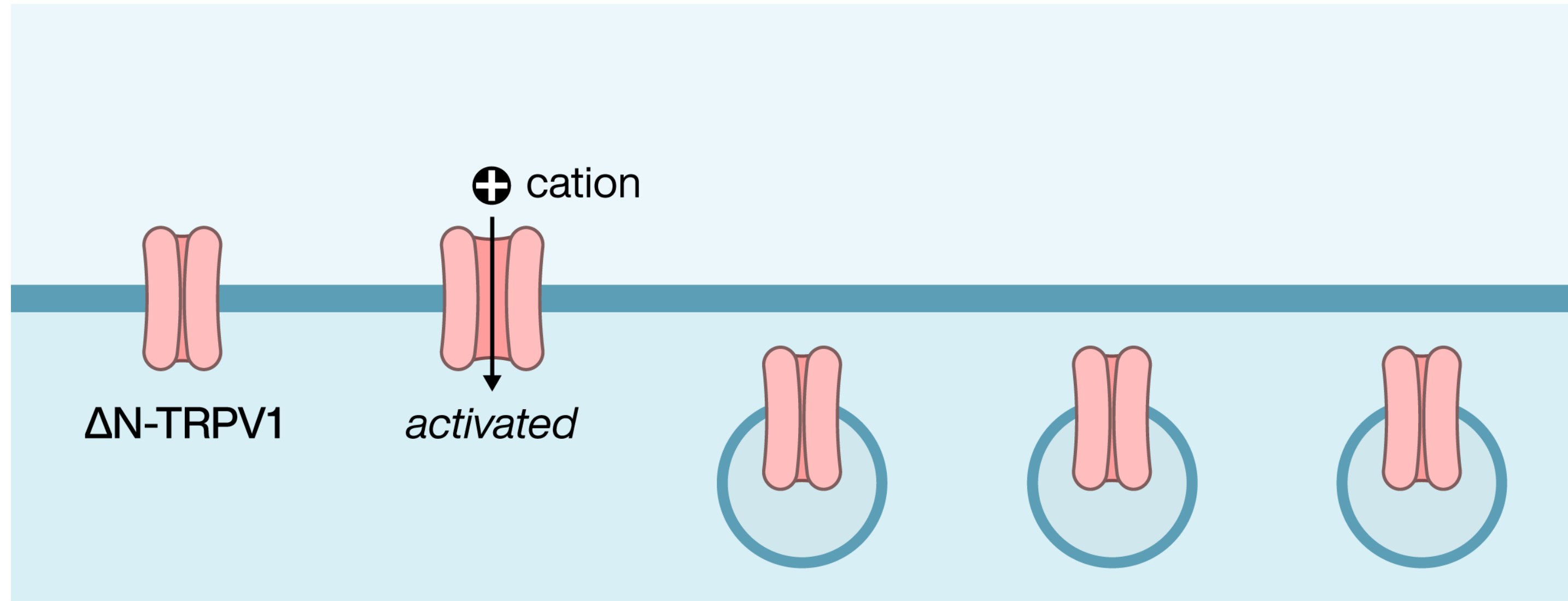




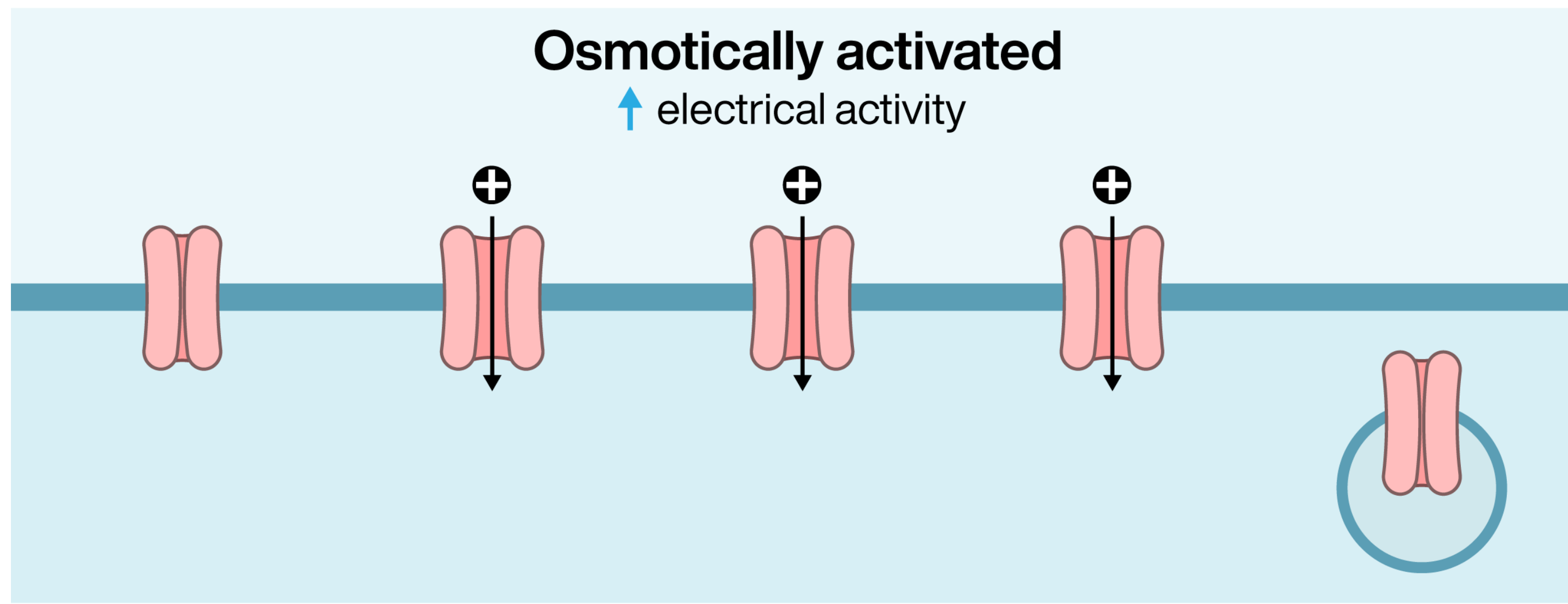
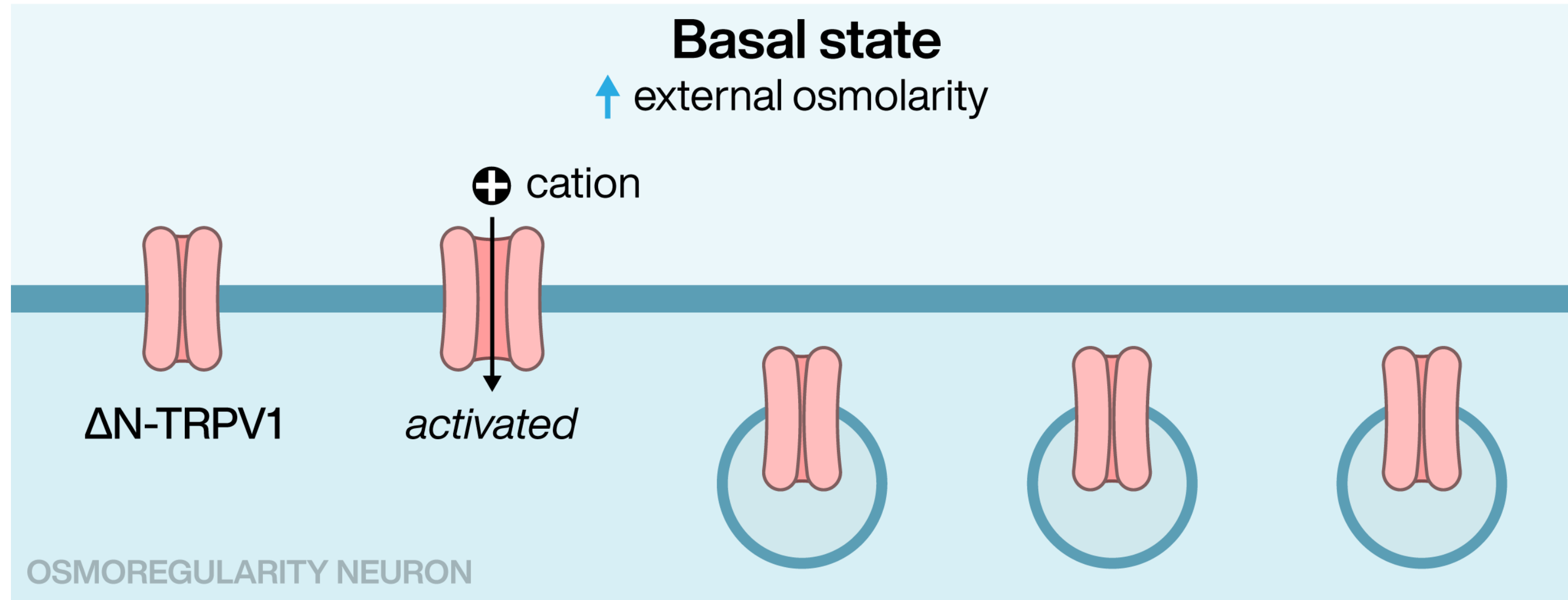






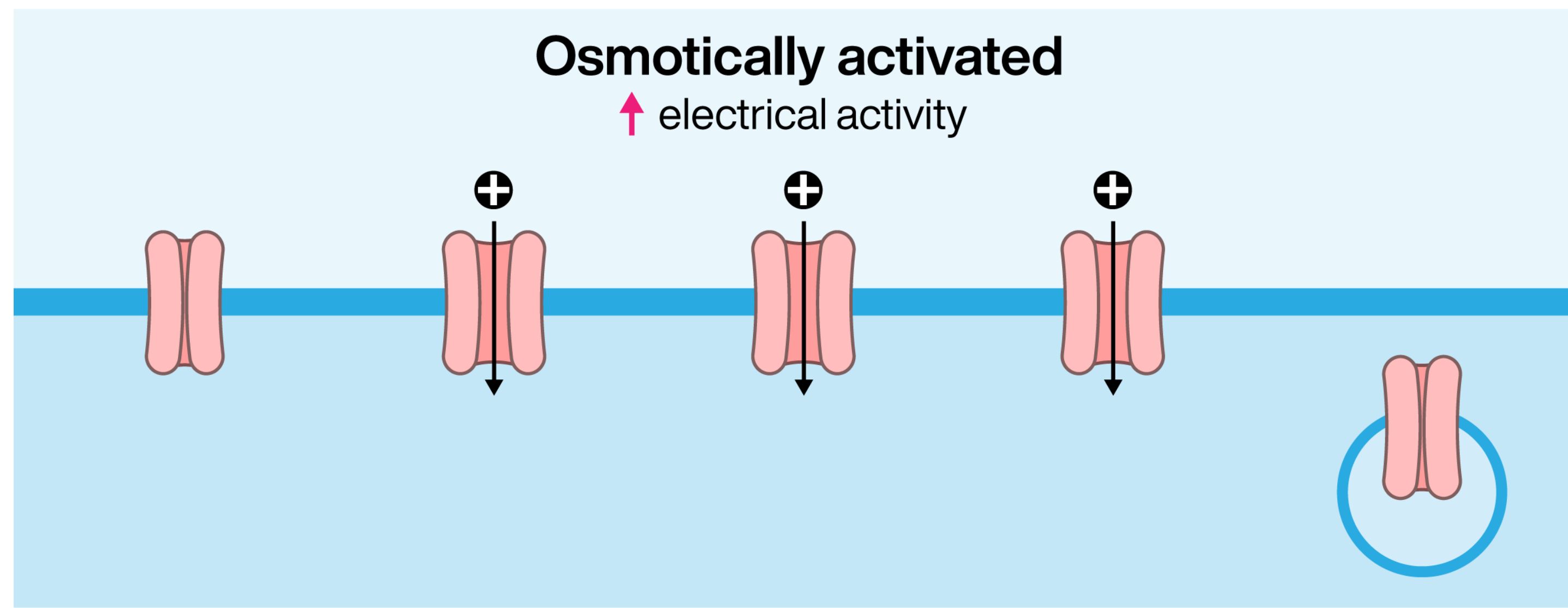
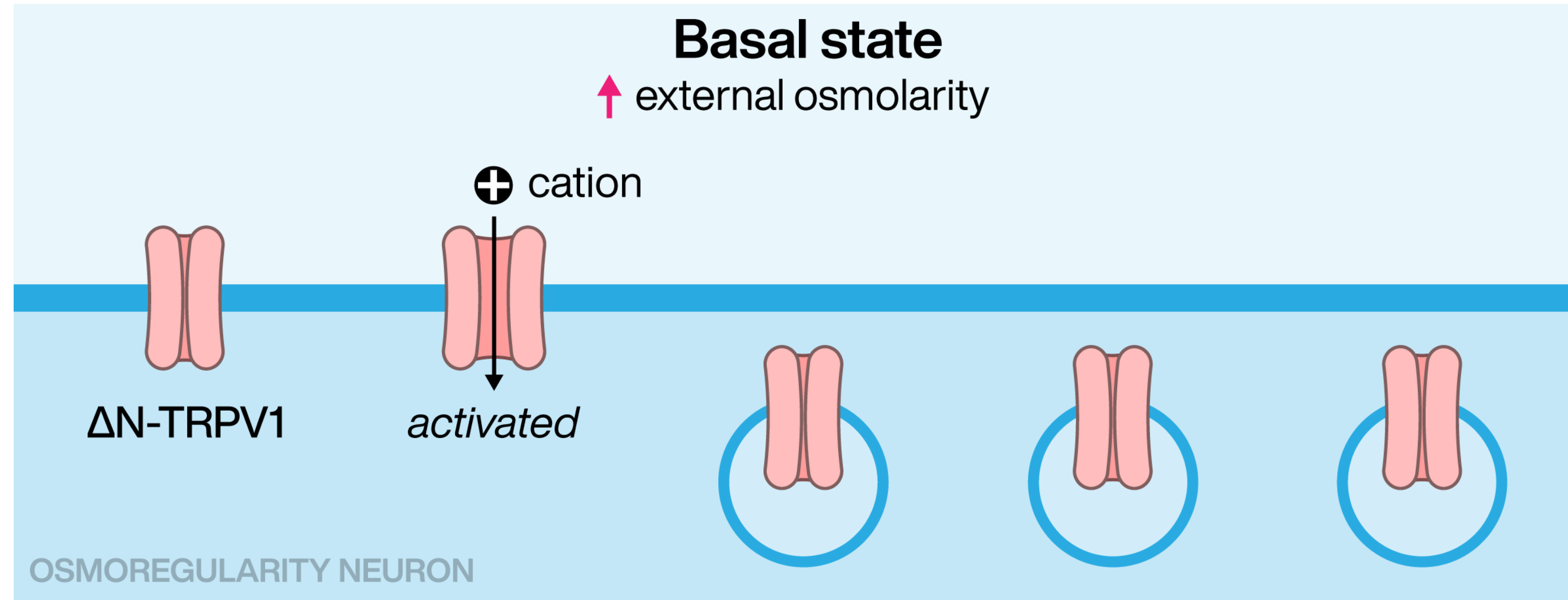


# $\Delta$ N-TRPV1 IS A MOLECULAR CO-DETECTOR OF BODY TEMPERATURE AND OSMOTIC STRESS





# $\Delta$ N-TRPV1 IS A MOLECULAR CO-DETECTOR OF BODY TEMPERATURE AND OSMOTIC STRESS







# **speak plainly**

impact & theme





# Lower Kuskokwim School District Student Survey Results



**SIDE B**

**1** **60 OUT OF 100 STUDENTS** in the Rural LKSD Schools agreed or strongly agreed that they feel like **ADULTS AT SCHOOL CARE ABOUT THEM.**



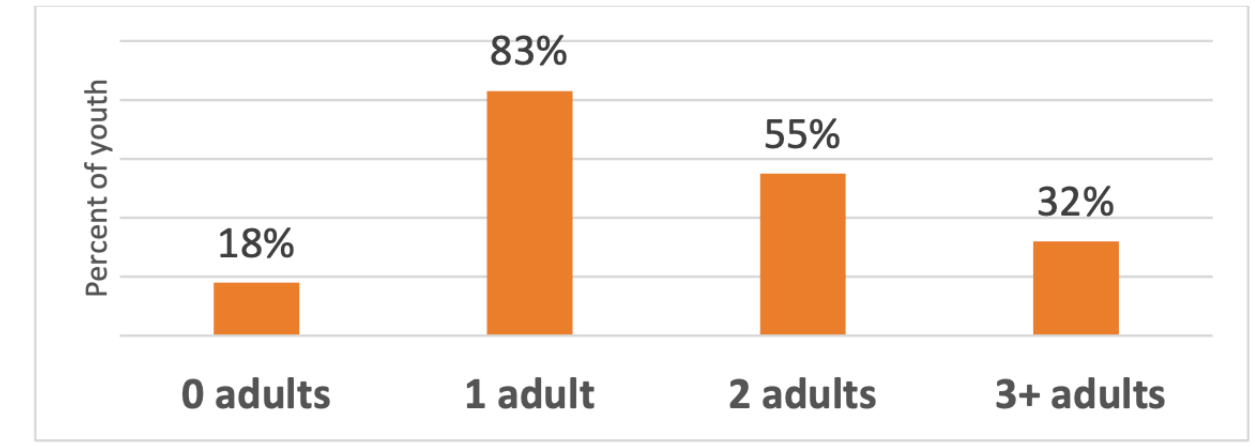
- School Climate and Connectedness Survey (2019)

**2** **22 OUT OF 100 STUDENTS** agreed or strongly agreed that they **FEEL ALONE IN THEIR LIFE.**




- Youth Risk Behavior Survey (2017)


**3** Youth reported **the number of adults they said they would feel comfortable going to** if they had an important question affecting their life...



- Youth Risk Behavior Survey (2017)



# Lower Kuskokwim School District Student Survey Results



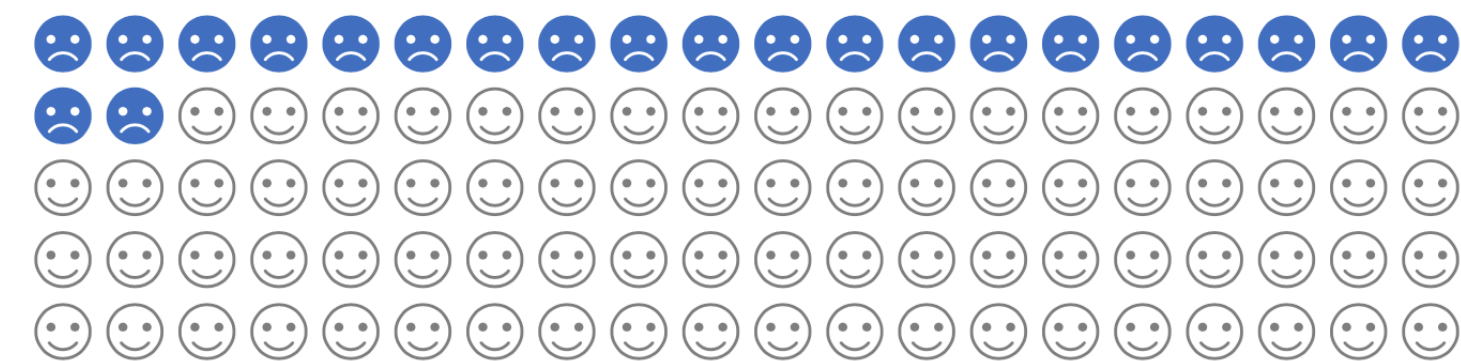
**SIDE B**

**1** **60 OUT OF 100 STUDENTS** in the Rural LKSD Schools agreed or strongly agreed that they feel like **ADULTS AT SCHOOL CARE ABOUT THEM.**



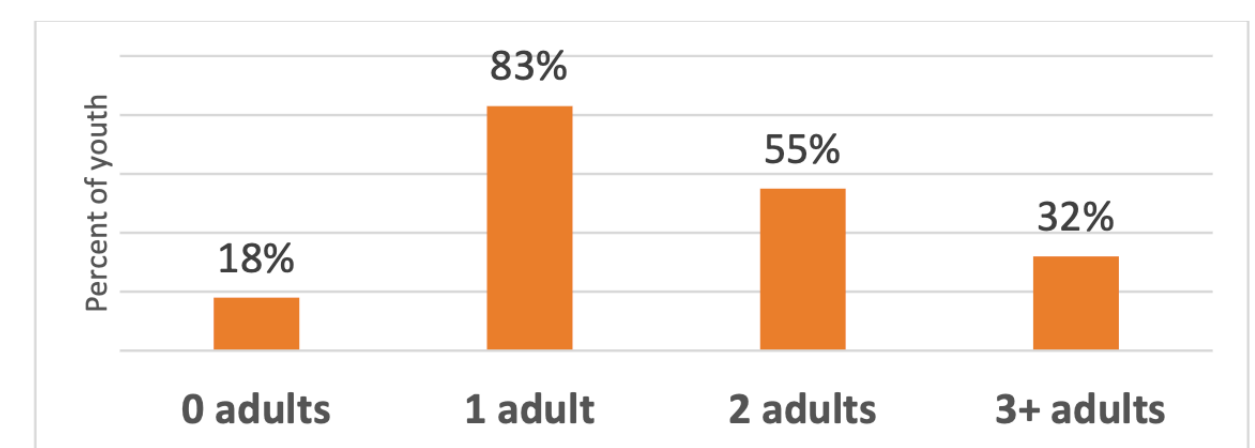
- School Climate and Connectedness Survey (2019)

**2** **22 OUT OF 100 STUDENTS** agreed or strongly agreed that they **FEEL ALONE IN THEIR LIFE.**



- Youth Risk Behavior Survey (2017)

**3** Youth reported **the number of adults they said they would feel comfortable going to** if they had an important question affecting their life...



- Youth Risk Behavior Survey (2017)

## LC 2: Support for Youth and Everyday Caring ACTIVITY 1: Survey Results Handout SIDE B

# Lower Kuskokwim School District Student Survey Results

### DO ADULTS AT SCHOOL CARE ABOUT ME?

60% of students in Rural LKSD Schools agreed or strongly agreed that they feel that adults at school care about them.  
—School Climate and Connectedness Survey (2019)

---

### AM I ALONE?

22% of students agreed or strongly agreed that they feel alone in life.  
—Youth Risk Behavior Survey (2017)

---

### DO I HAVE ADULTS THAT I CAN TRUST?

XX% of students had at least 2 adults with whom they feel comfortable speaking to about important life questions.  
—Youth Risk Behavior Survey (2017)

Number of Adults	Students, %
0	10
1	50
2	25
3+	15



## Lower Kuskokwim School District Student Survey Results

### DO ADULTS AT SCHOOL CARE ABOUT ME?



60% of students in Rural LKSD Schools agreed or strongly agreed that they feel that adults at school care about them.

—School Climate and Connectedness Survey (2019)

### AM I ALONE?



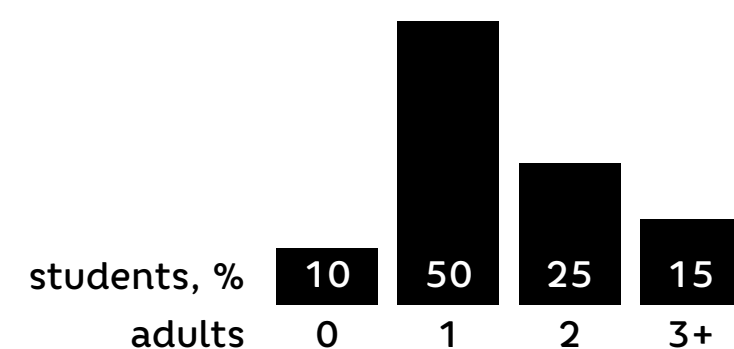
22% of students agreed or strongly agreed that they feel alone in life.

—Youth Risk Behavior Survey (2017)

### DO I HAVE ADULTS THAT I CAN TRUST?

XX% of students had at least 2 adults with whom they feel comfortable speaking to about important life questions.

—Youth Risk Behavior Survey (2017)



## Lower Kuskokwim School District Student Survey Results

### DO ADULTS AT SCHOOL CARE ABOUT ME?



60% of students in Rural LKSD Schools agreed or strongly agreed that they feel that adults at school care about them.

—School Climate and Connectedness Survey (2019)

### AM I ALONE?



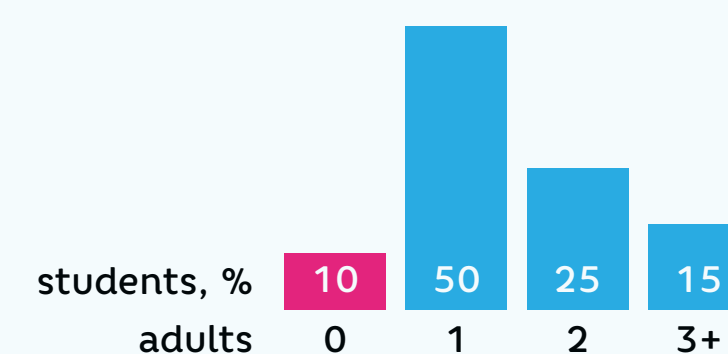
22% of students agreed or strongly agreed that they feel alone in life.

—Youth Risk Behavior Survey (2017)

### DO I HAVE ADULTS THAT I CAN TRUST?

XX% of students had at least 2 adults with whom they feel comfortable speaking to about important life questions.

—Youth Risk Behavior Survey (2017)



## Lower Kuskokwim School District Student Survey Results

### DO ADULTS AT SCHOOL CARE ABOUT ME?



60% of students in Rural LKSD Schools agreed or strongly agreed that they feel that adults at school care about them.

—School Climate and Connectedness Survey (2019)

### AM I ALONE?



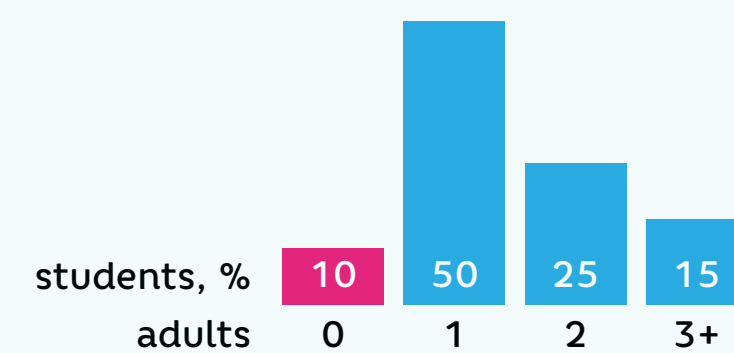
22% of students agreed or strongly agreed that they feel alone in life.

—Youth Risk Behavior Survey (2017)

### DO I HAVE ADULTS THAT I CAN TRUST?

XX% of students had at least 2 adults with whom they feel comfortable speaking to about important life questions.

—Youth Risk Behavior Survey (2017)



## Lower Kuskokwim School District Student Survey Results

### DO ADULTS AT SCHOOL CARE ABOUT ME?



60% of students in Rural LKSD Schools agreed or strongly agreed that they feel that adults at school care about them.

—School Climate and Connectedness Survey (2019)

### AM I ALONE?



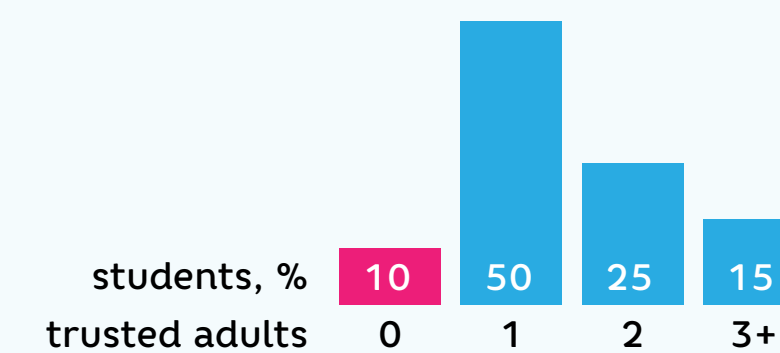
22% of students agreed or strongly agreed that they feel alone in life.

—Youth Risk Behavior Survey (2017)

### DO I HAVE ADULTS THAT I CAN TRUST?

XX% of students had at least 2 adults with whom they feel comfortable speaking to about important life questions.

—Youth Risk Behavior Survey (2017)



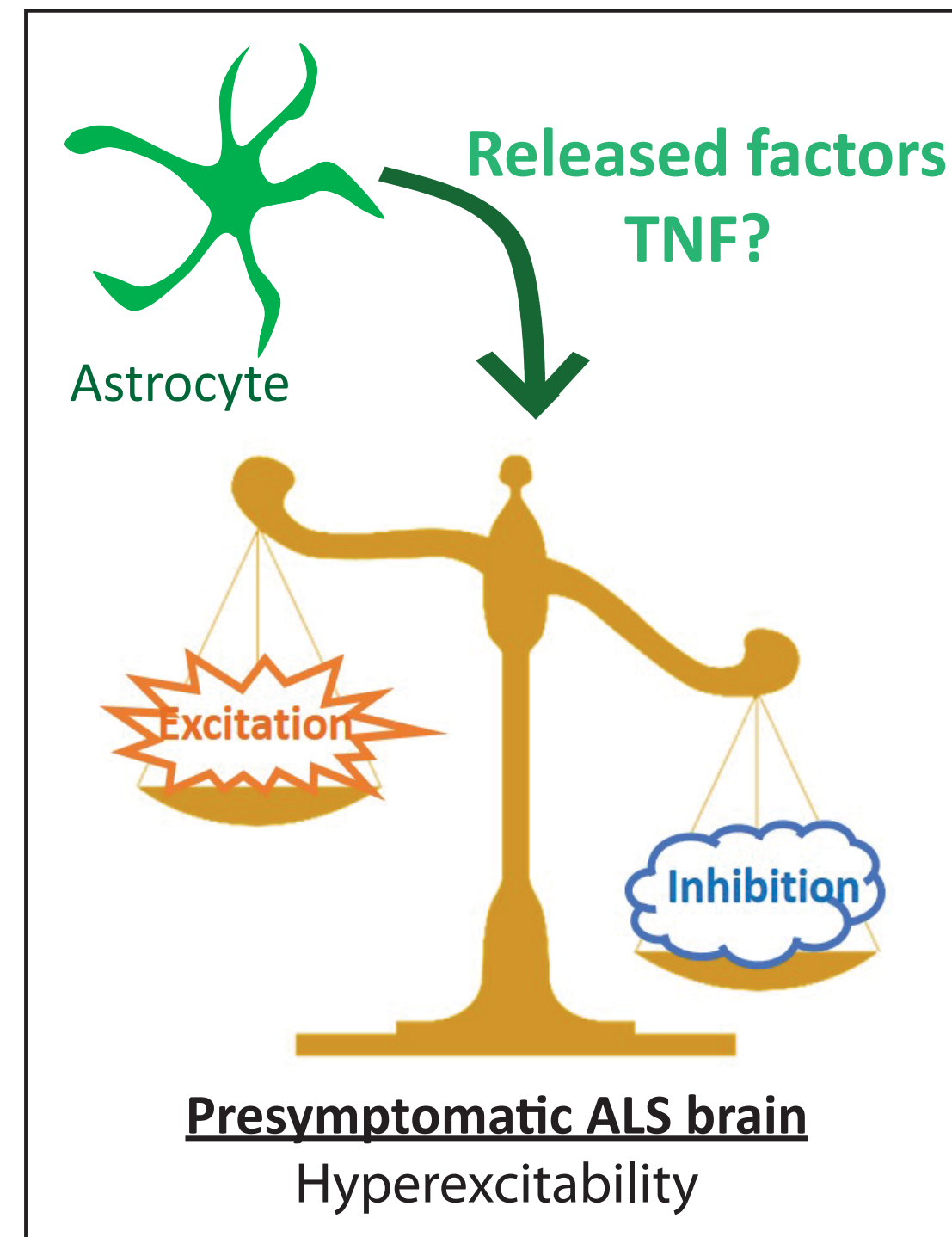
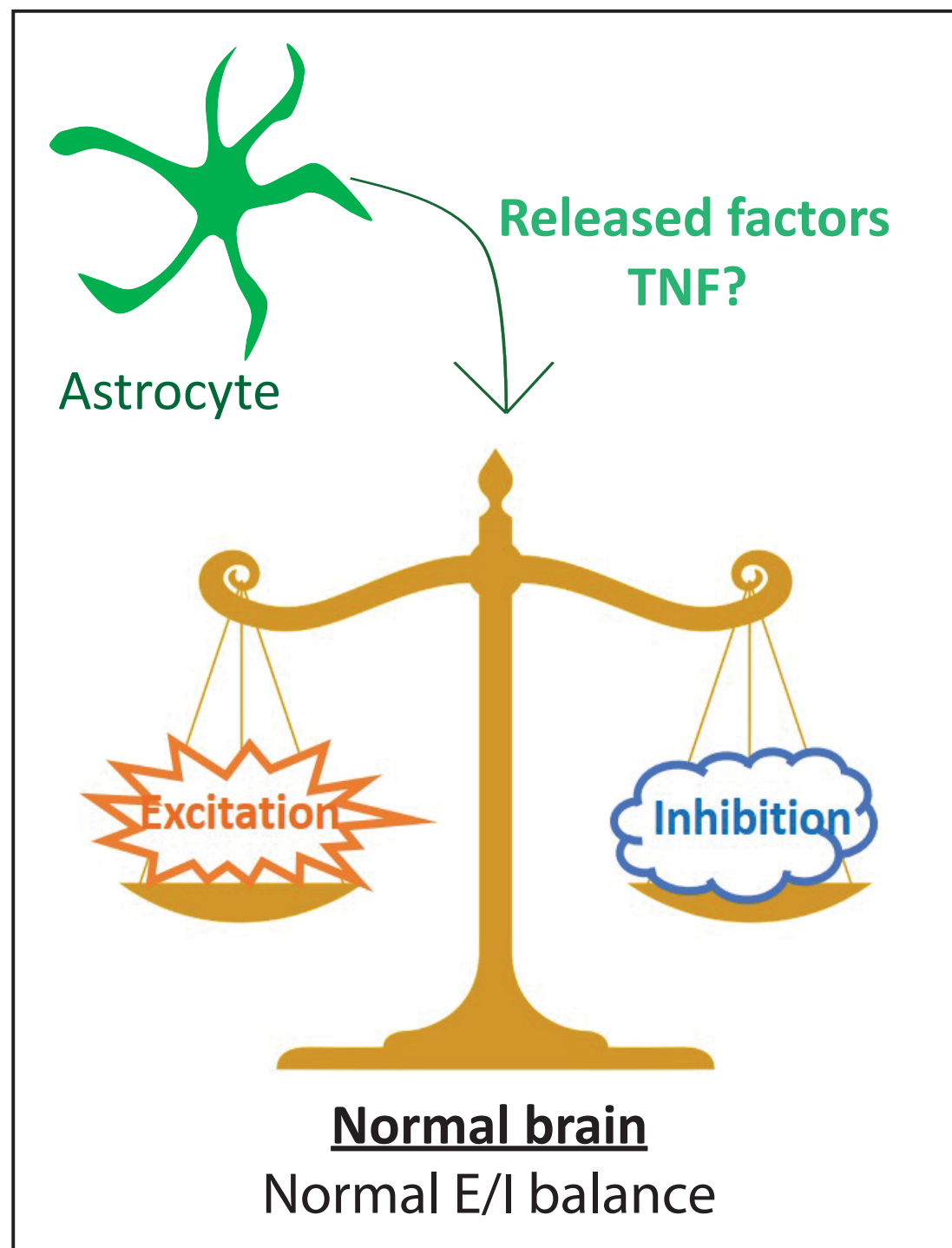


**draw for the mind**

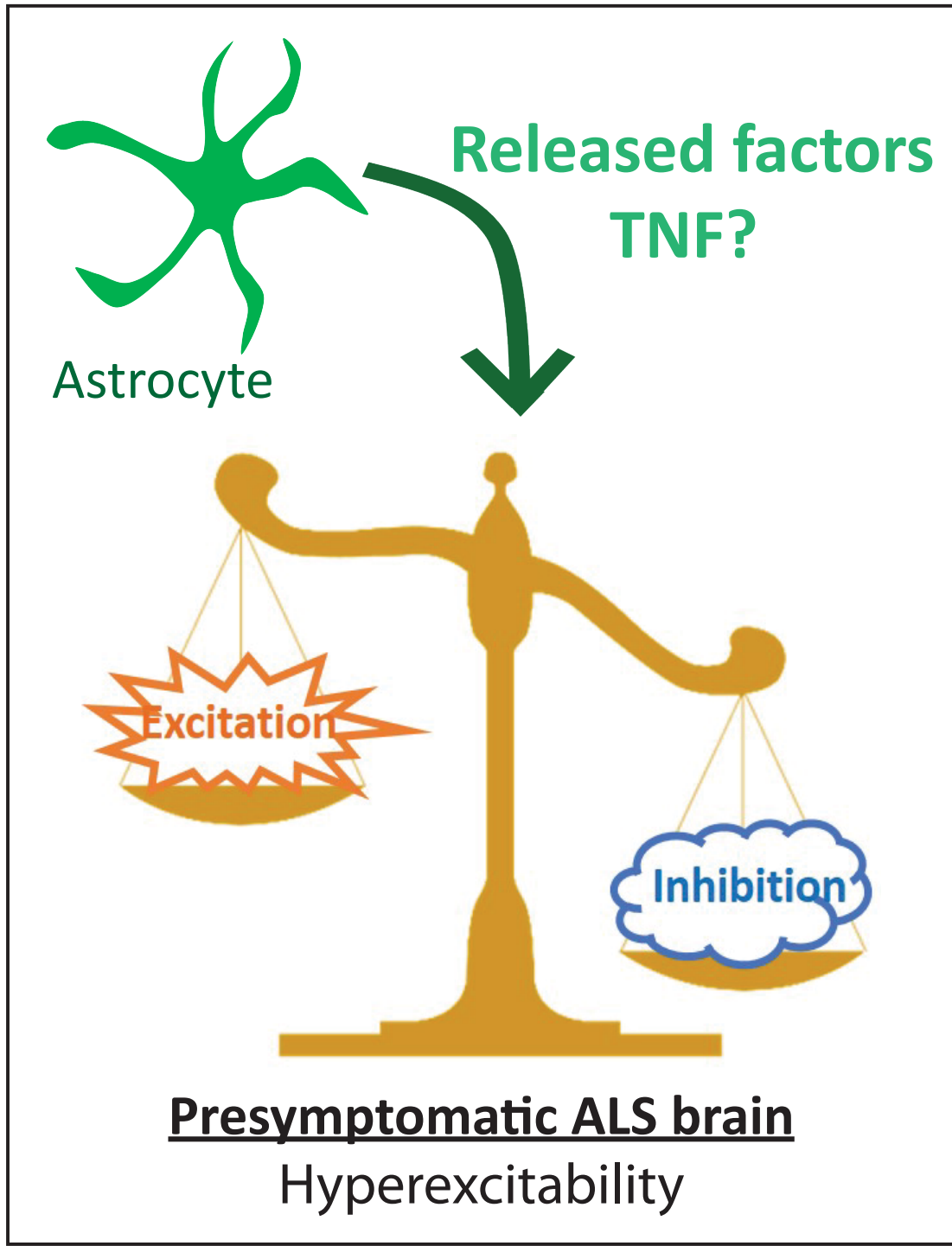
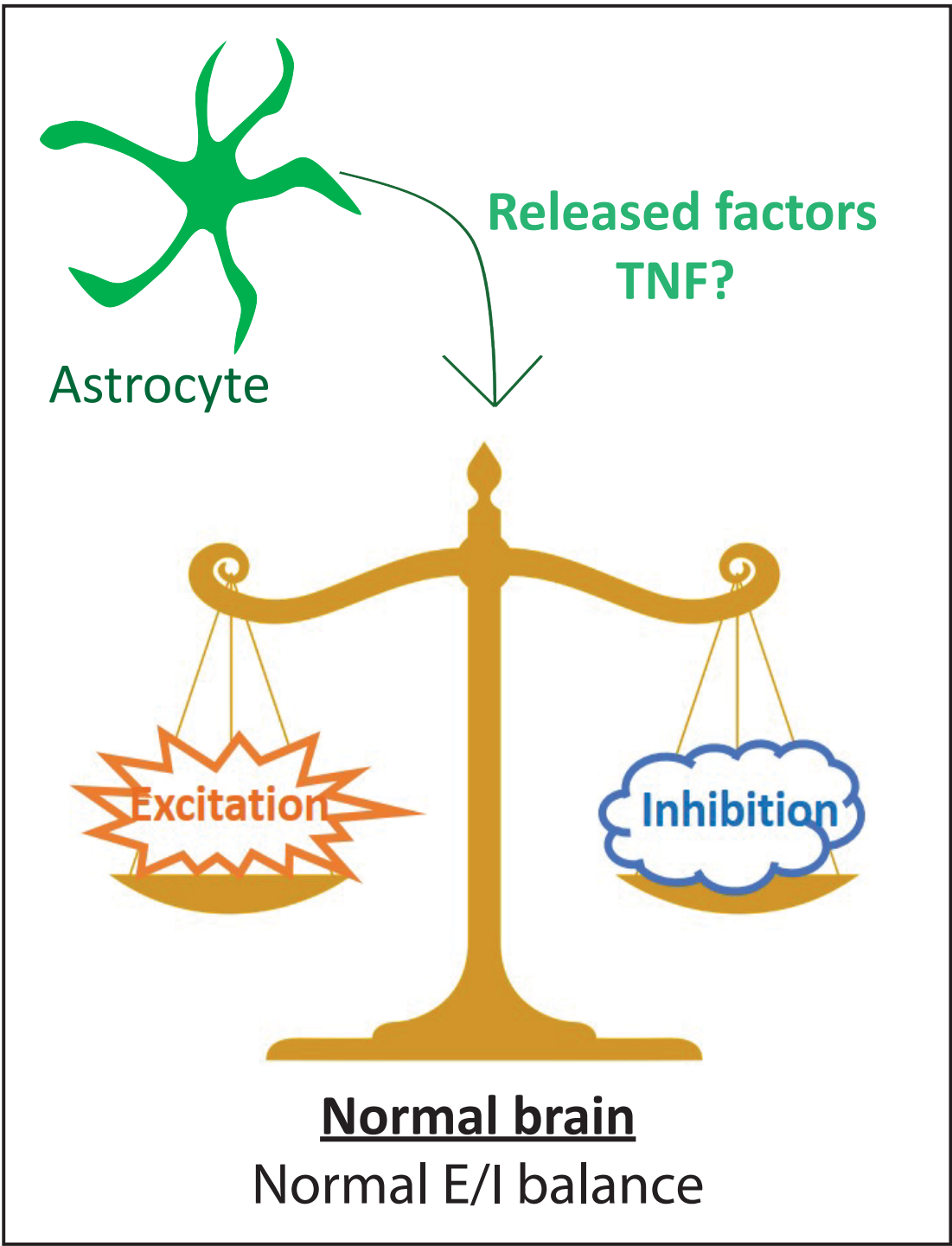
through (not to) the eye



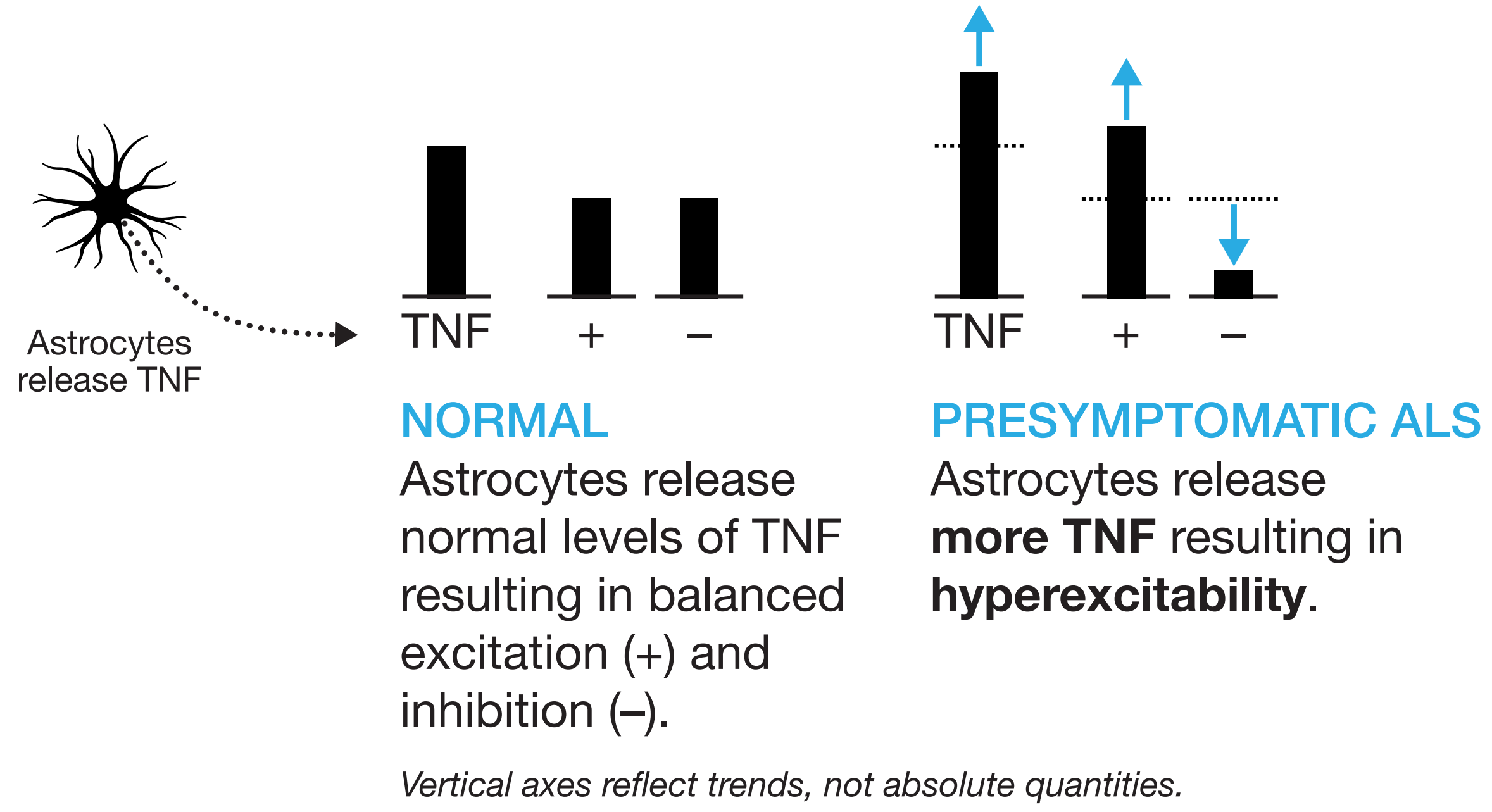
# Hypothesis



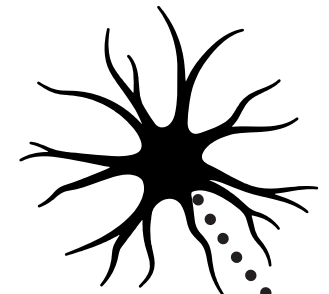
# Hypothesis



## HYPOTHESIS – hyperexcitability in the ALS brain

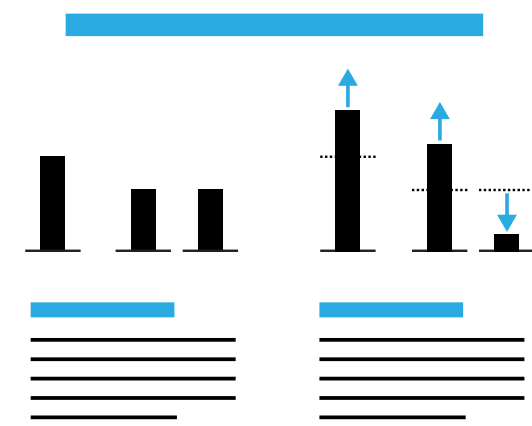


Homeostatic synaptic plasticity deregulation in the ALS cortex. Franquin et al (poster presentation).

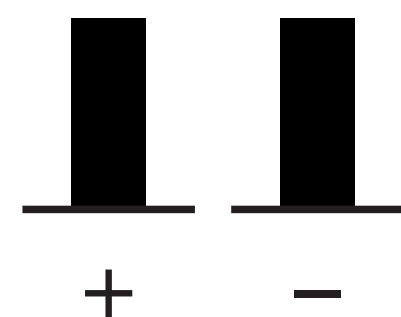


Astrocytes release TNF

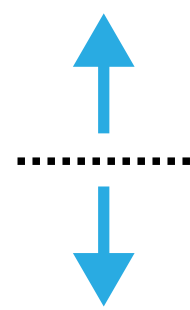
SET THE CONTEXT



COLORIZE AND TABULATE

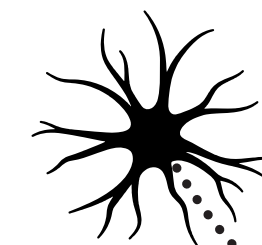


ABBREVIATE AND SCALE

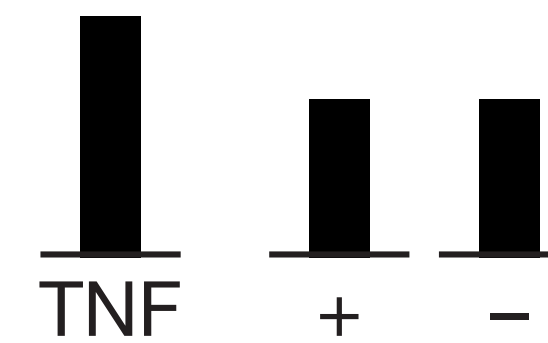


DEMONSTRATE TRENDS

## HYPOTHESIS – hyperexcitability in the ALS brain



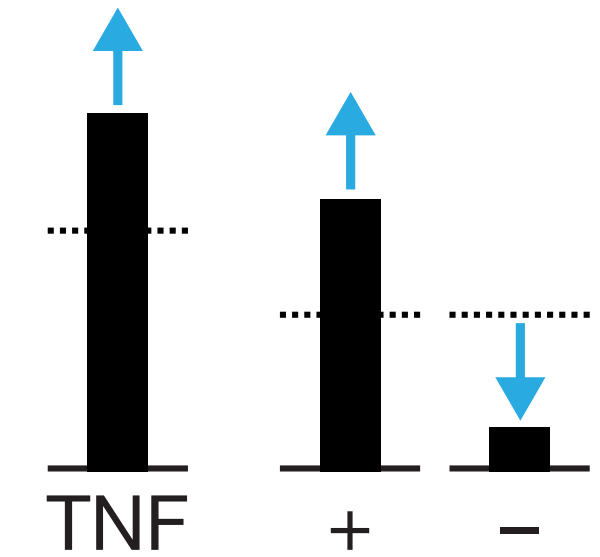
Astrocytes release TNF



### NORMAL

Astrocytes release normal levels of TNF resulting in balanced excitation (+) and inhibition (-).

*Vertical axes reflect trends, not absolute quantities.*



### PRESYMPTOMATIC ALS

Astrocytes release **more TNF** resulting in **hyperexcitability**.

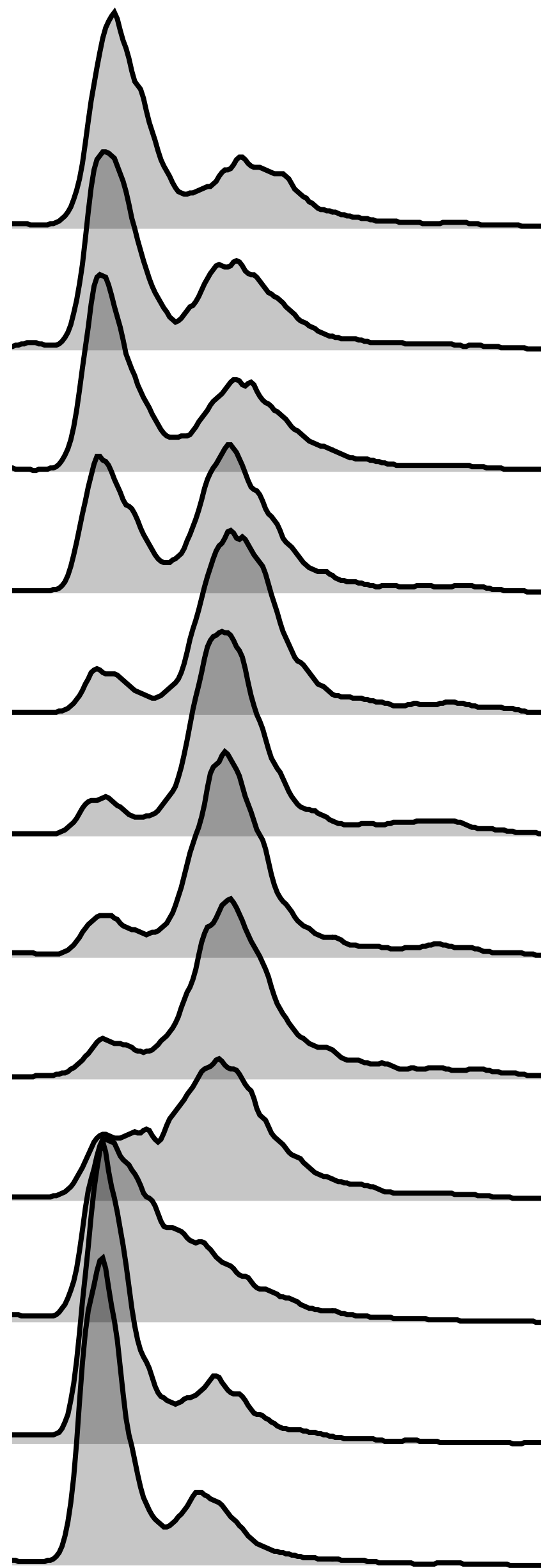




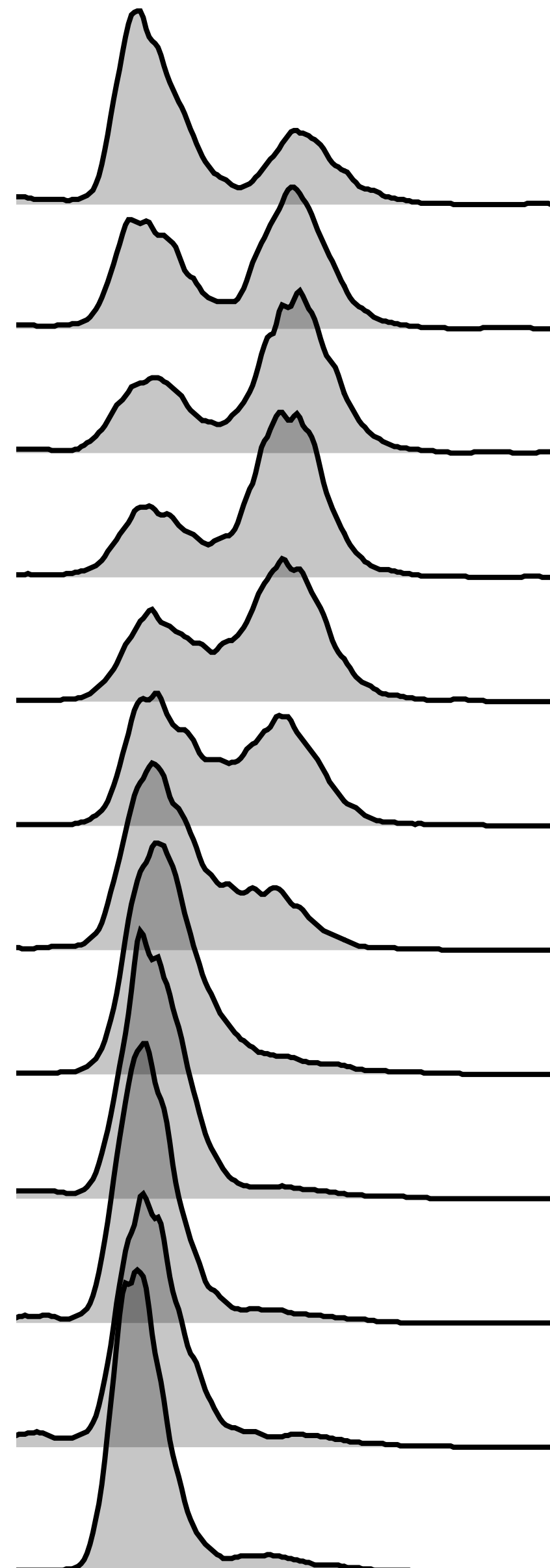
**design embodies purpose**

reason for being

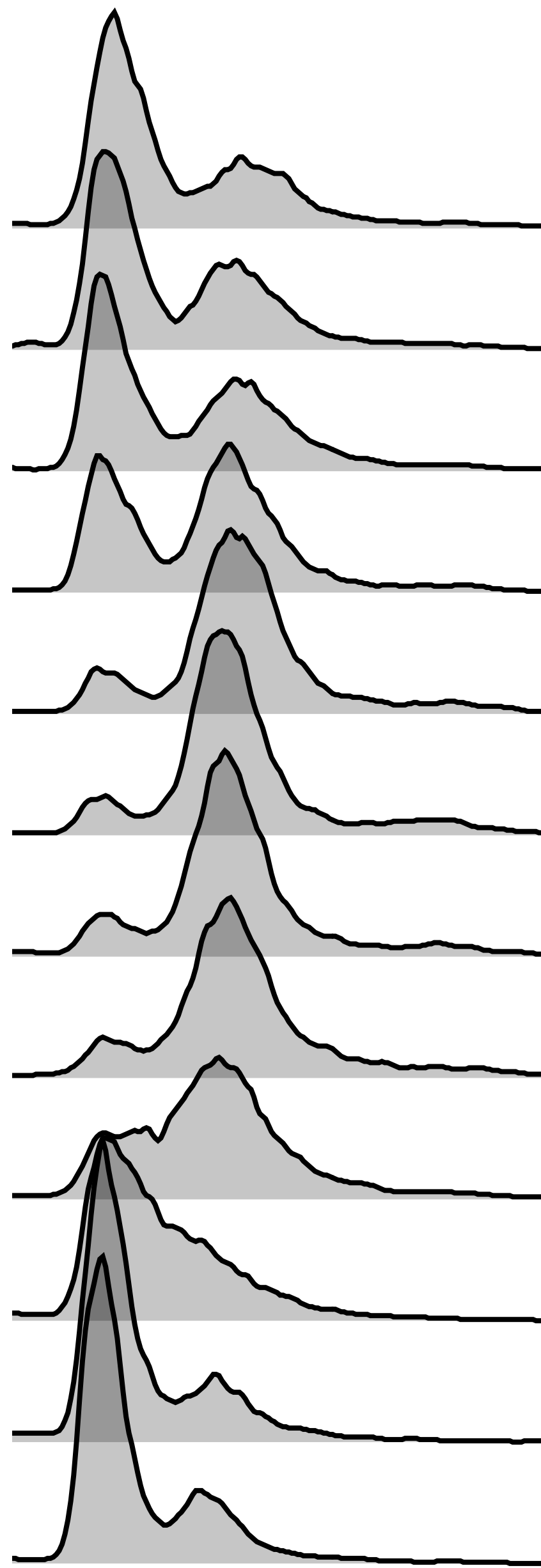
**Control**



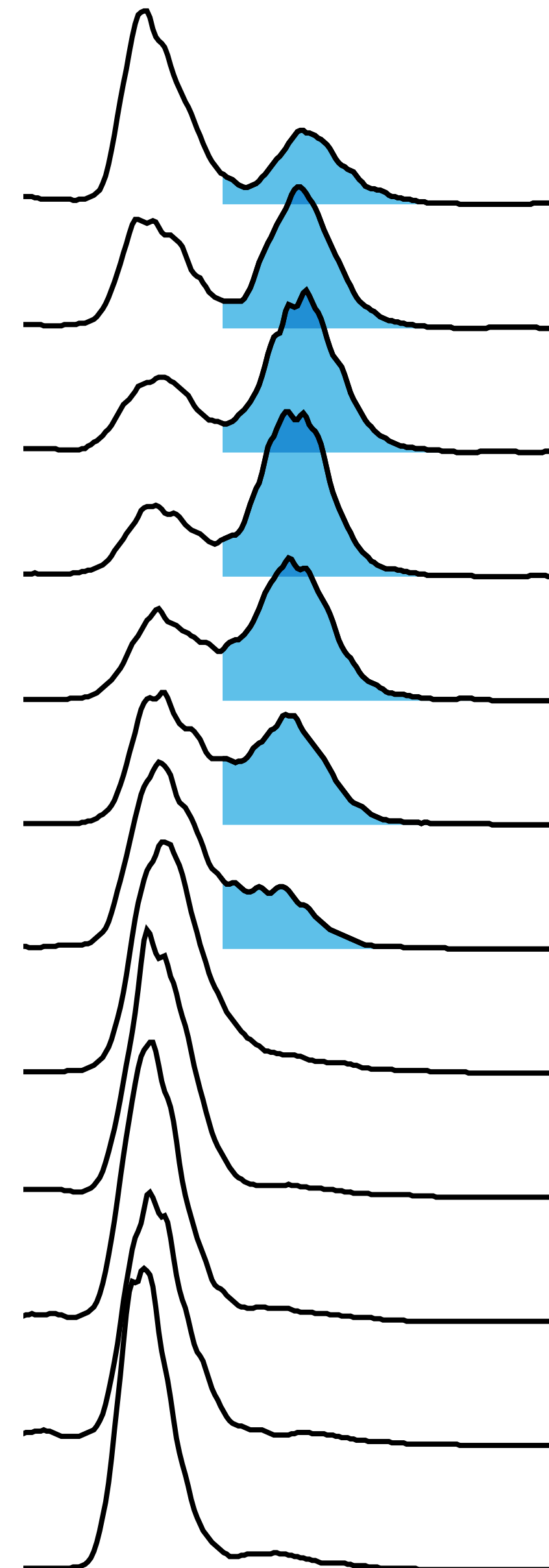
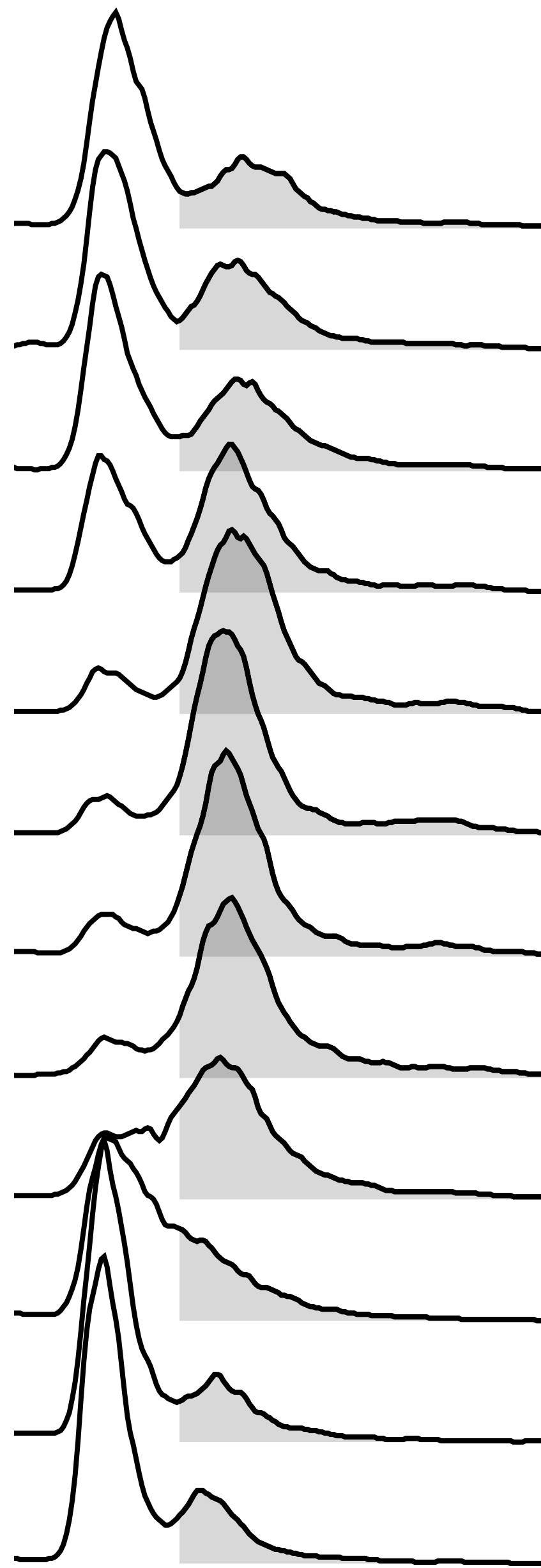
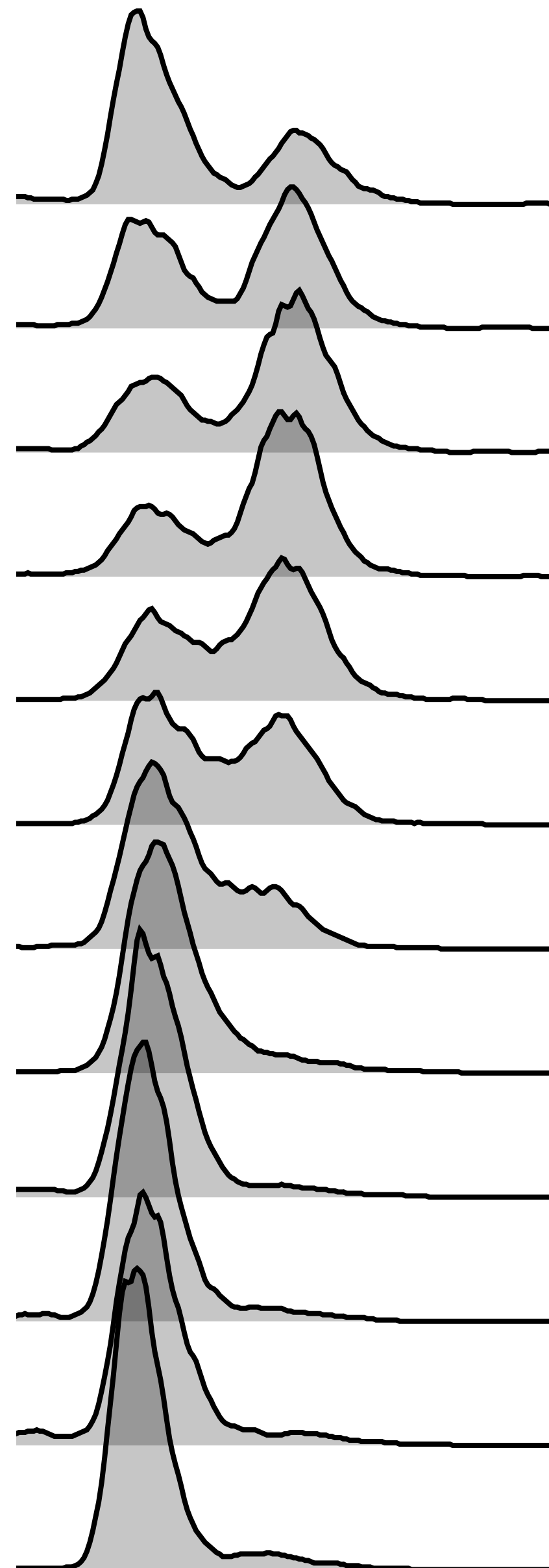
**Cln2-C1b2**



**Control**



**Cln2-C1b2**





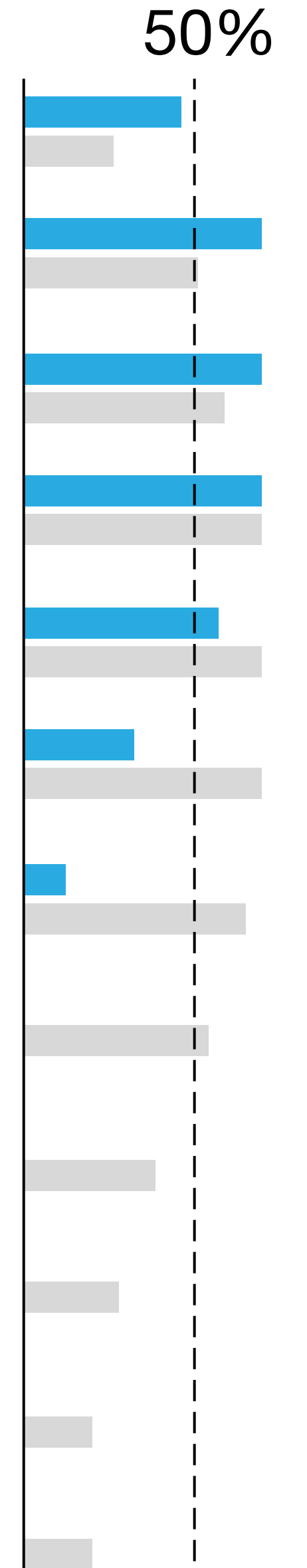
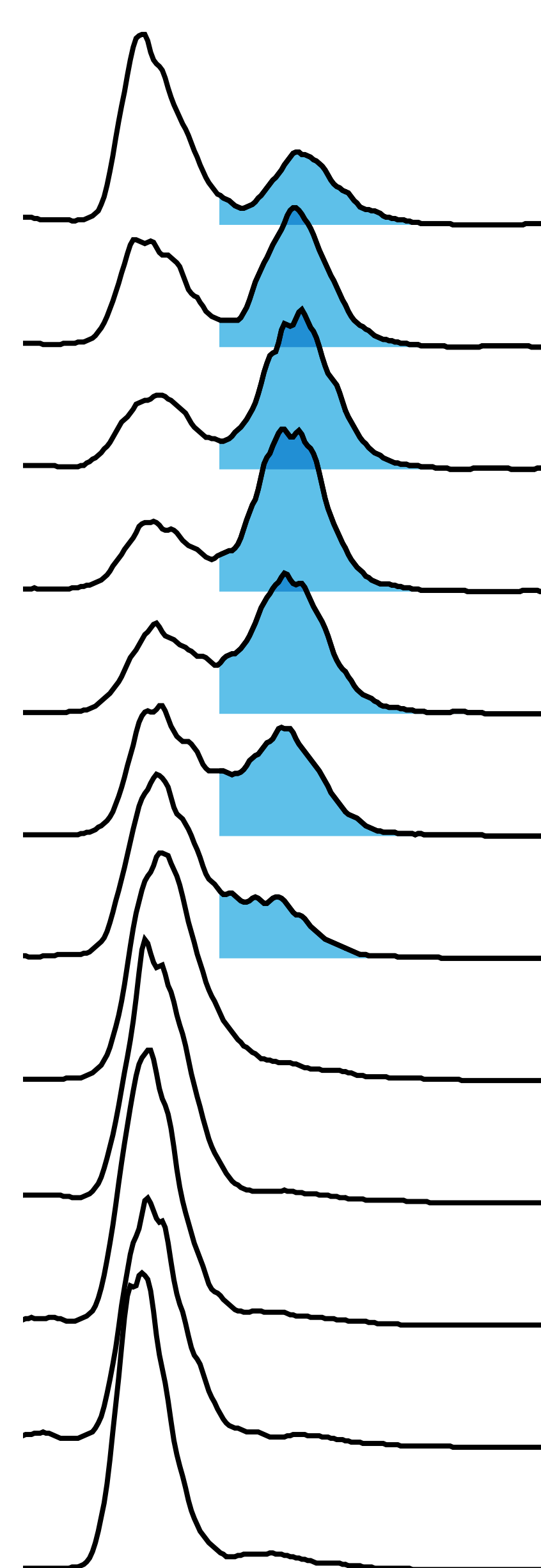
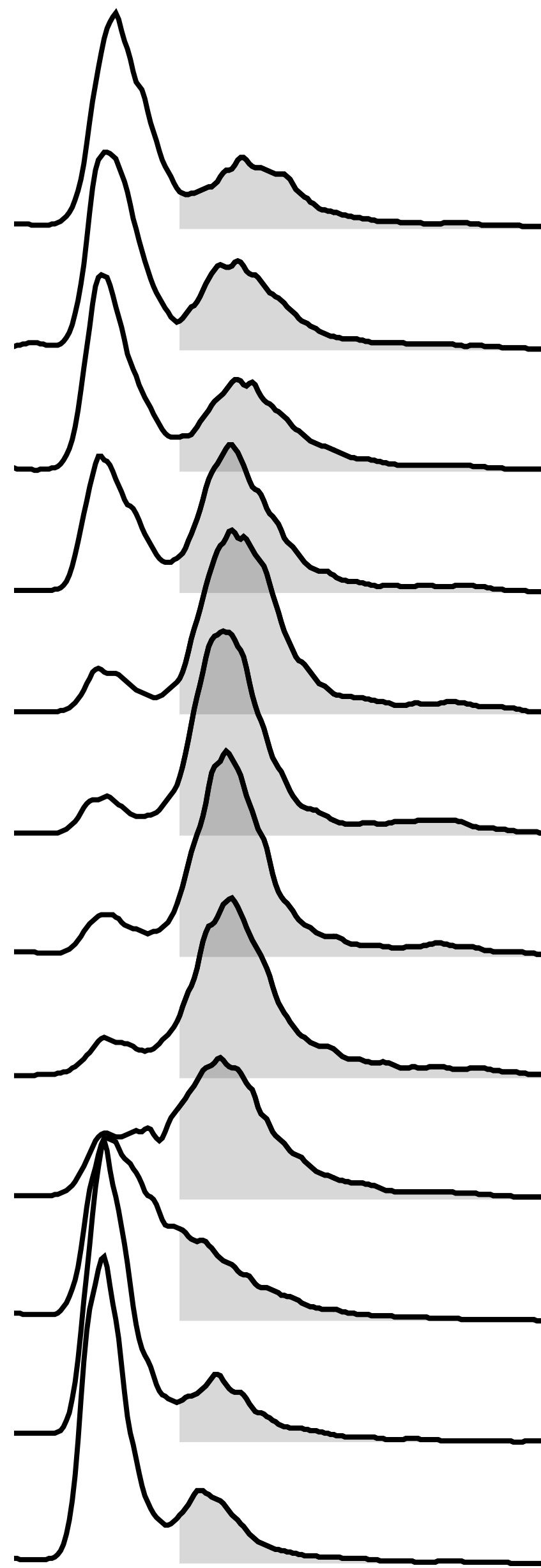
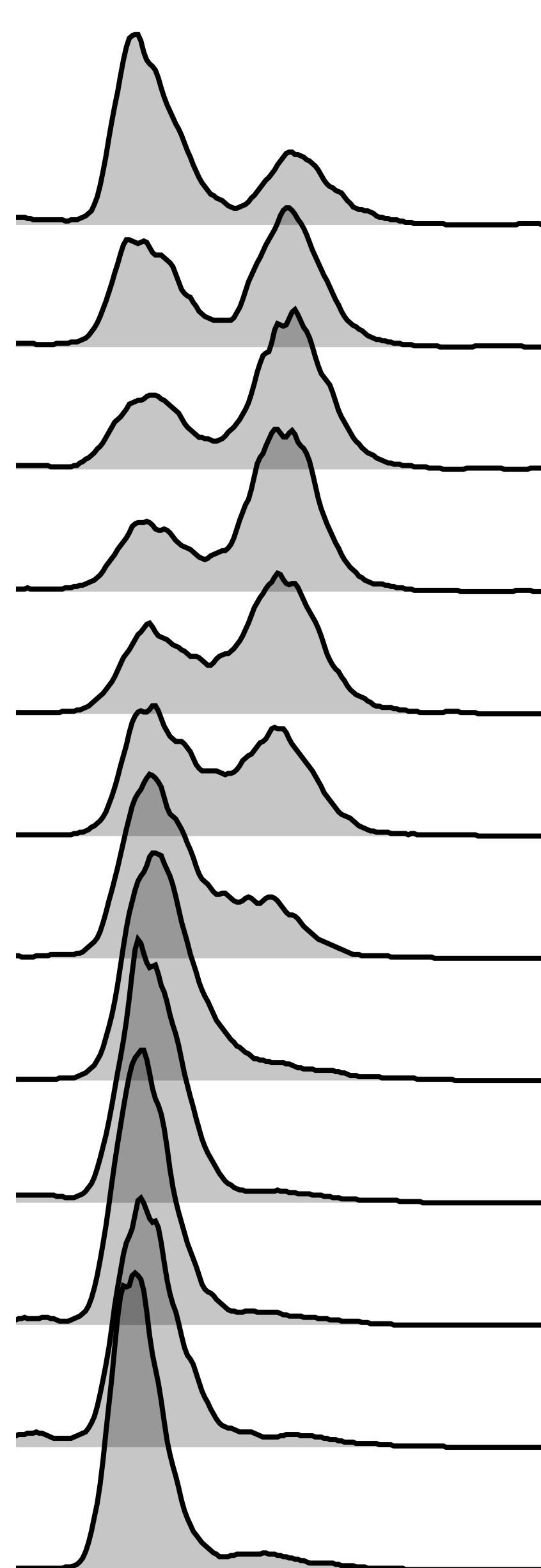
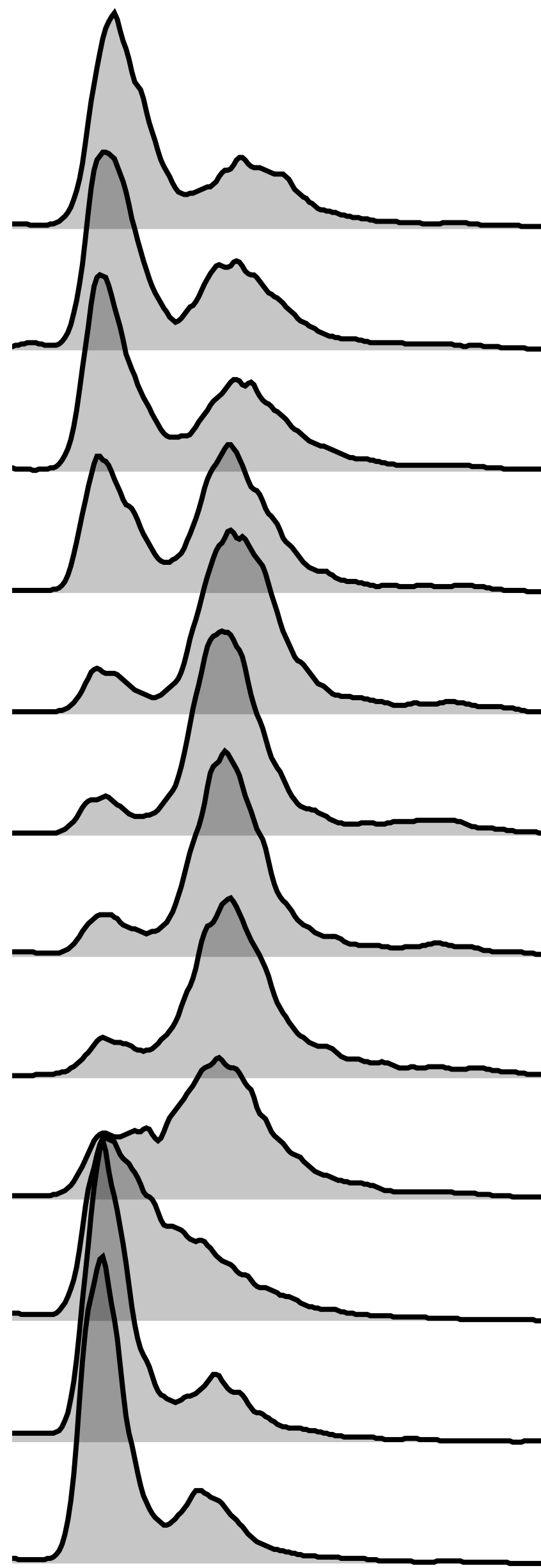
# **quantitative judgments**

have baseline, will compare



Control

Cln2-C1b2



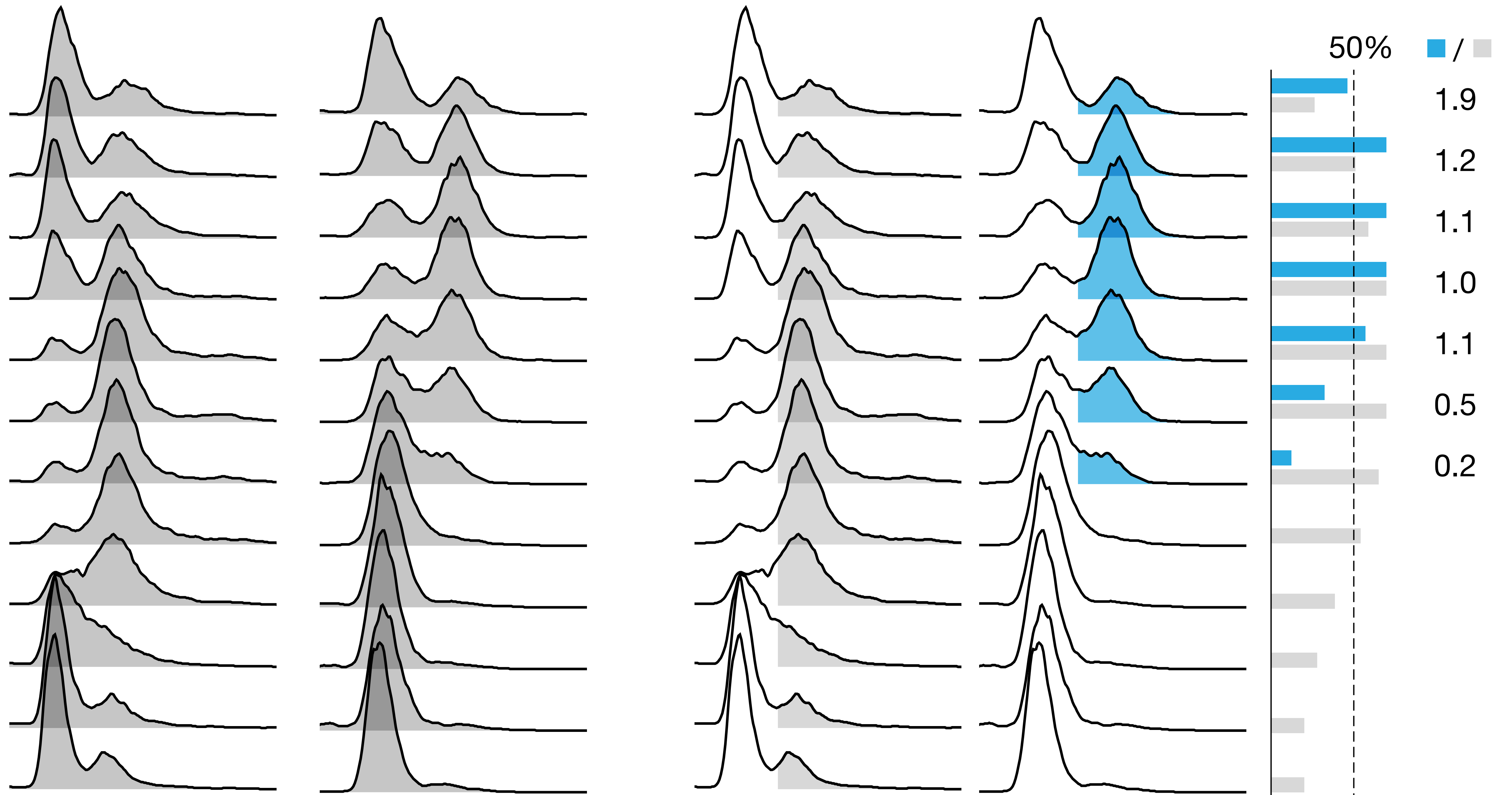


**answer key questions**

data won't speak for itself

Control

Cln2-C1b2





**data (often) doesn't tell the story**

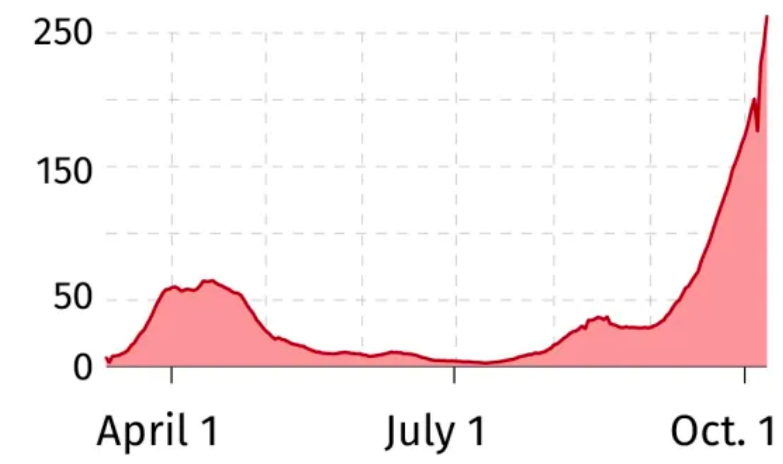
you do



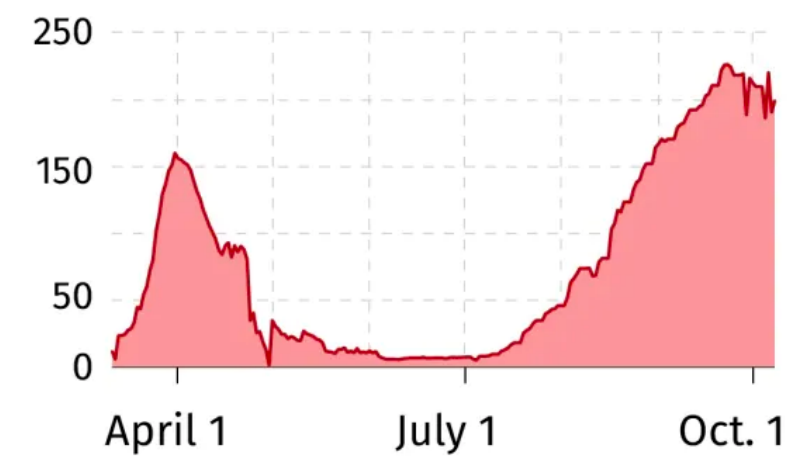
# How different countries have handled the second wave

7-day average of daily new COVID-19 cases per million

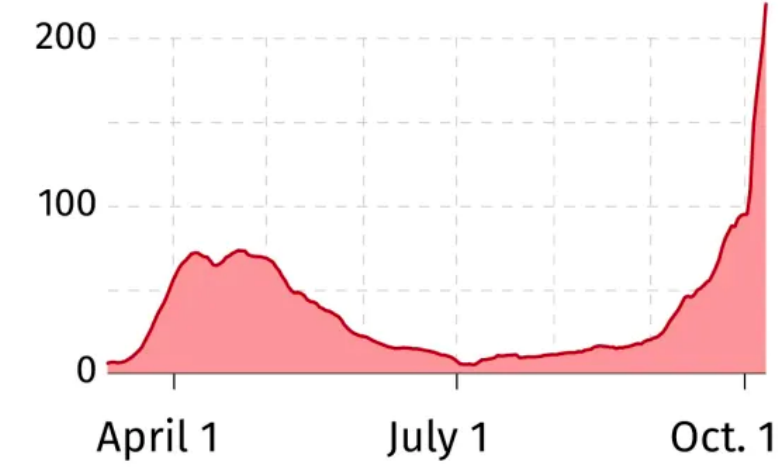
### Netherlands



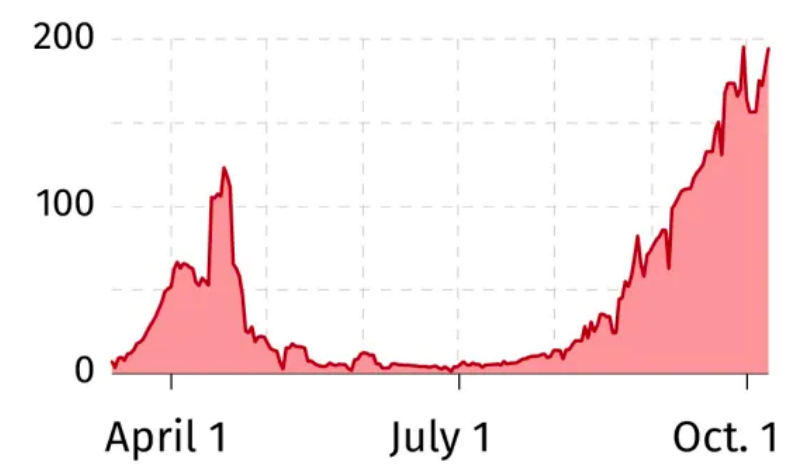
### Spain



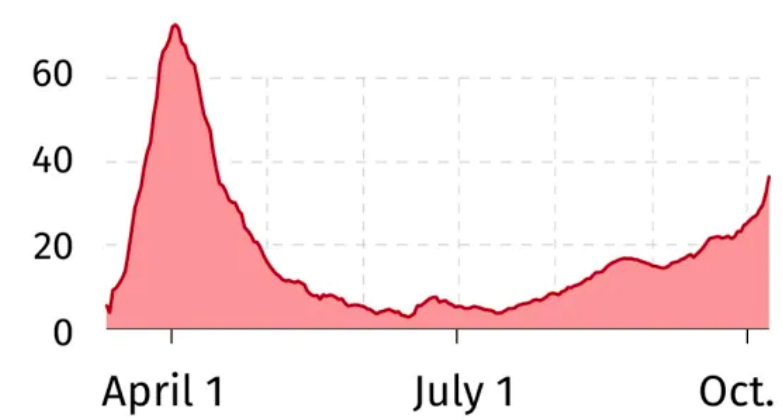
### United Kingdom



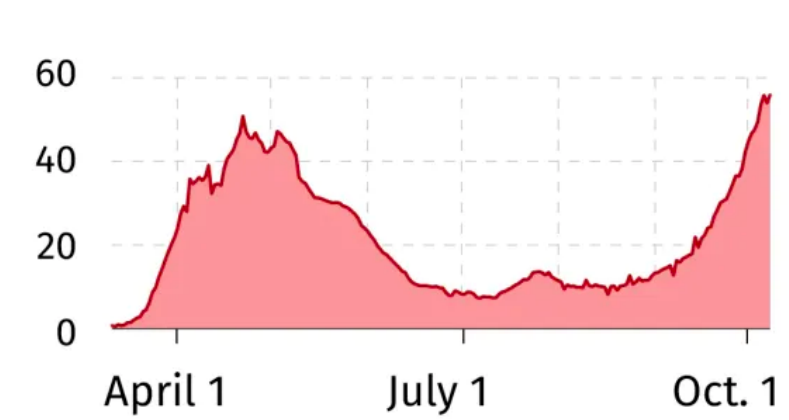
### France



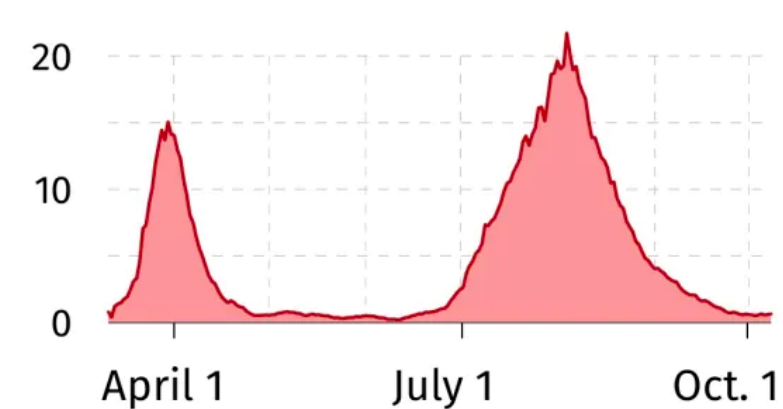
### Germany



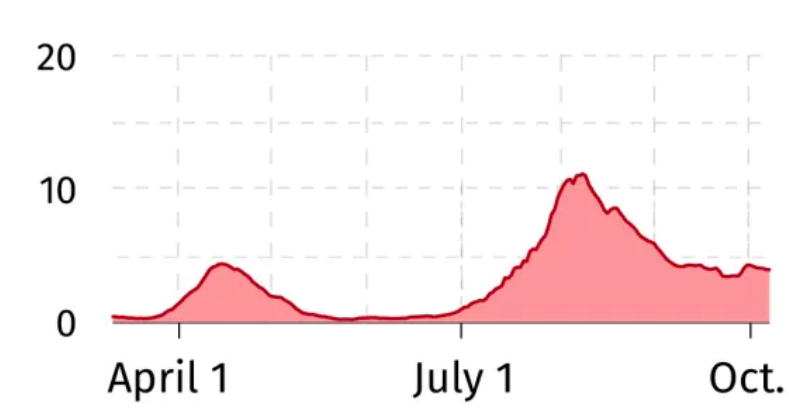
### Canada



### Australia

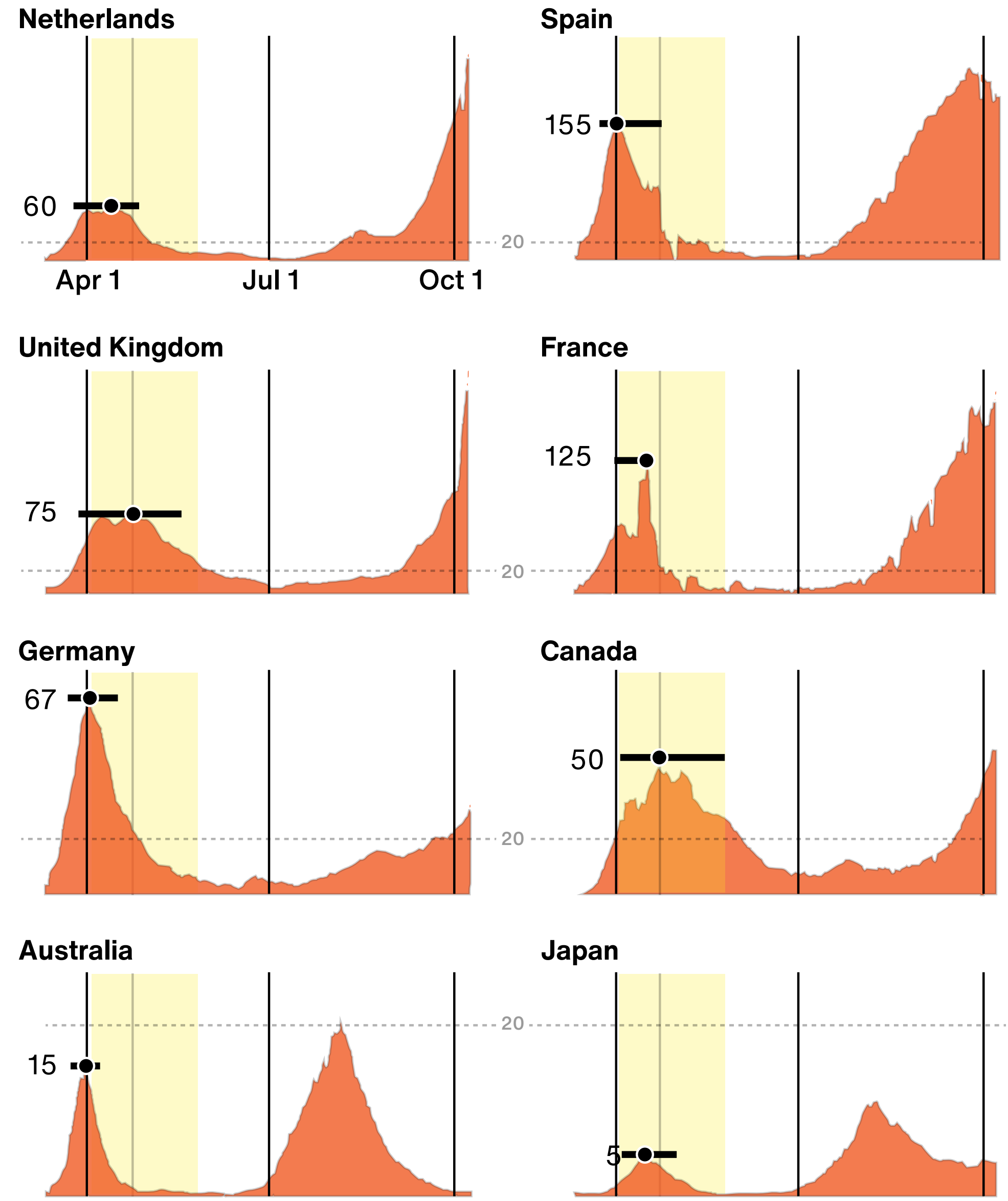
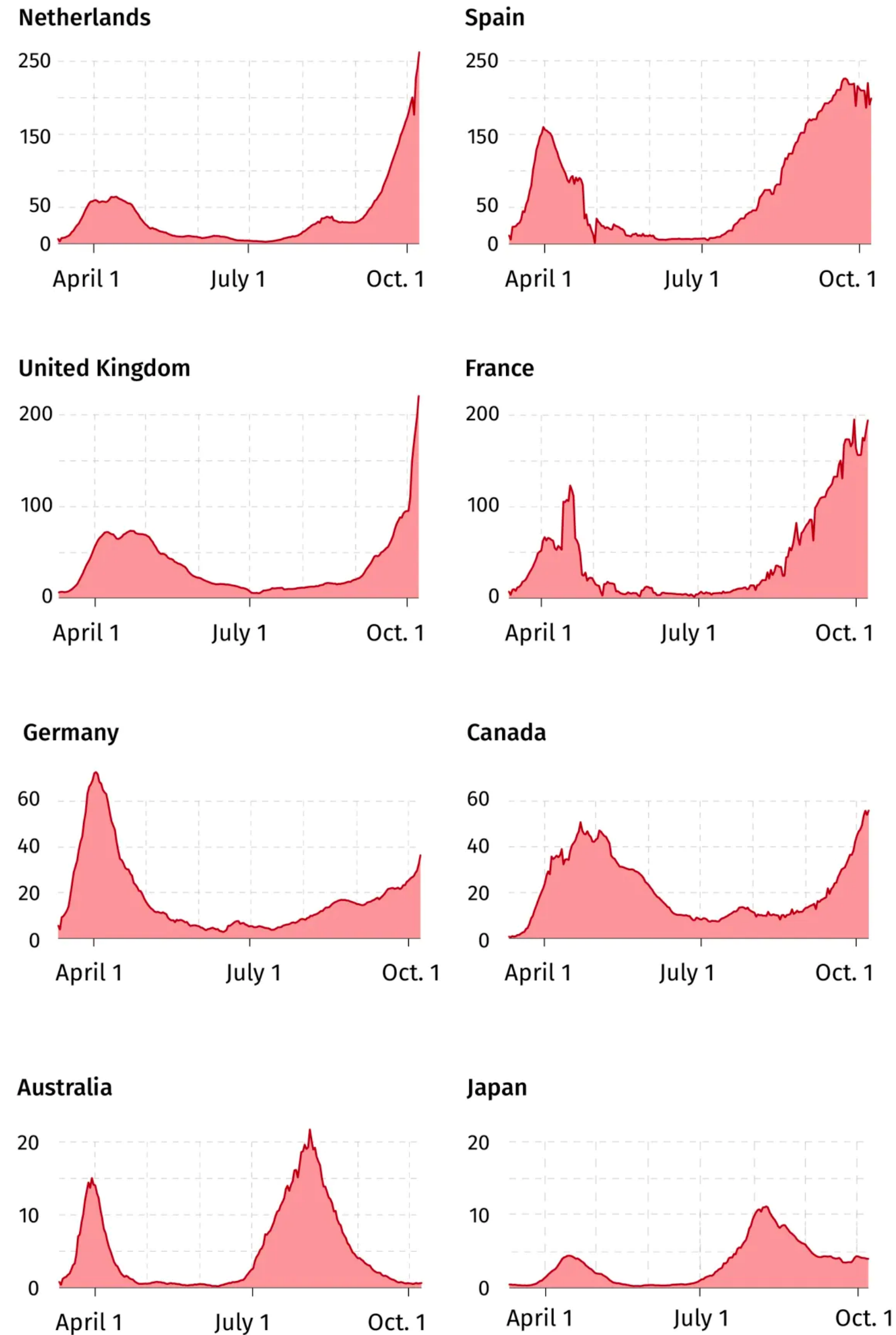


### Japan



# How different countries have handled the second wave

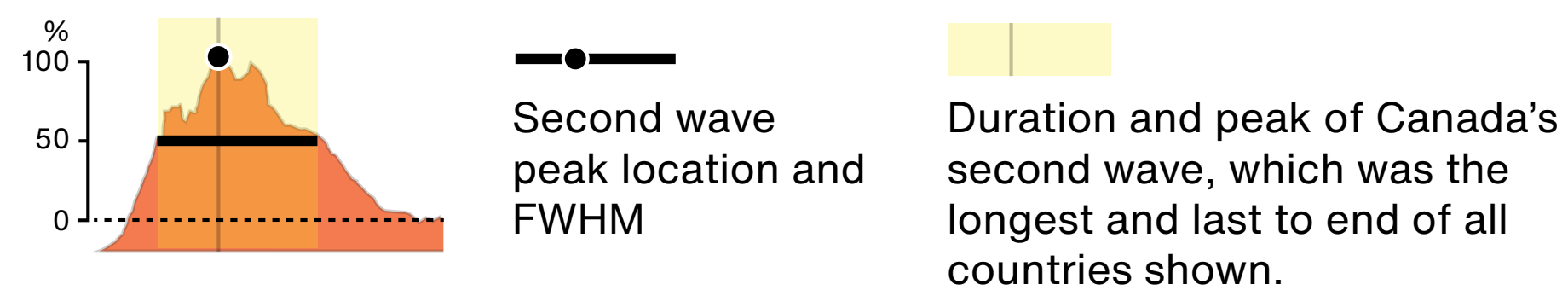
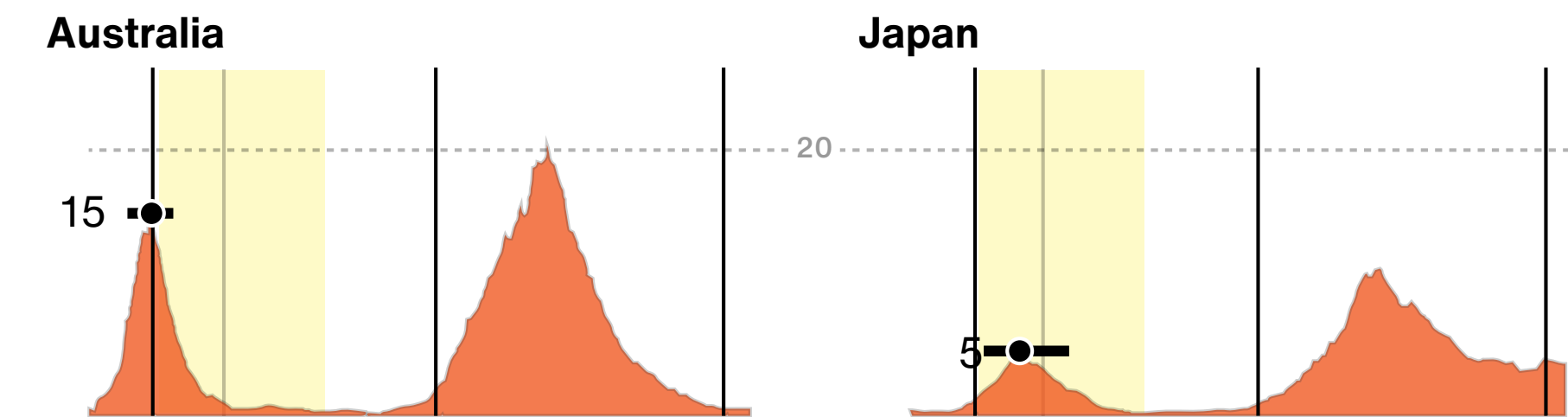
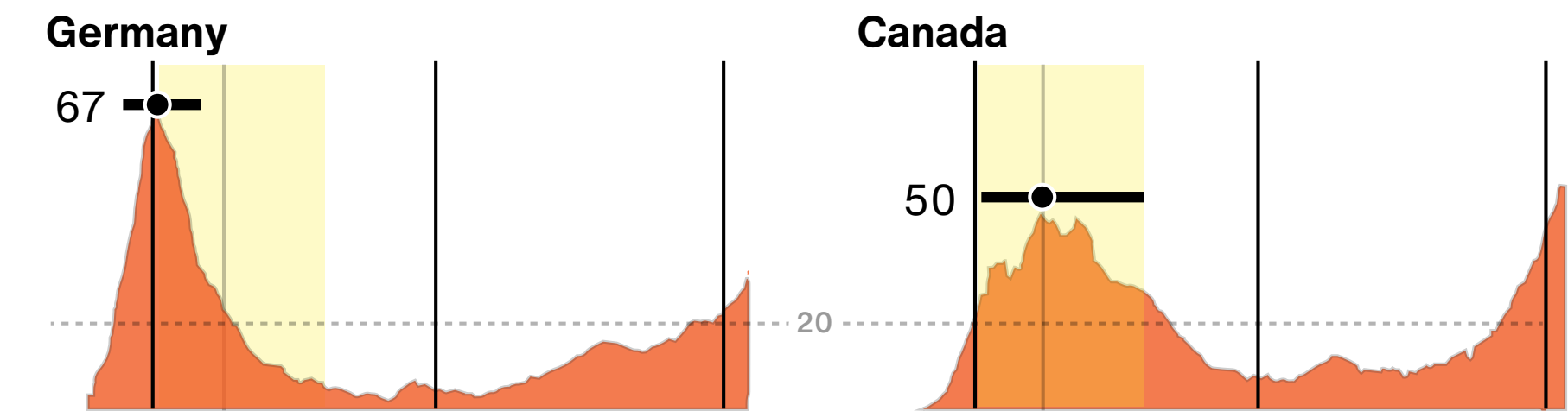
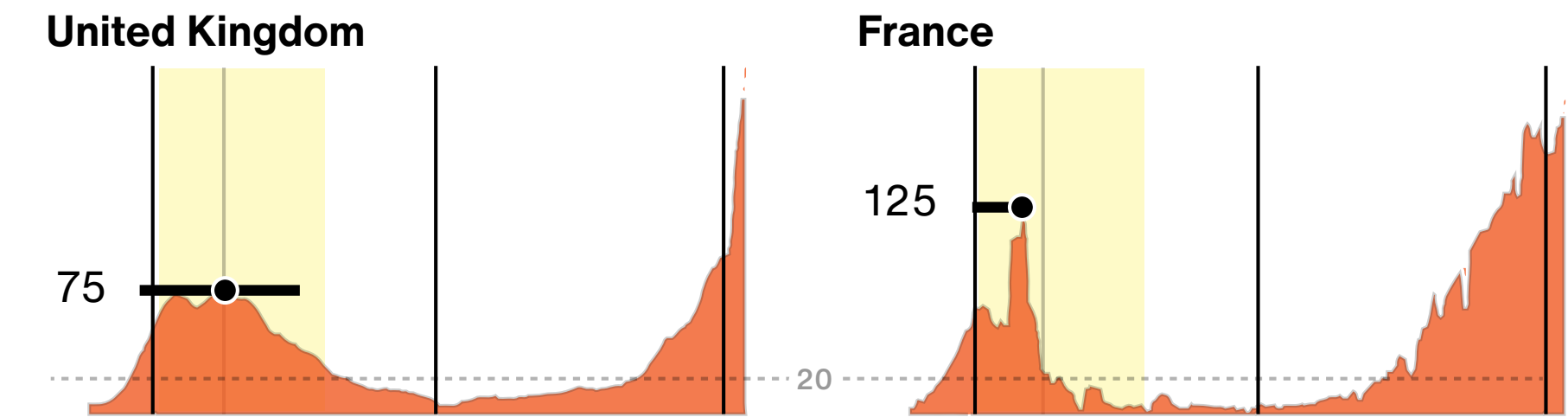
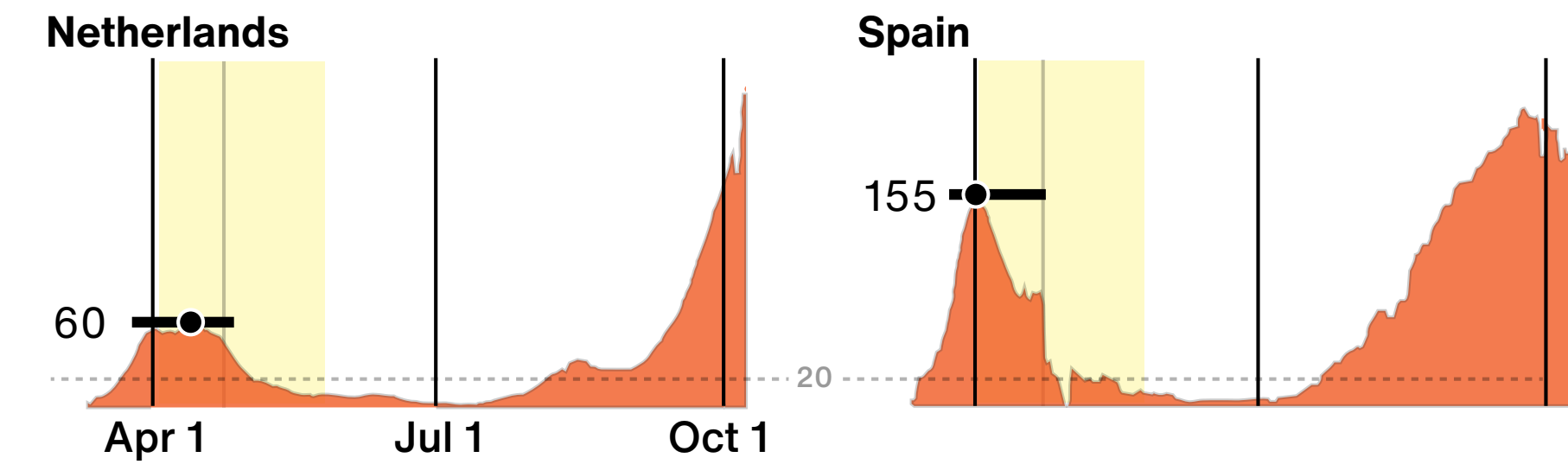
7-day average of daily new COVID-19 cases per million



—●—  
Second wave peak location and FWHM

■  
Duration and center of Canada's second wave, which was the longest and last to end of all countries shown.

# The second wave: the long and short of it



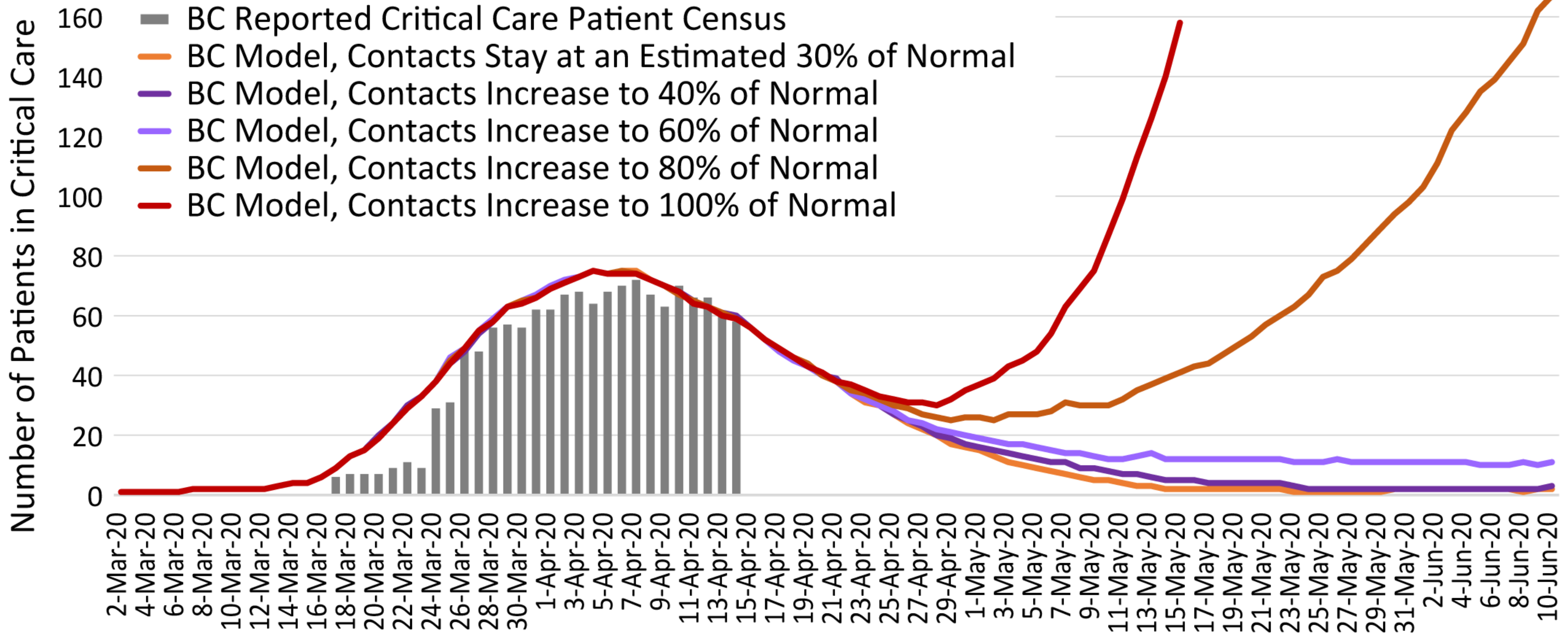


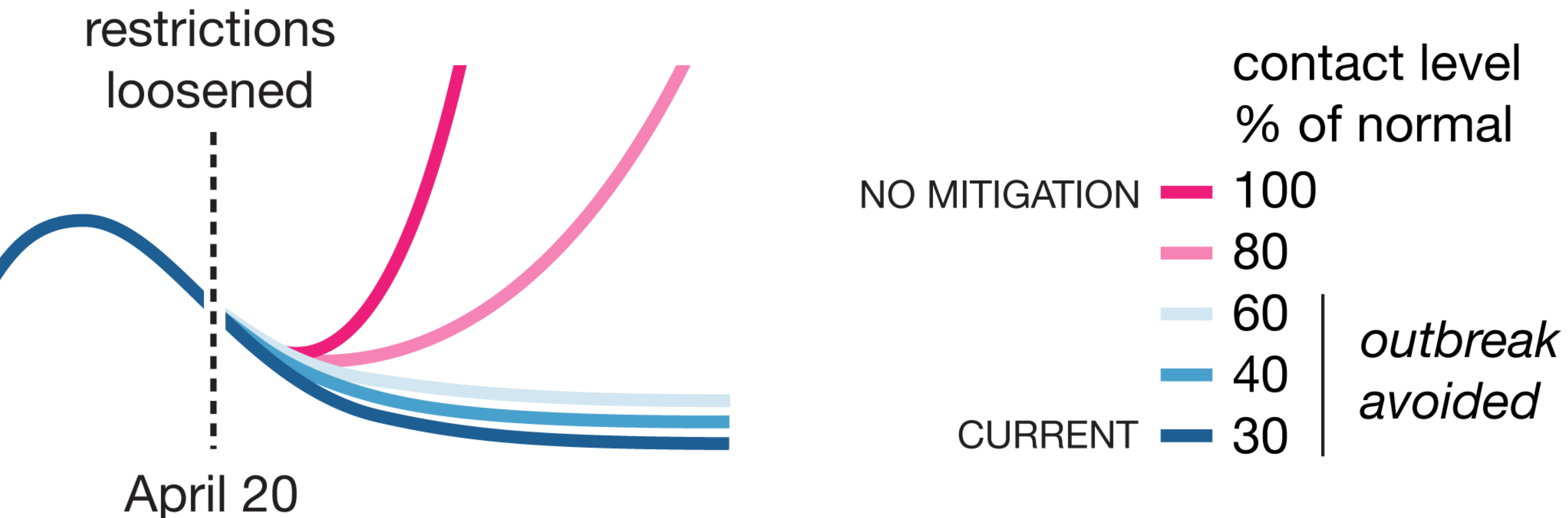
**putting it together**

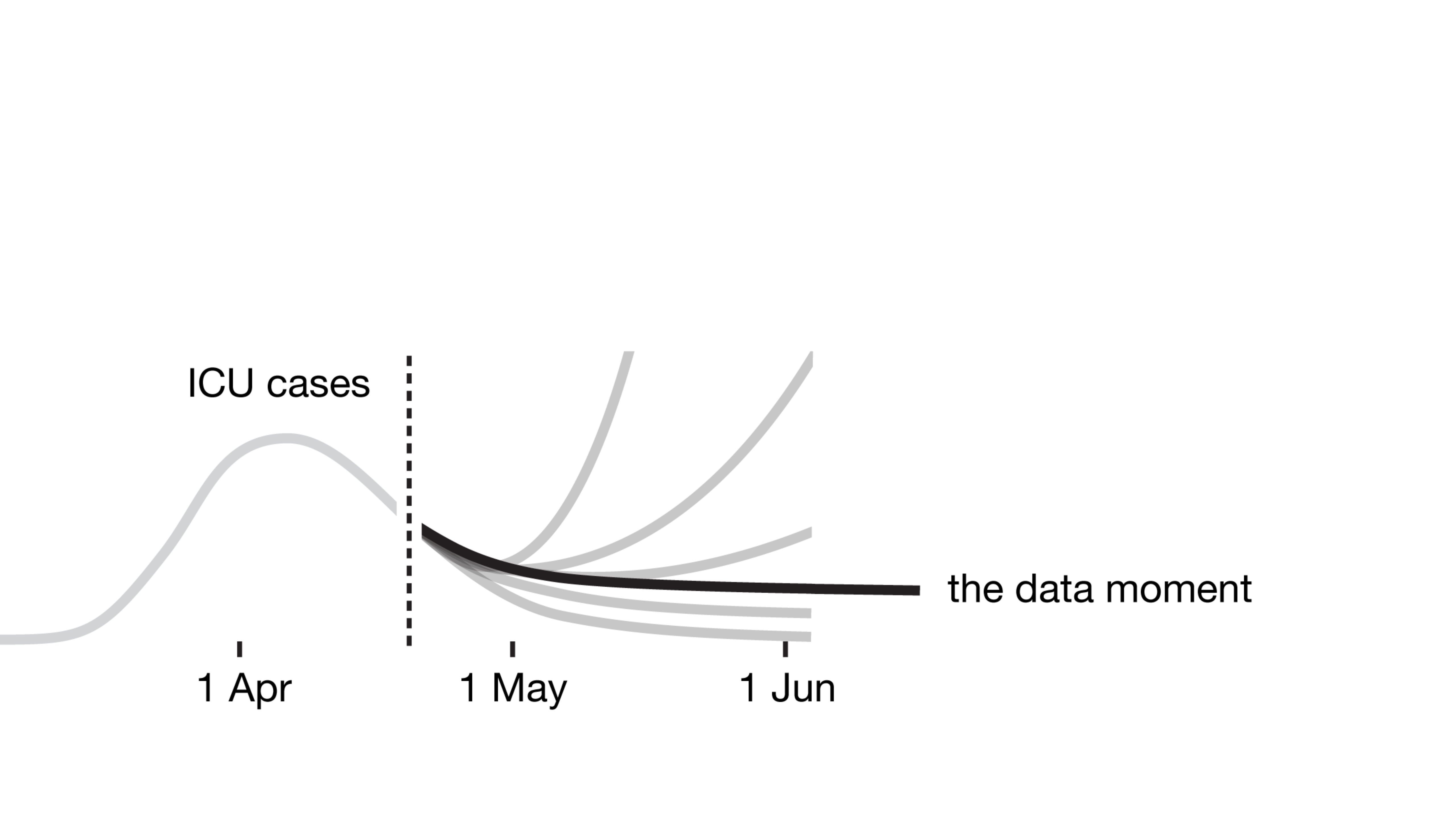
theme & crisp answer



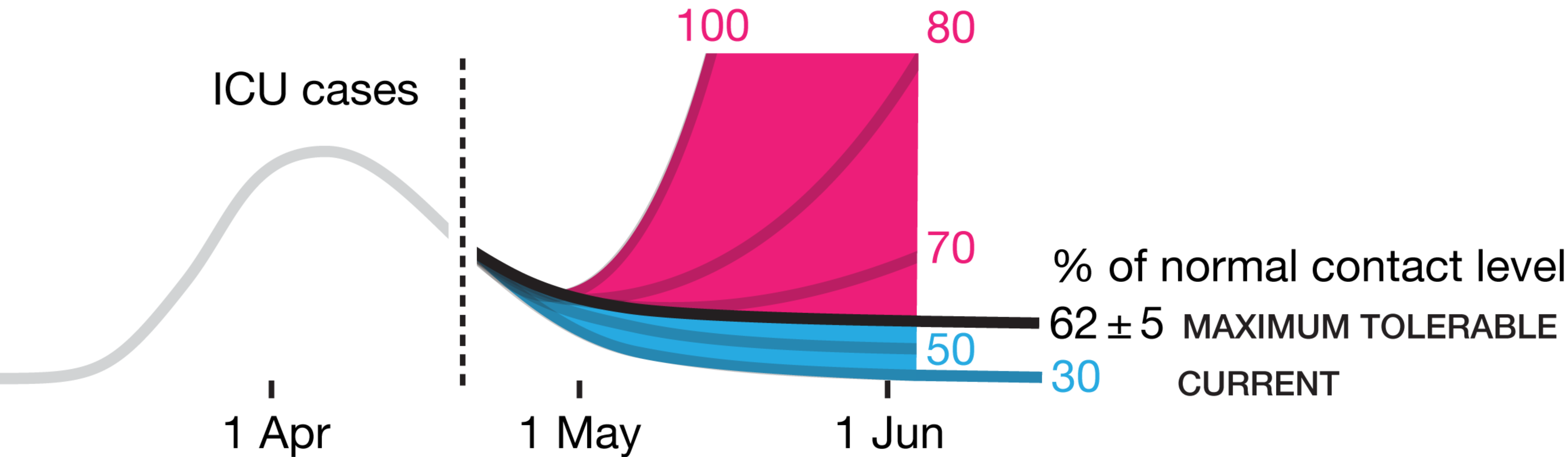
# Example: critical care implications of dynamic model in BC's context







# Critical care admission rate remains acceptable if restrictions are relaxed up to 60% of normal





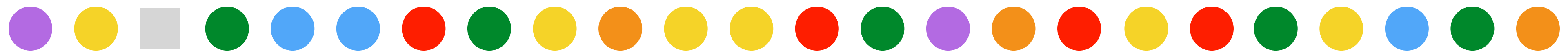


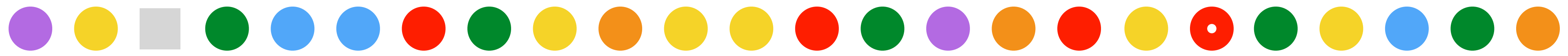
# Gestalt

one word to bind them







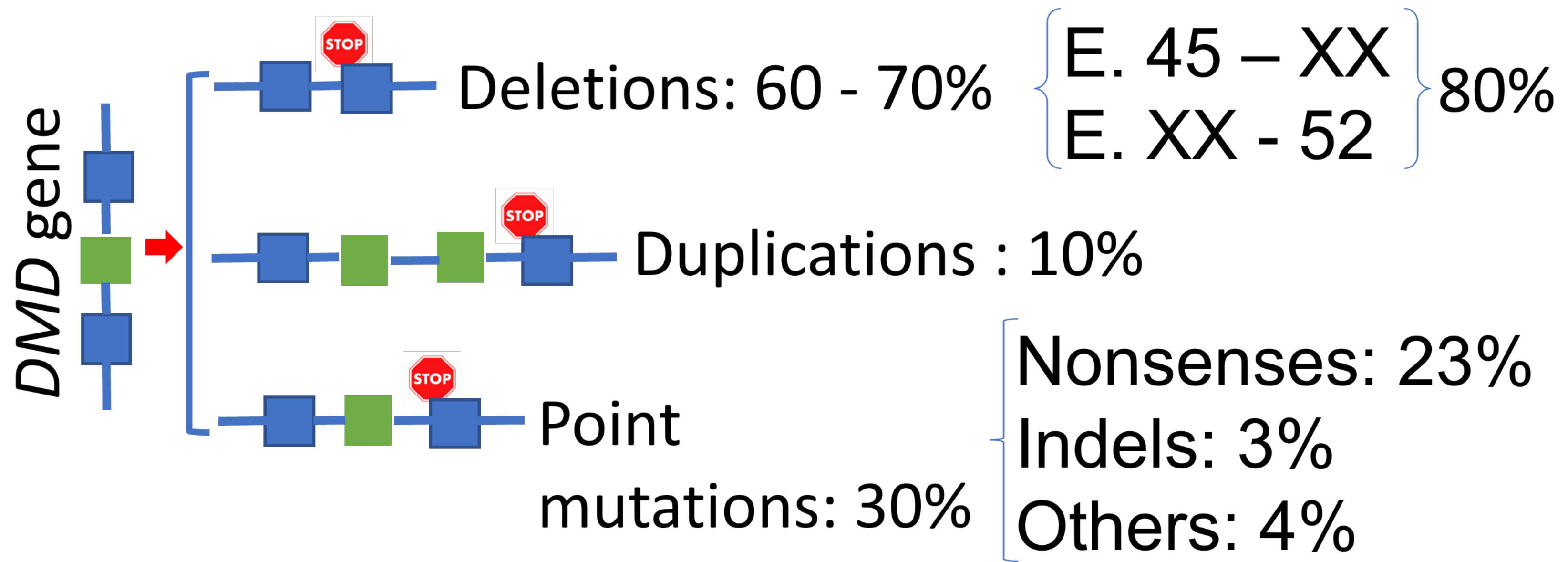


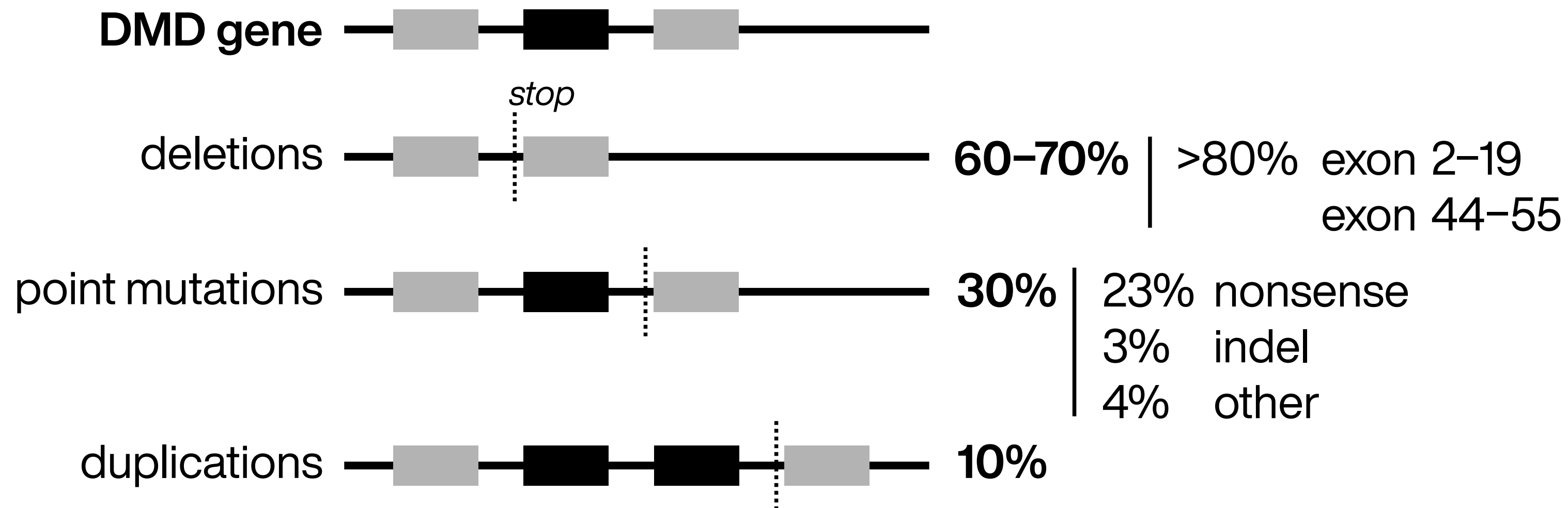
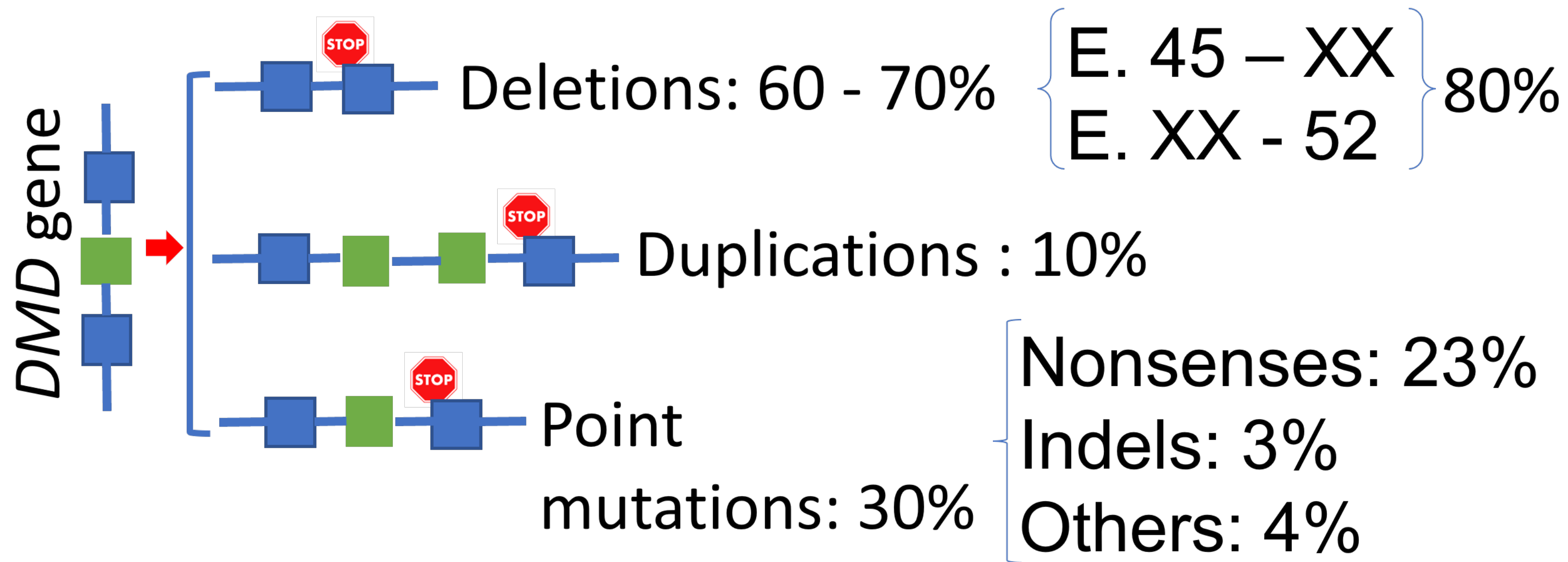


**Spa cemak esgro ups**





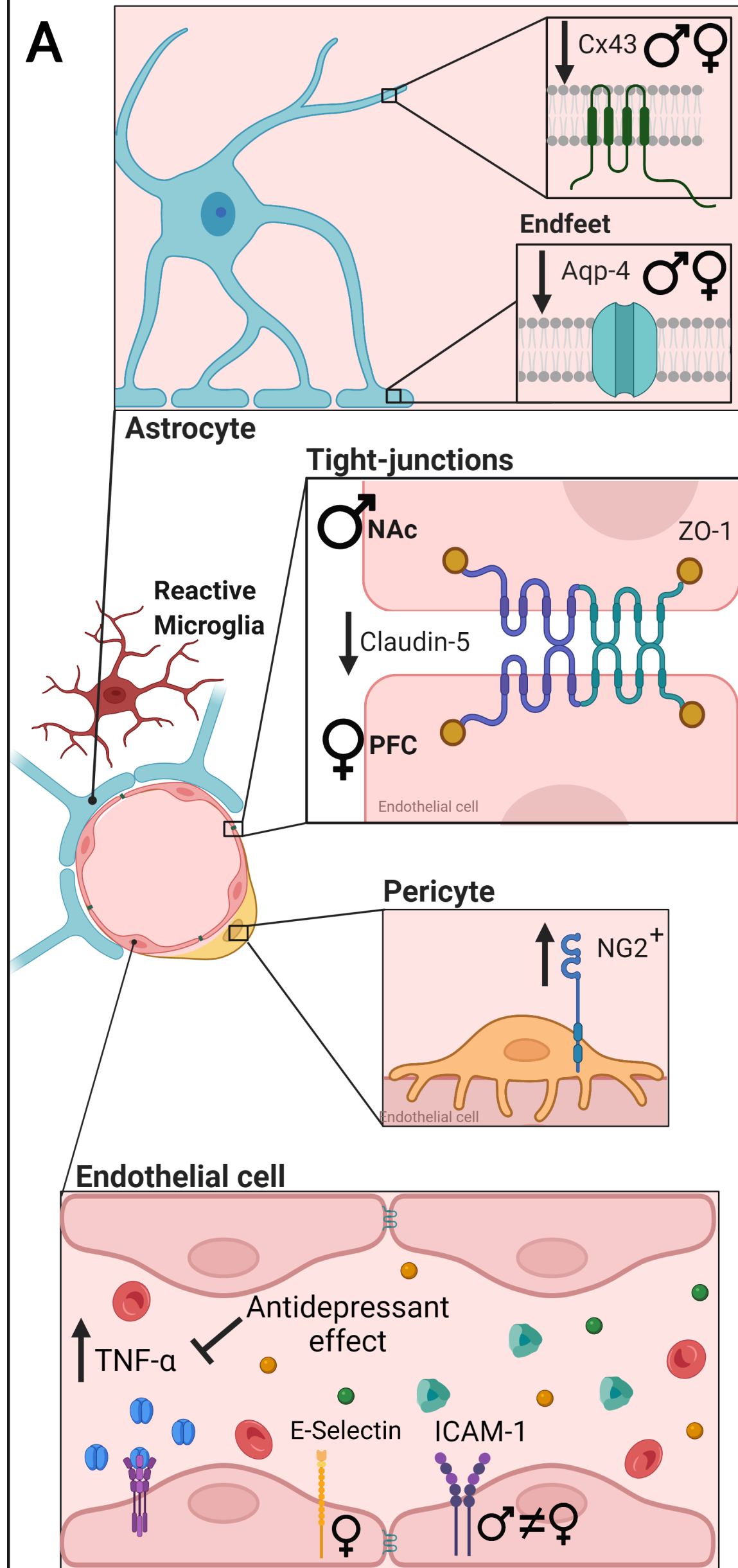




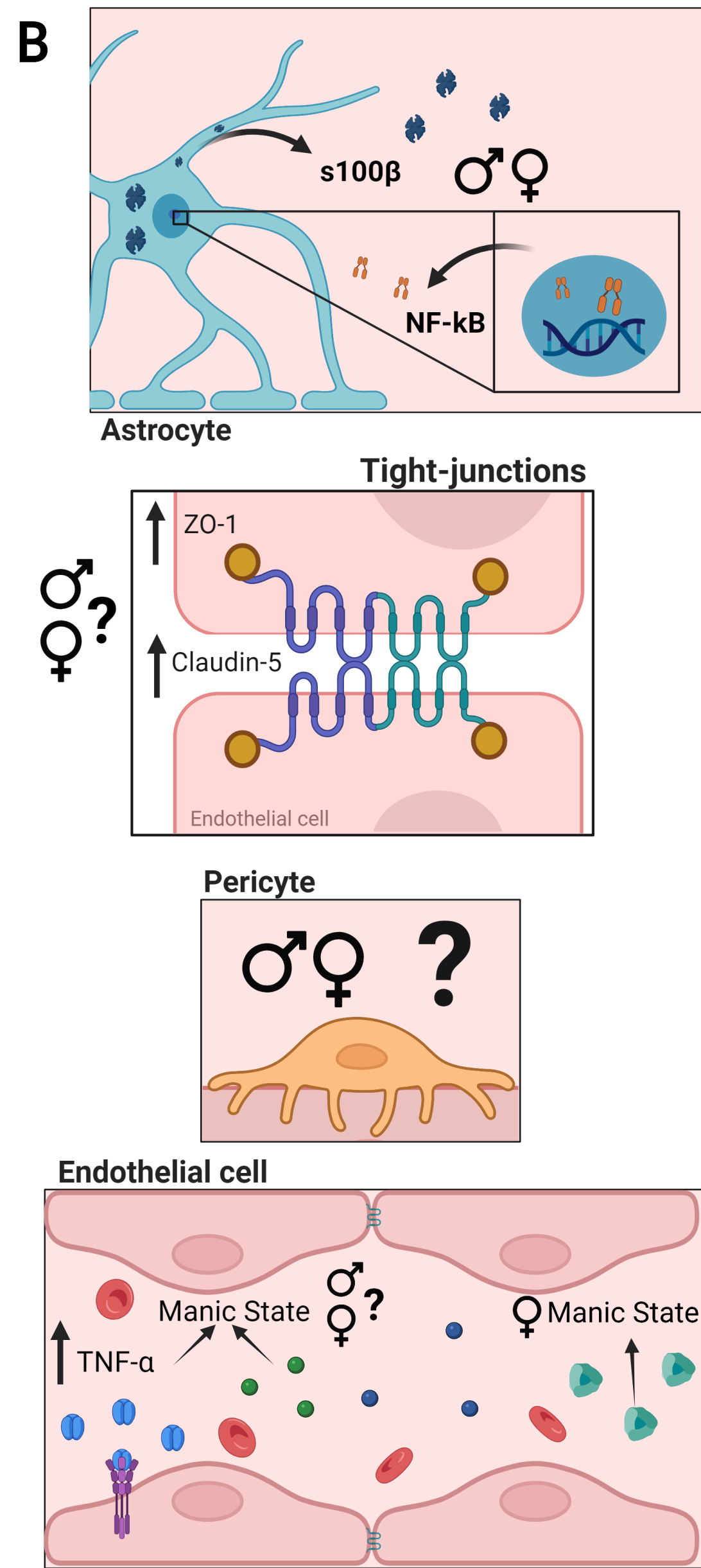


Spa cemak esgro ups

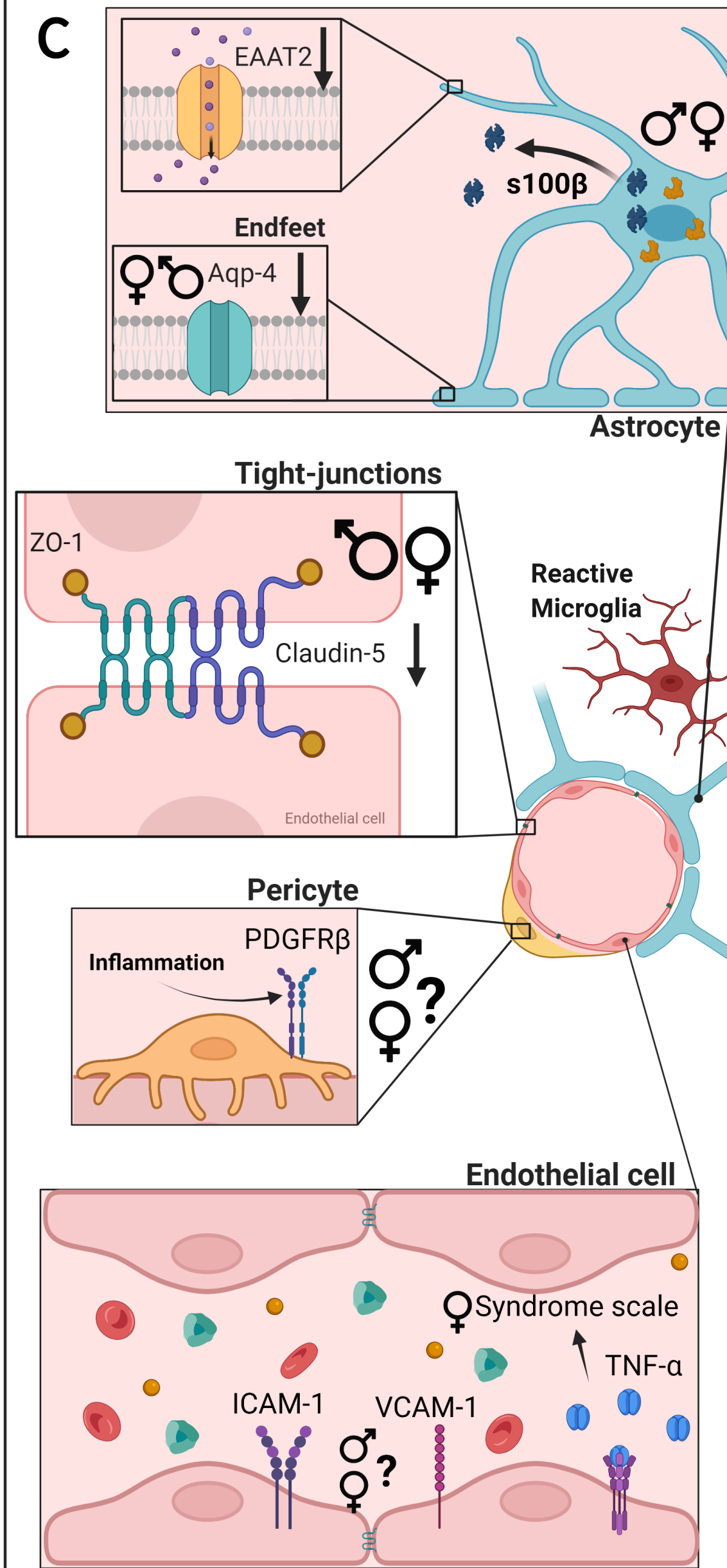
# Major Depressive Disorder



# Bipolar Disorder

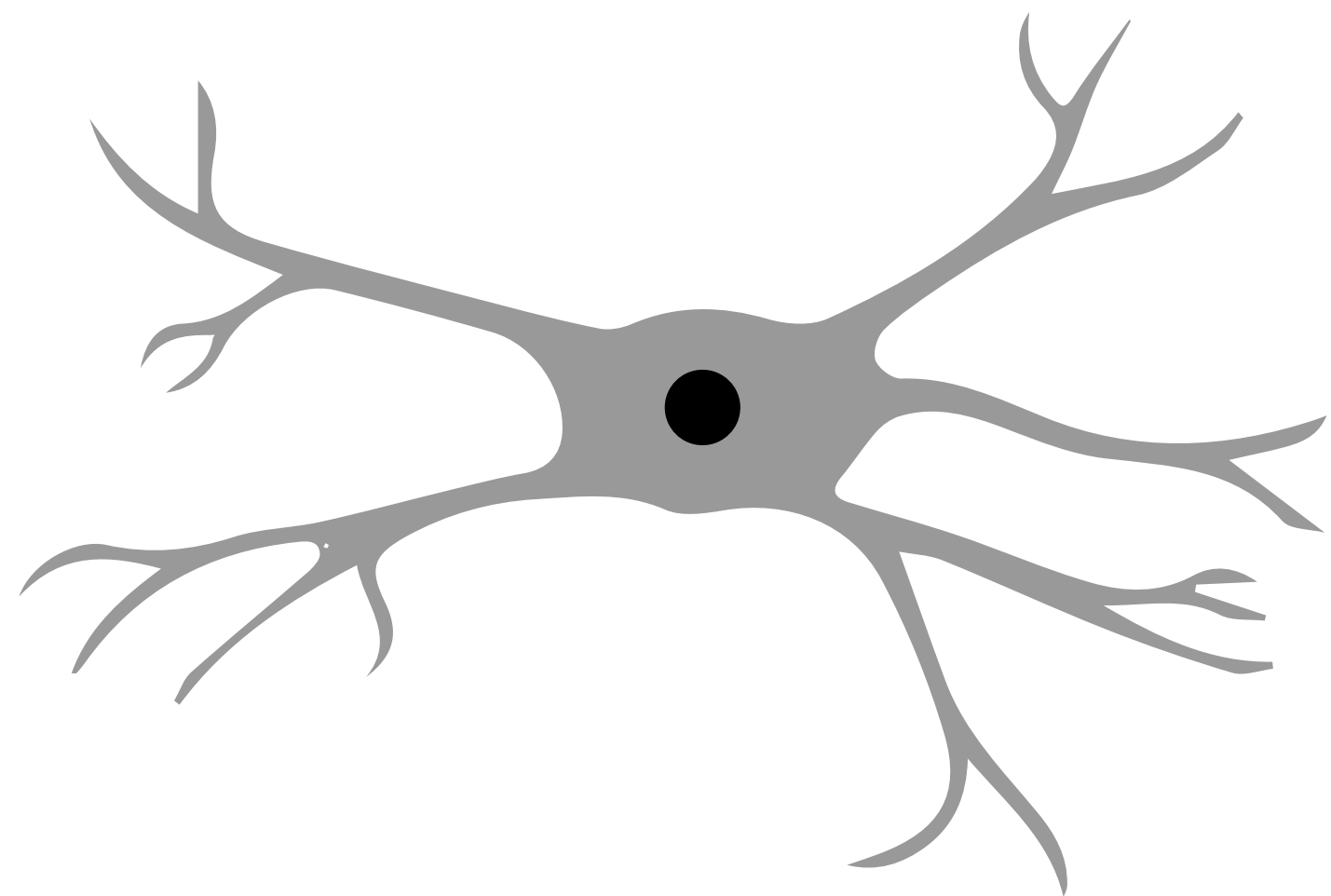
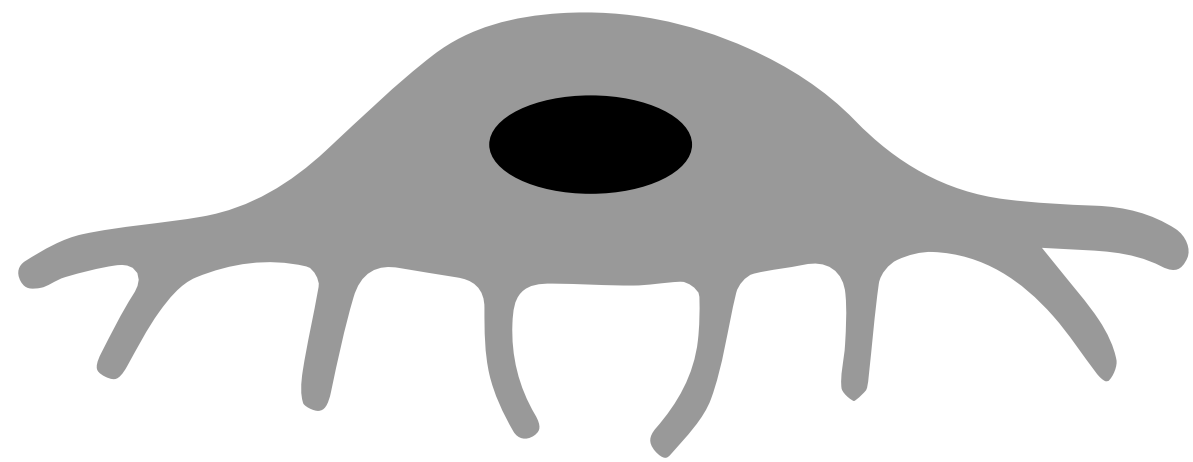
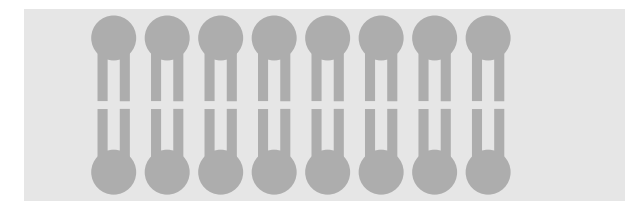
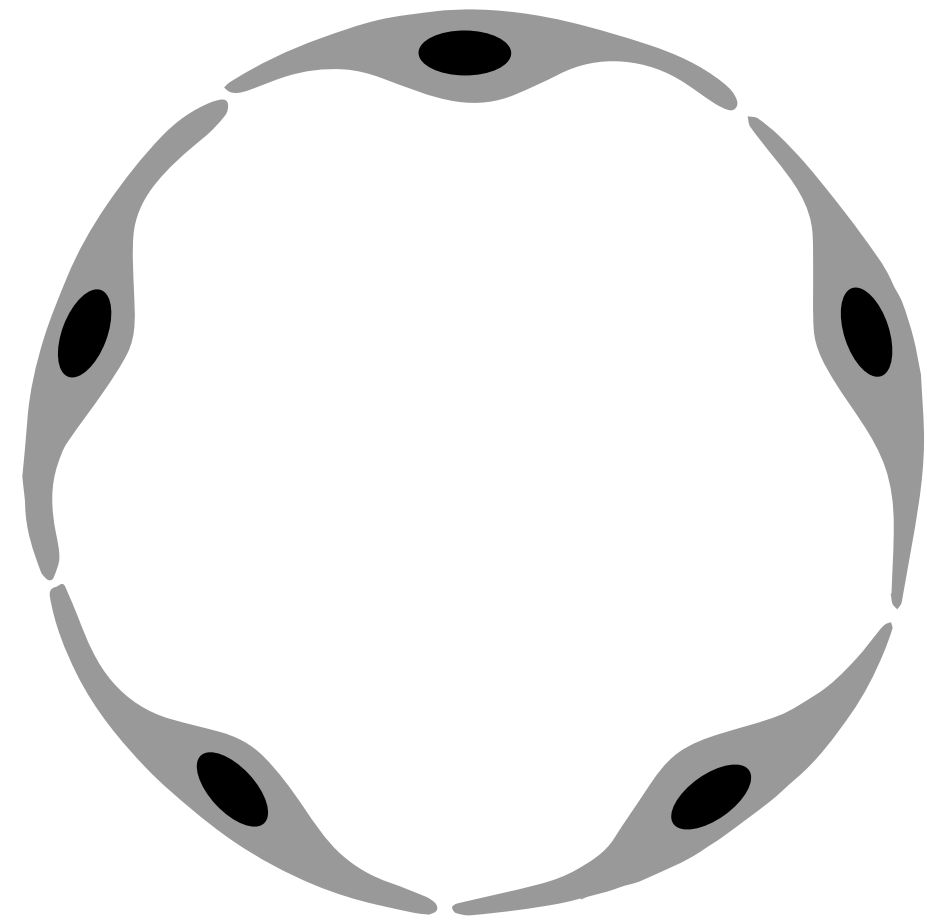
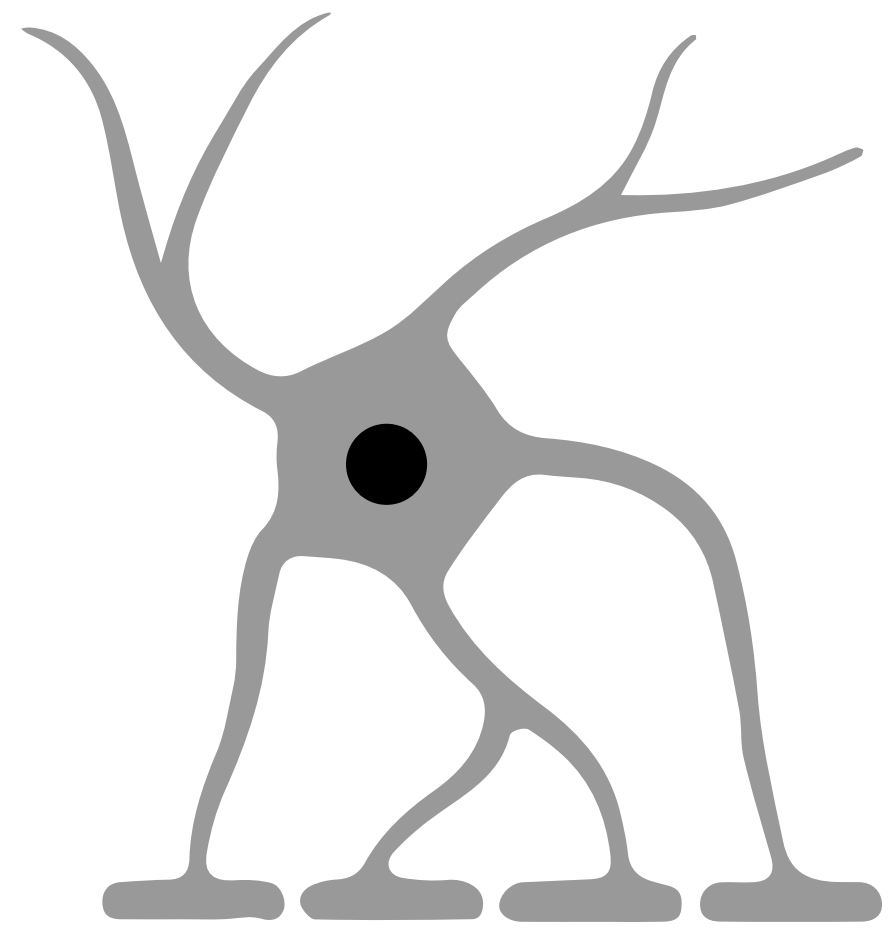


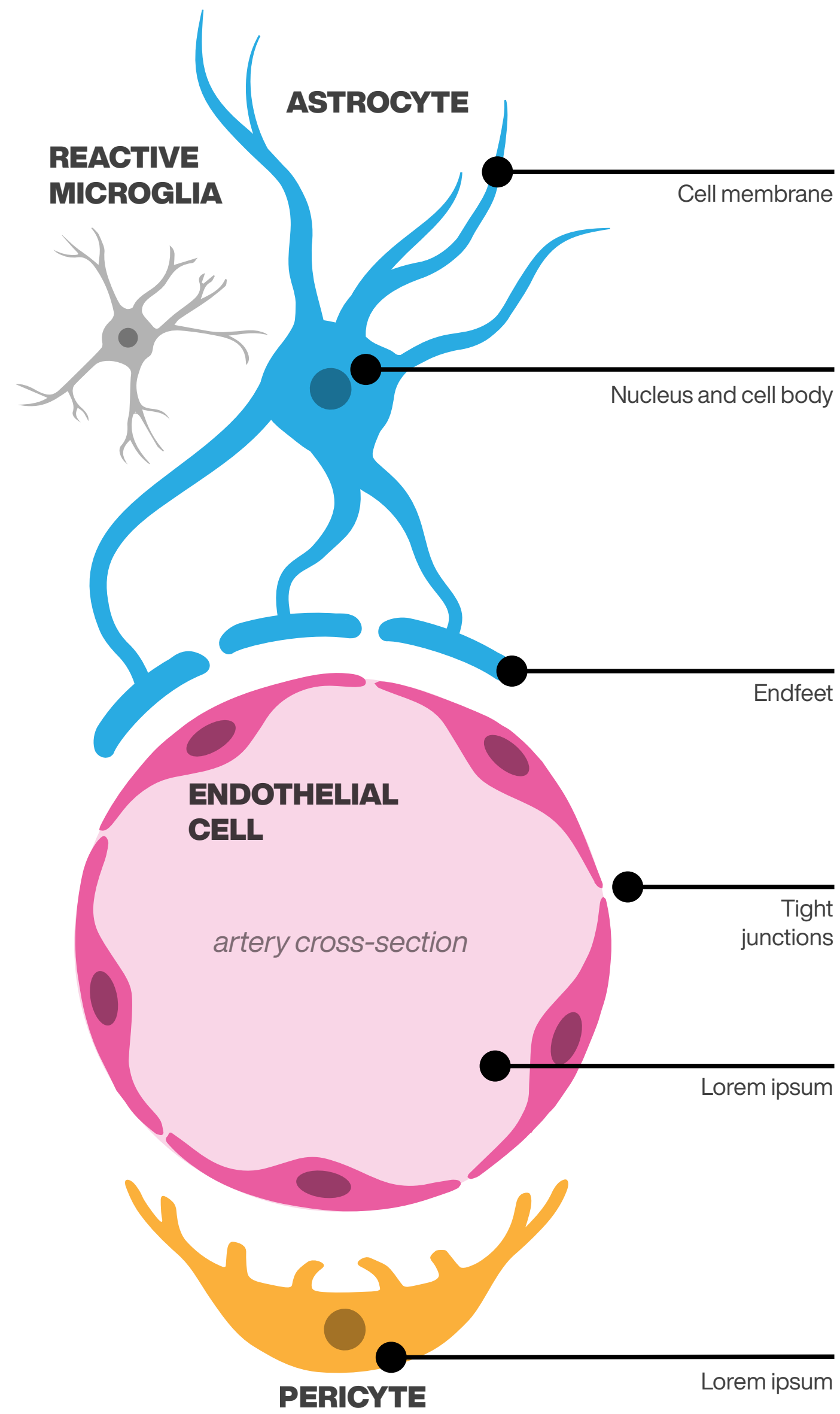
# Schizophrenia



**Legend:**

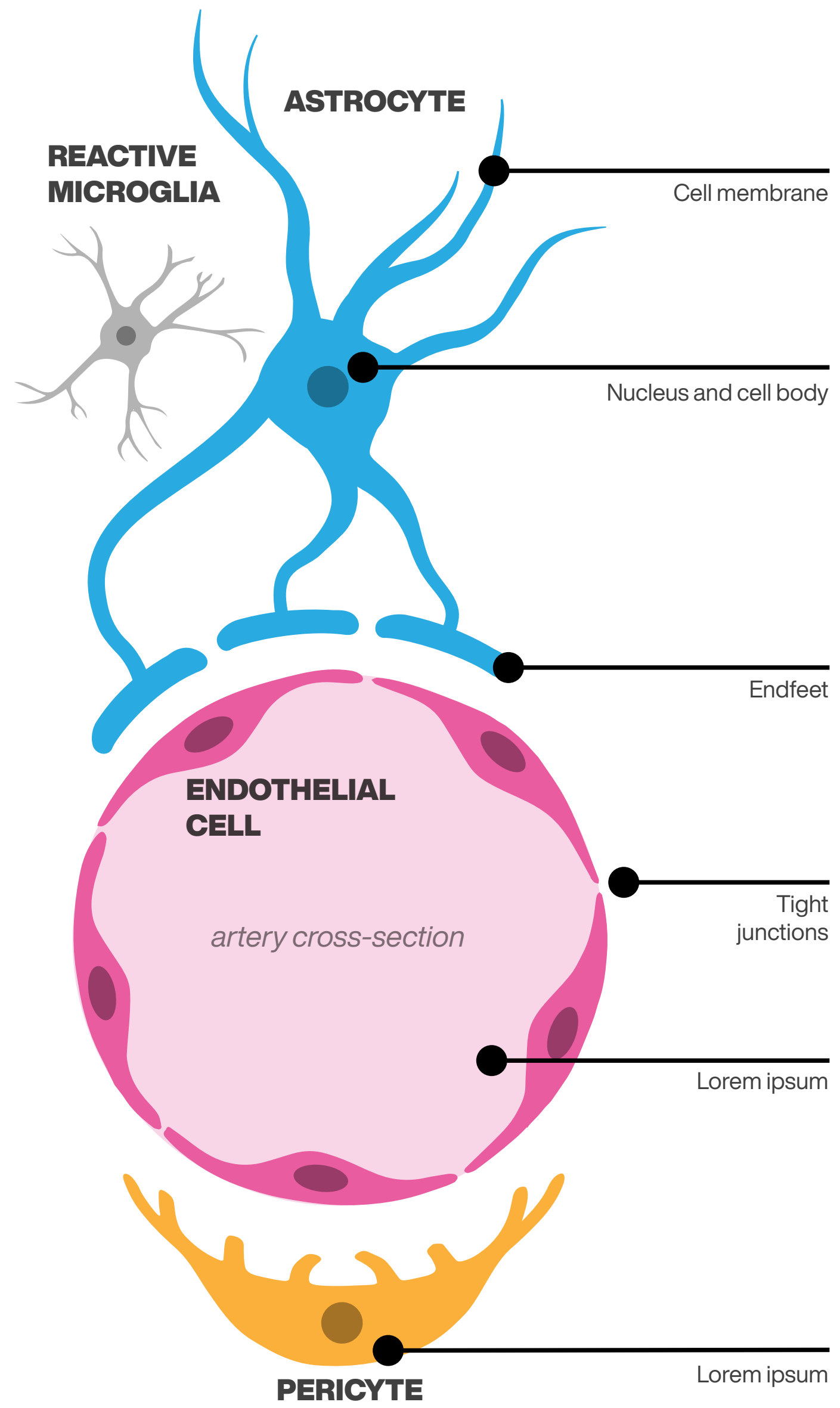
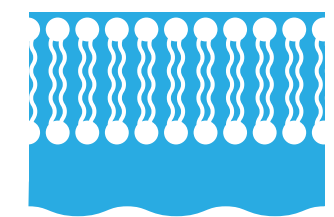
- Glu
- IL-6
- IL-1β
- IL-8
- CRP
- TNF-α
- NF-κB
- ALDH1L1
- s100β
- EAAT2
- Aqp-4
- ♂♀ Both sex (non-differentiated)



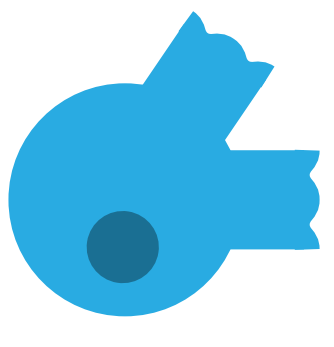




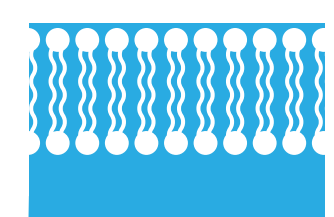


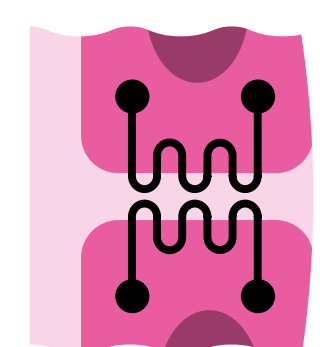
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh



Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh



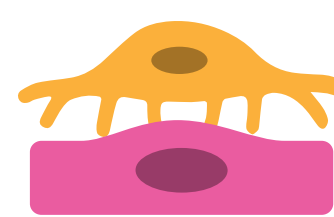
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh



Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

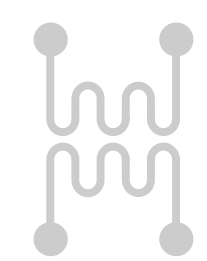
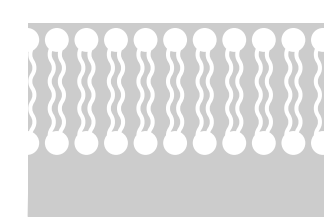
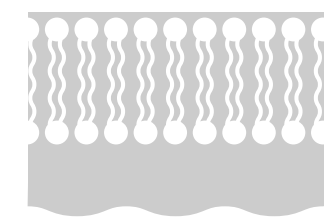


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

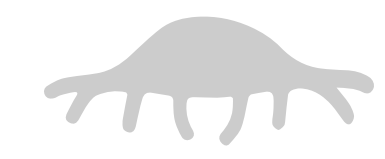
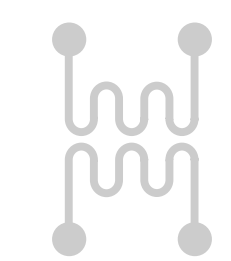
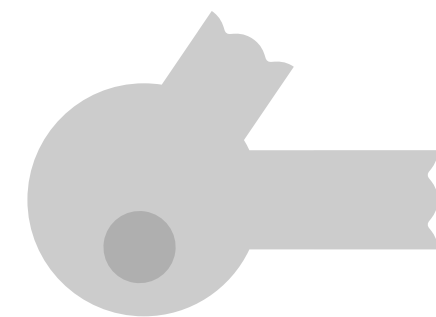
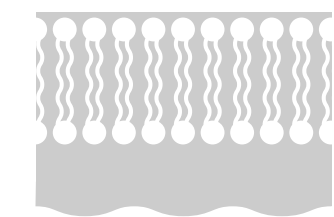


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

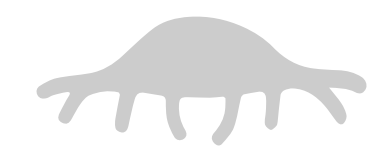
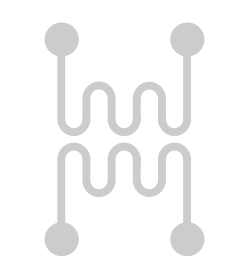
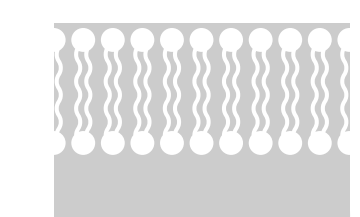
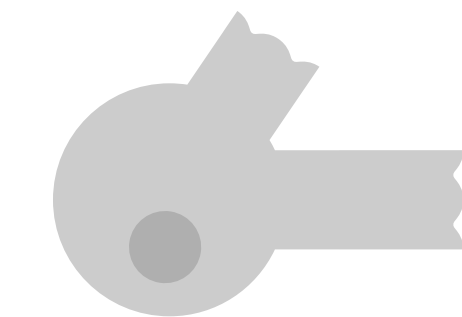
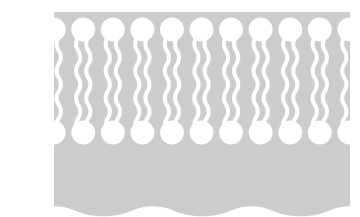
**Major depressive disorder**

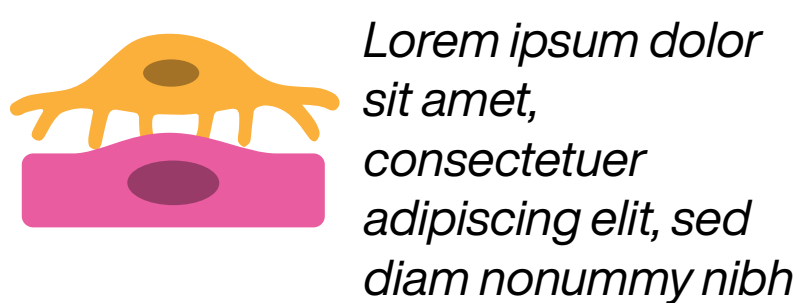
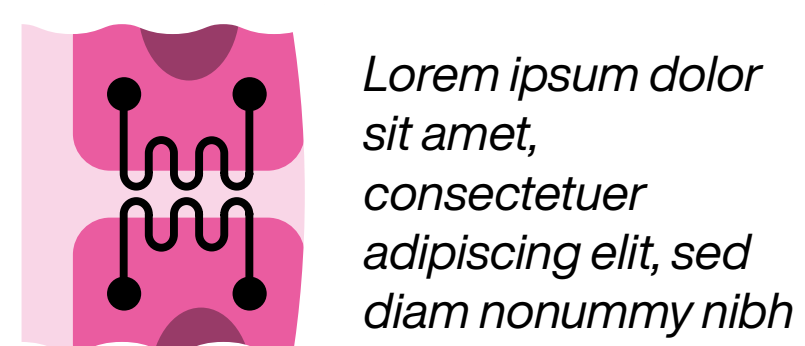
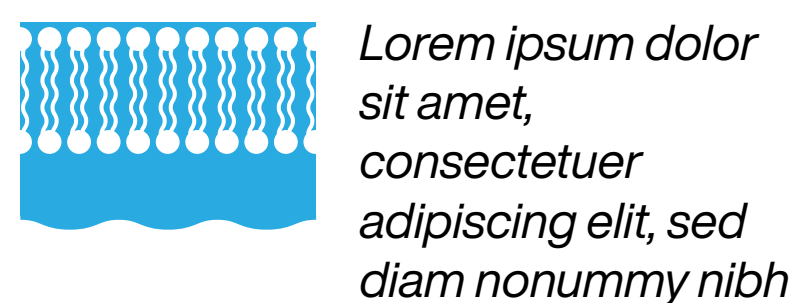
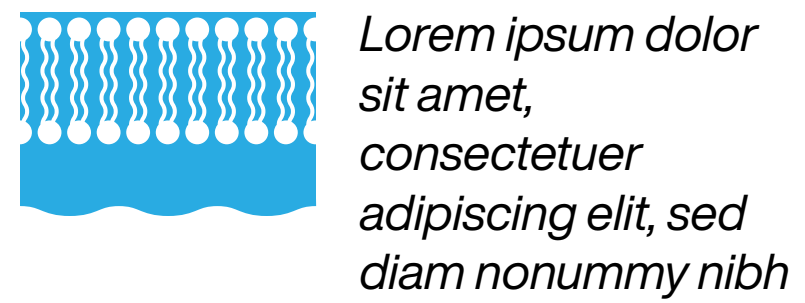
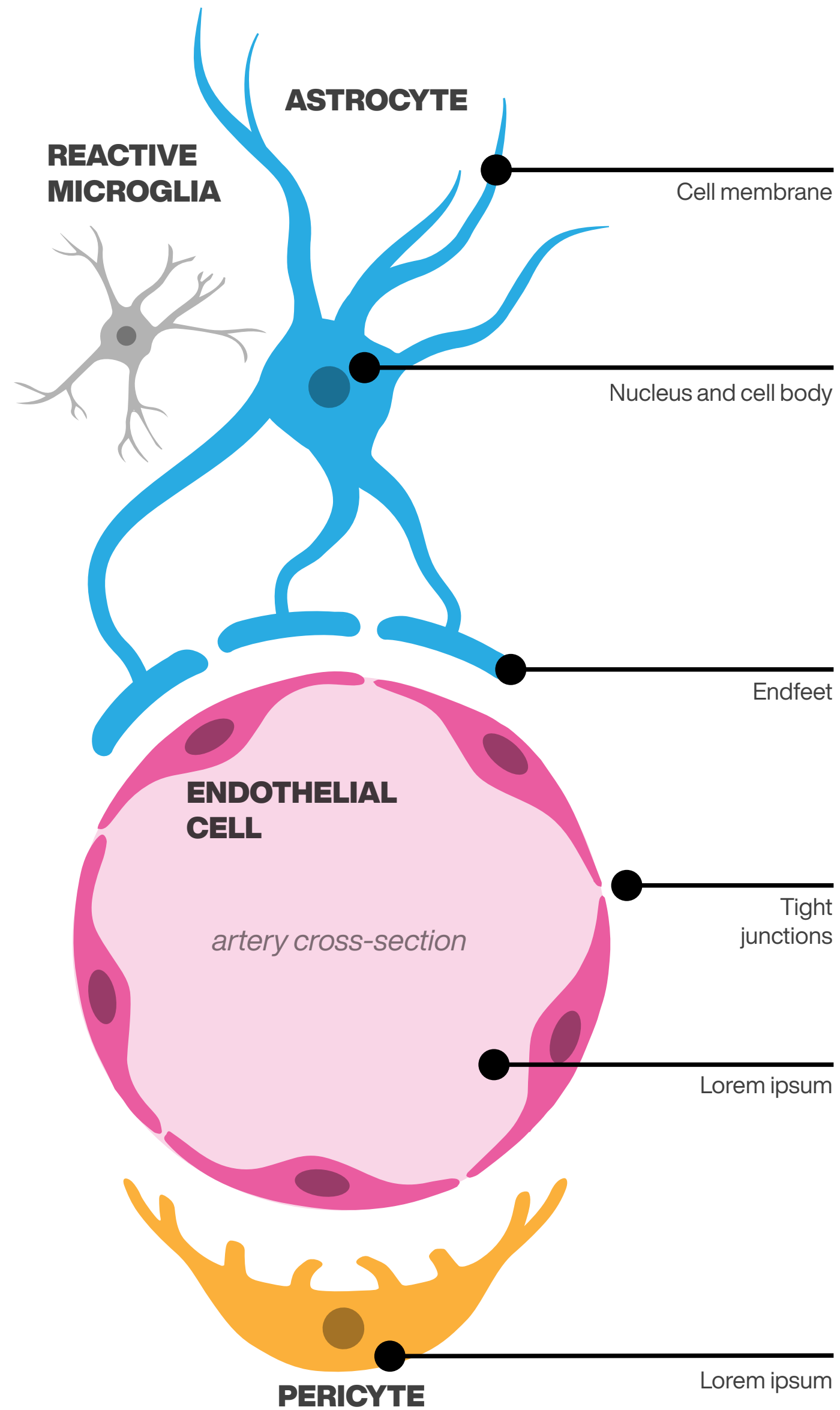


**Bipolar disorder**



**Schizophrenia**





Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

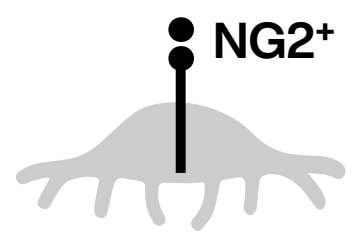
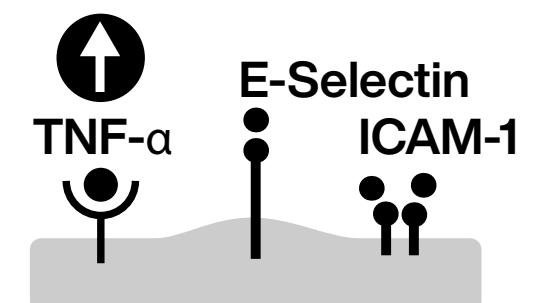
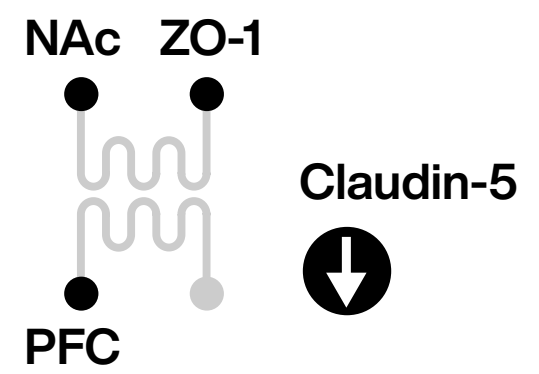
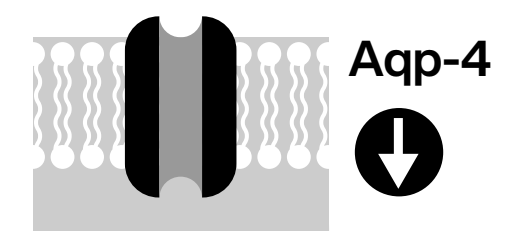
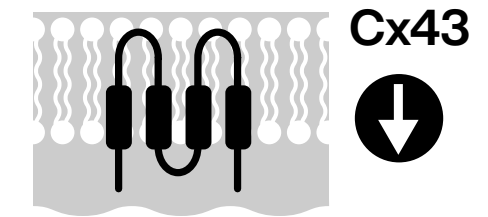
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

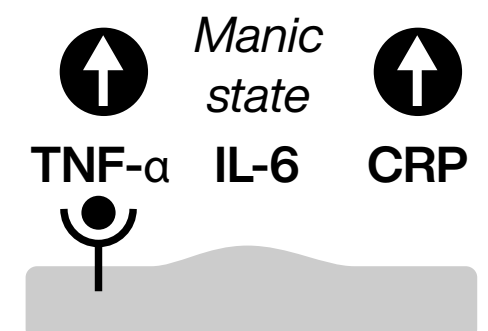
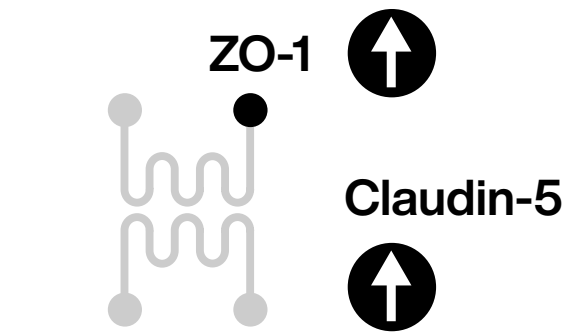
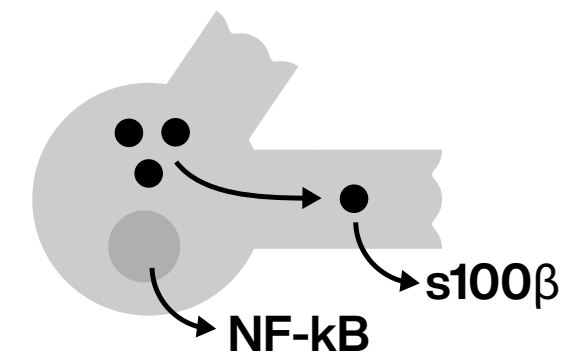
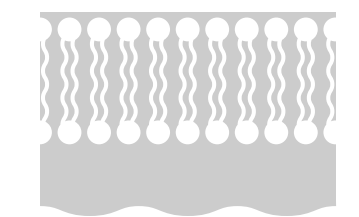
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

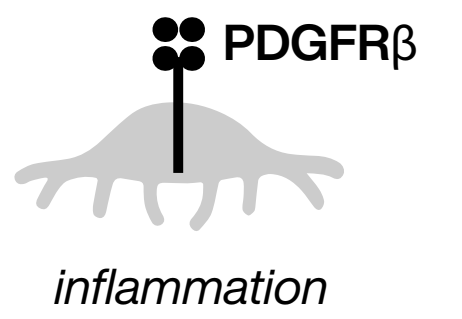
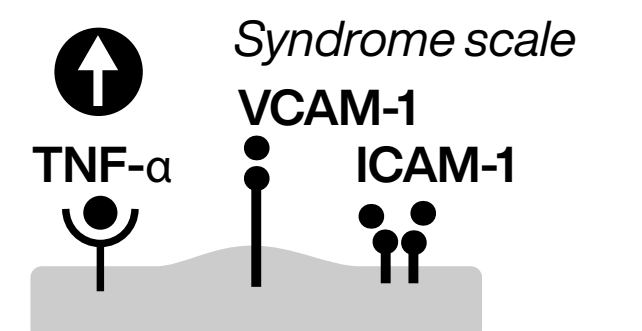
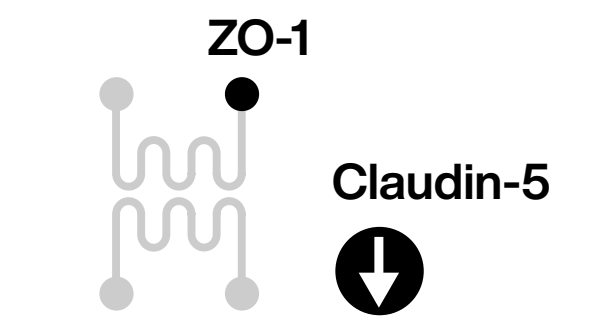
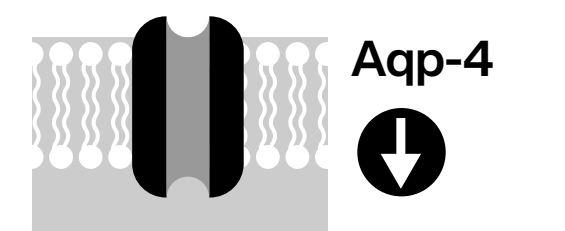
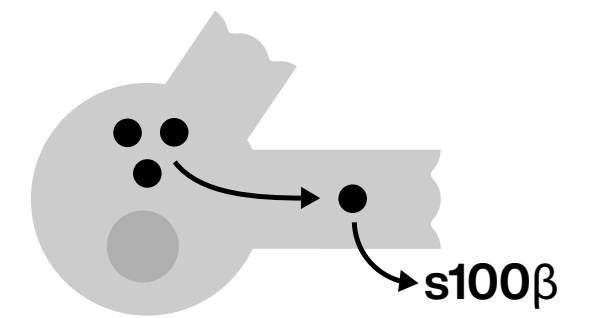
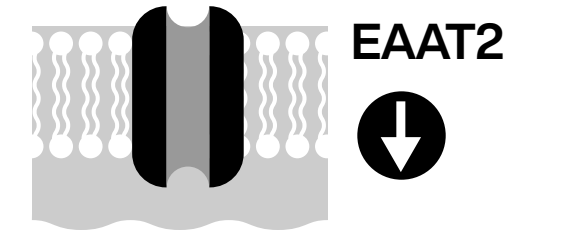
**Major depressive disorder**

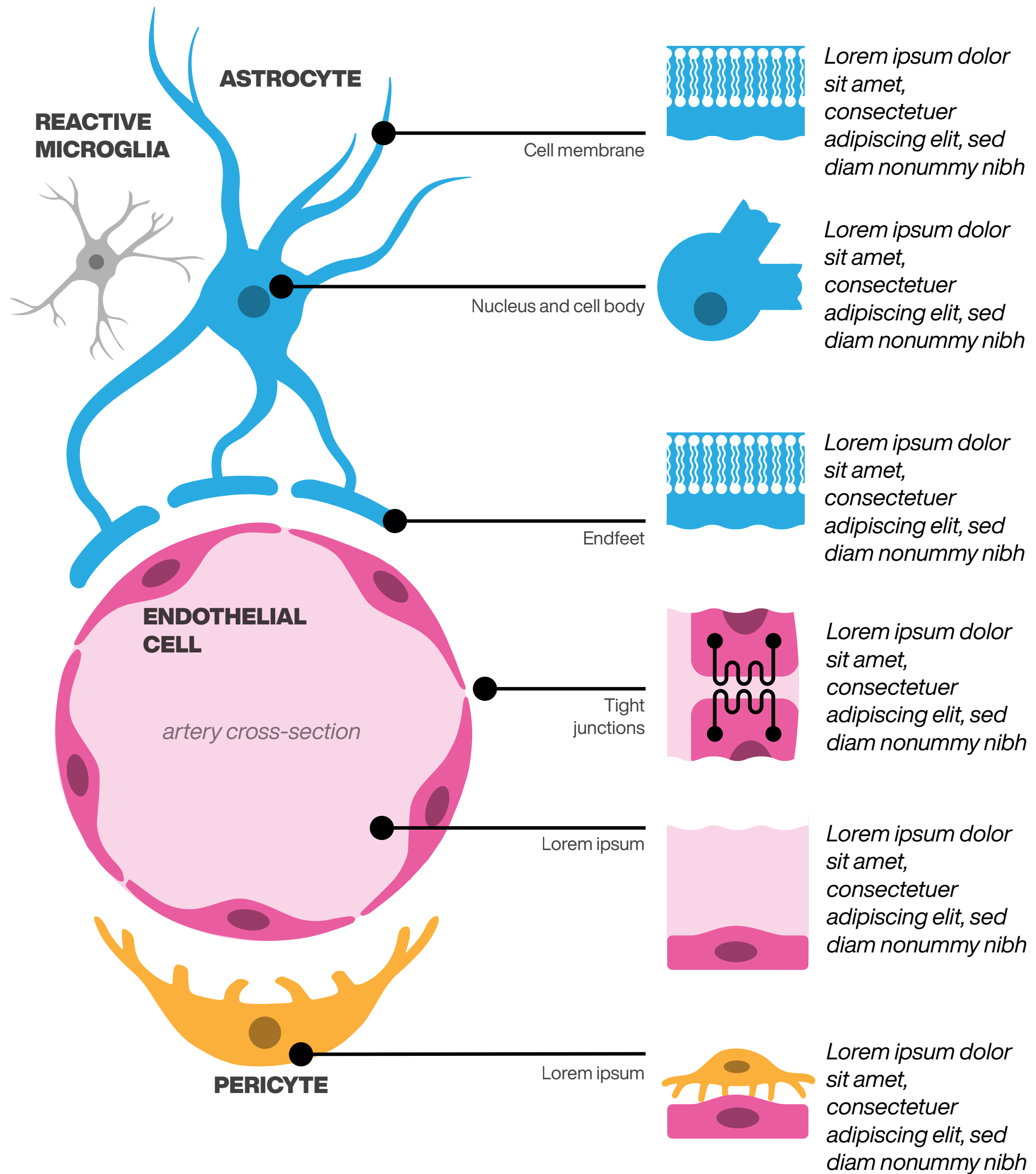


**Bipolar disorder**



**Schizophrenia**





Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

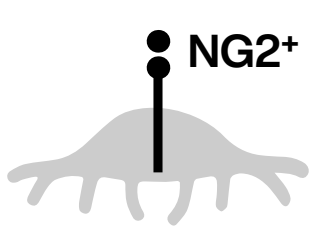
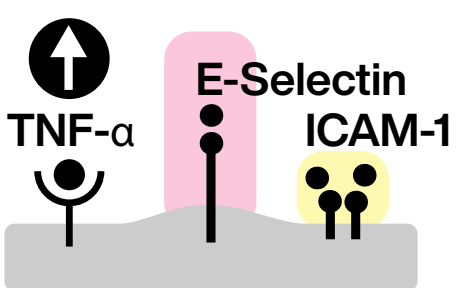
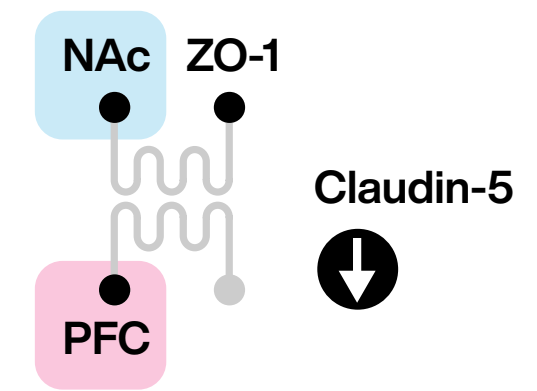
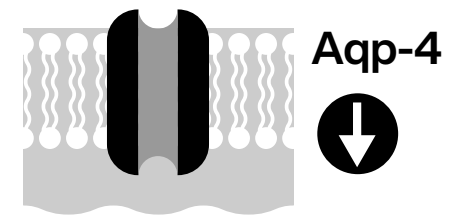
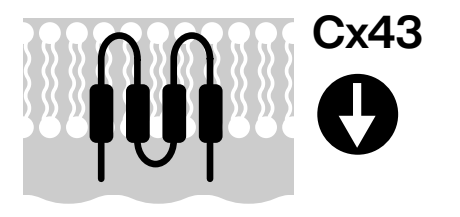
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

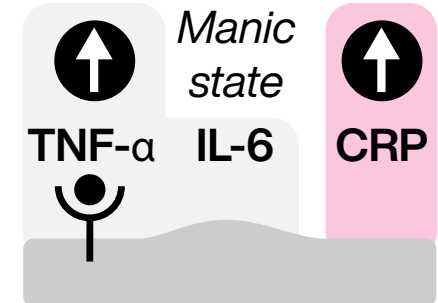
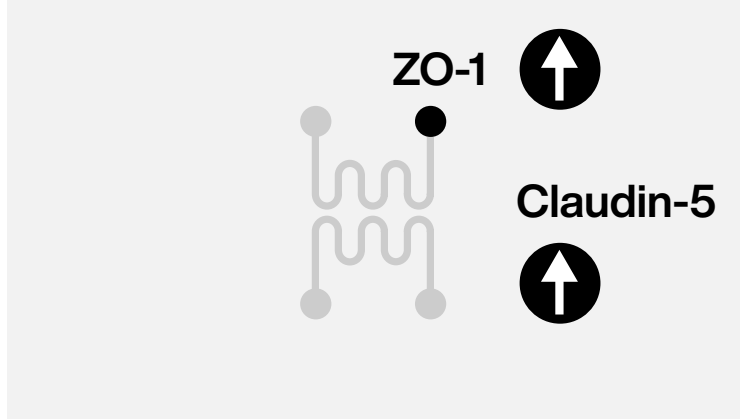
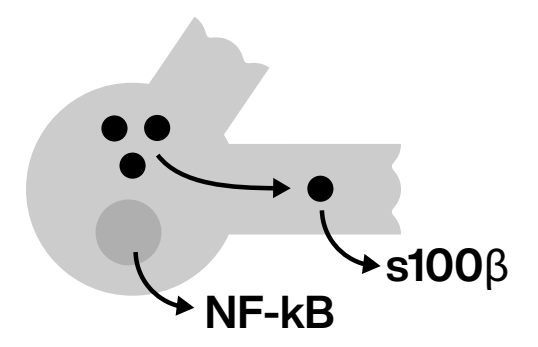
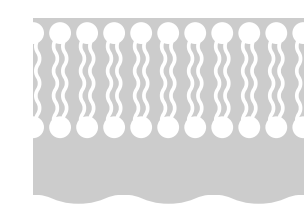
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

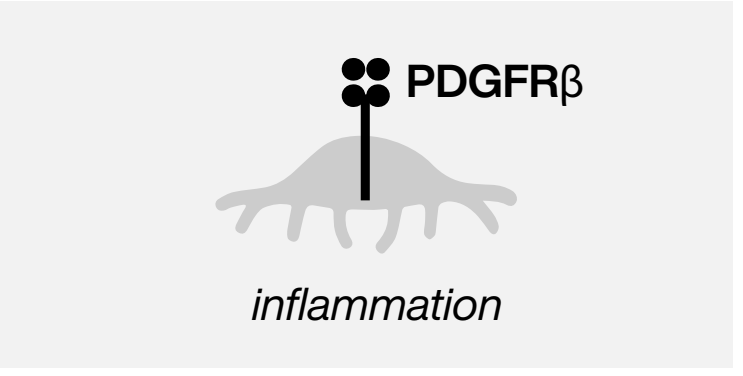
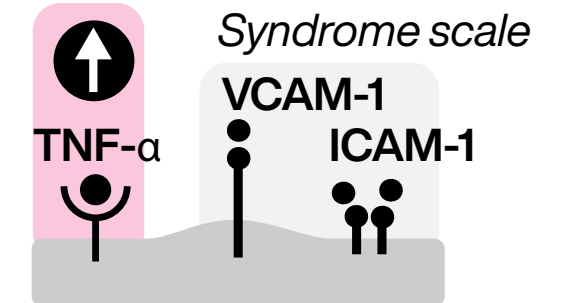
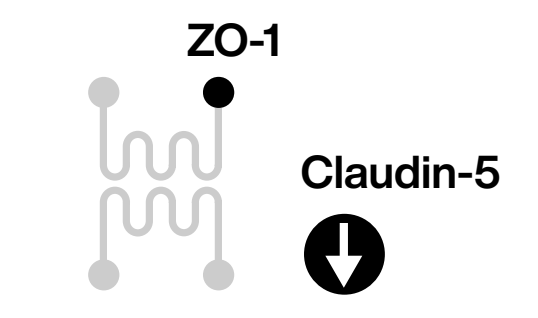
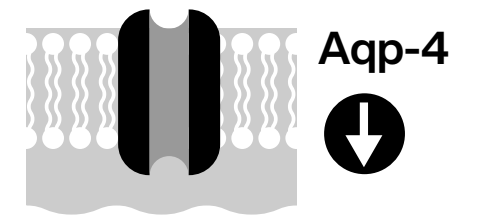
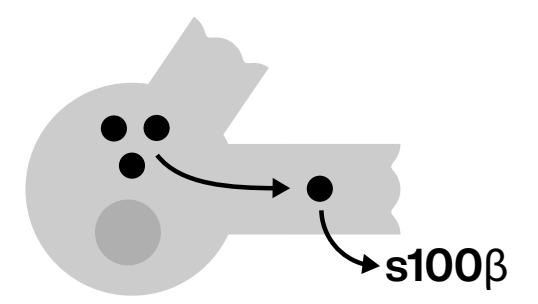
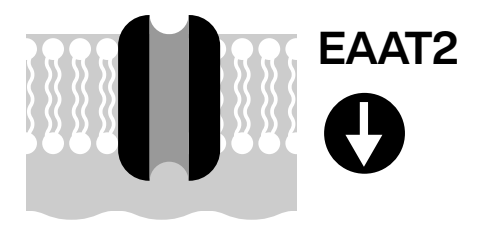
**Major depressive disorder**



**Bipolar disorder**



**Schizophrenia**

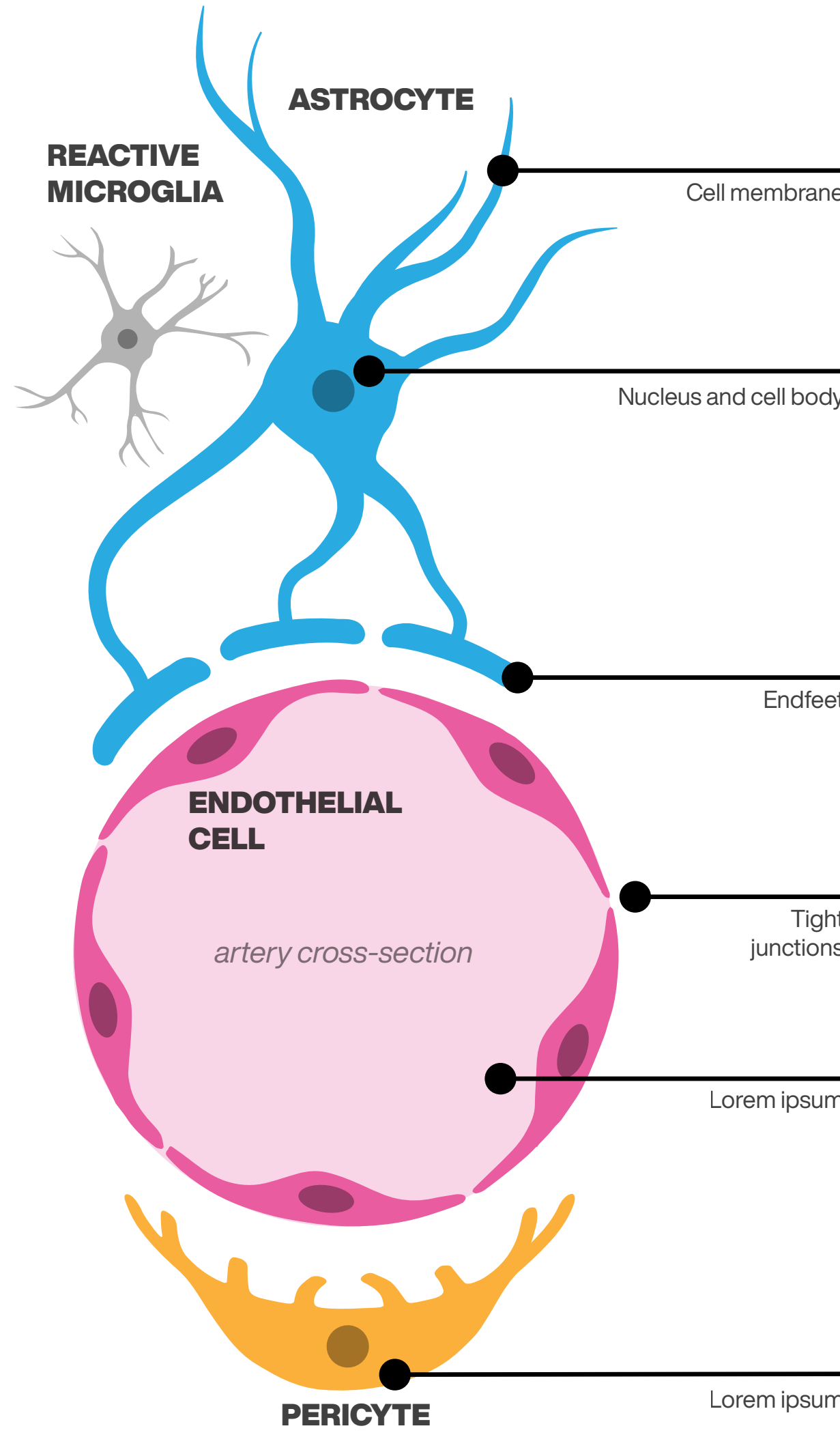


differentiation ■ male ■ female ■ suspected ■ unknown

### Major depressive disorder

### Bipolar disorder

### Schizophrenia



Cell membrane  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

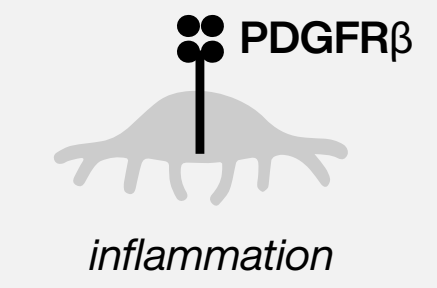
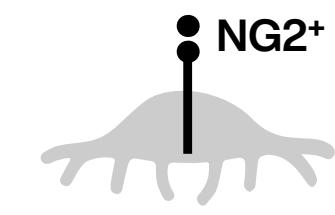
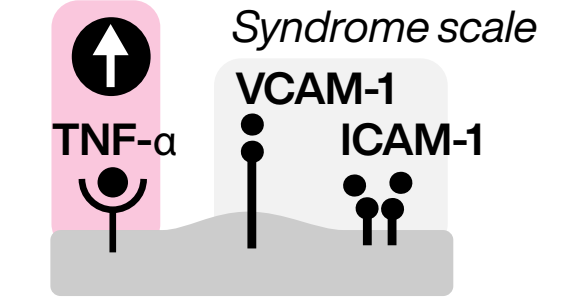
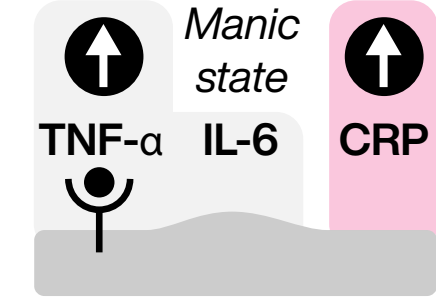
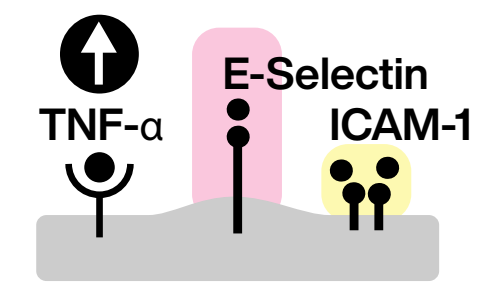
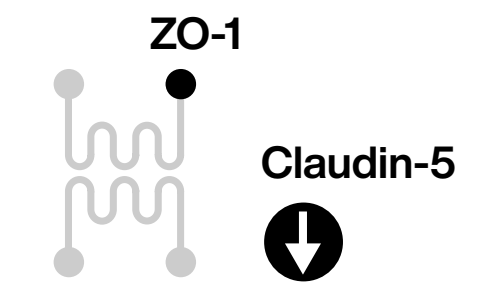
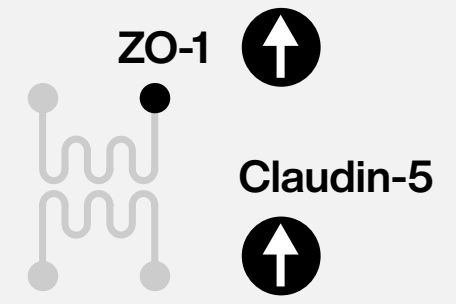
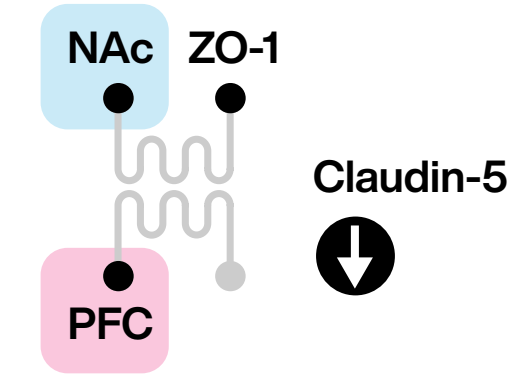
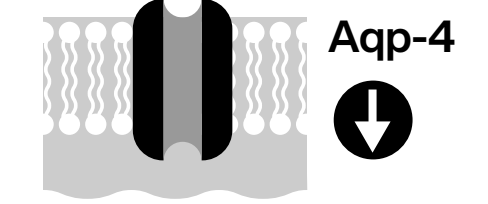
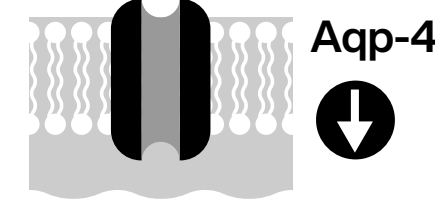
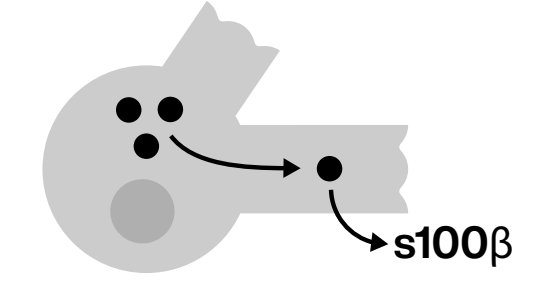
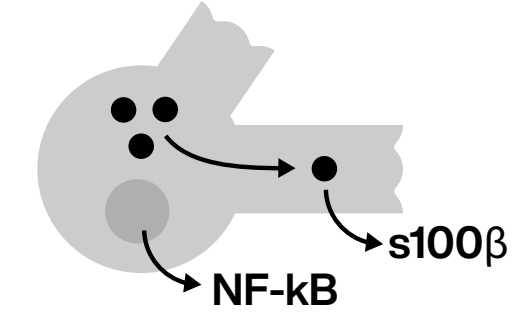
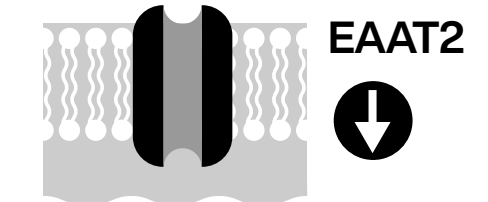
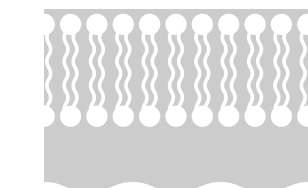
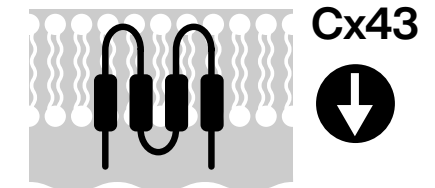
Nucleus and cell body  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Endfeet  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Tight junctions  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh

Lorem ipsum  
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh



differentiation  male  female  suspected  unknown

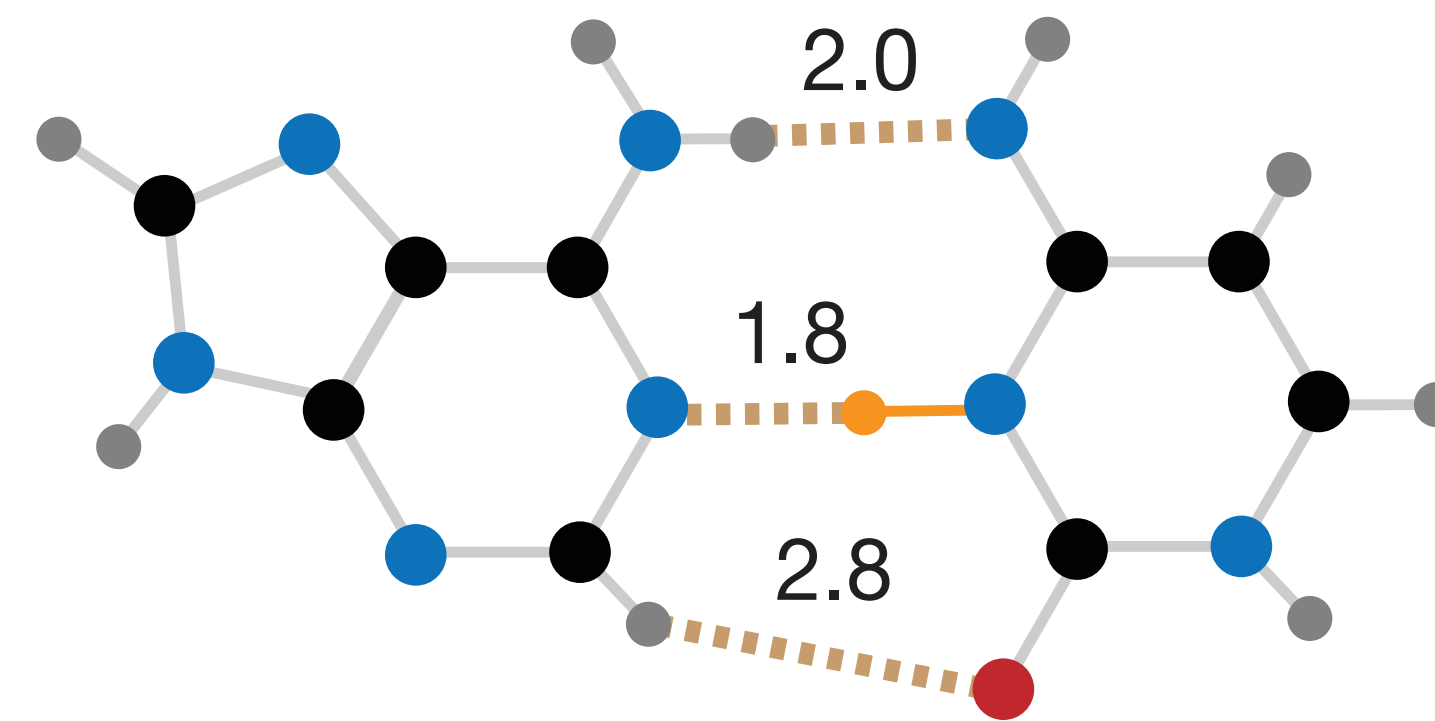
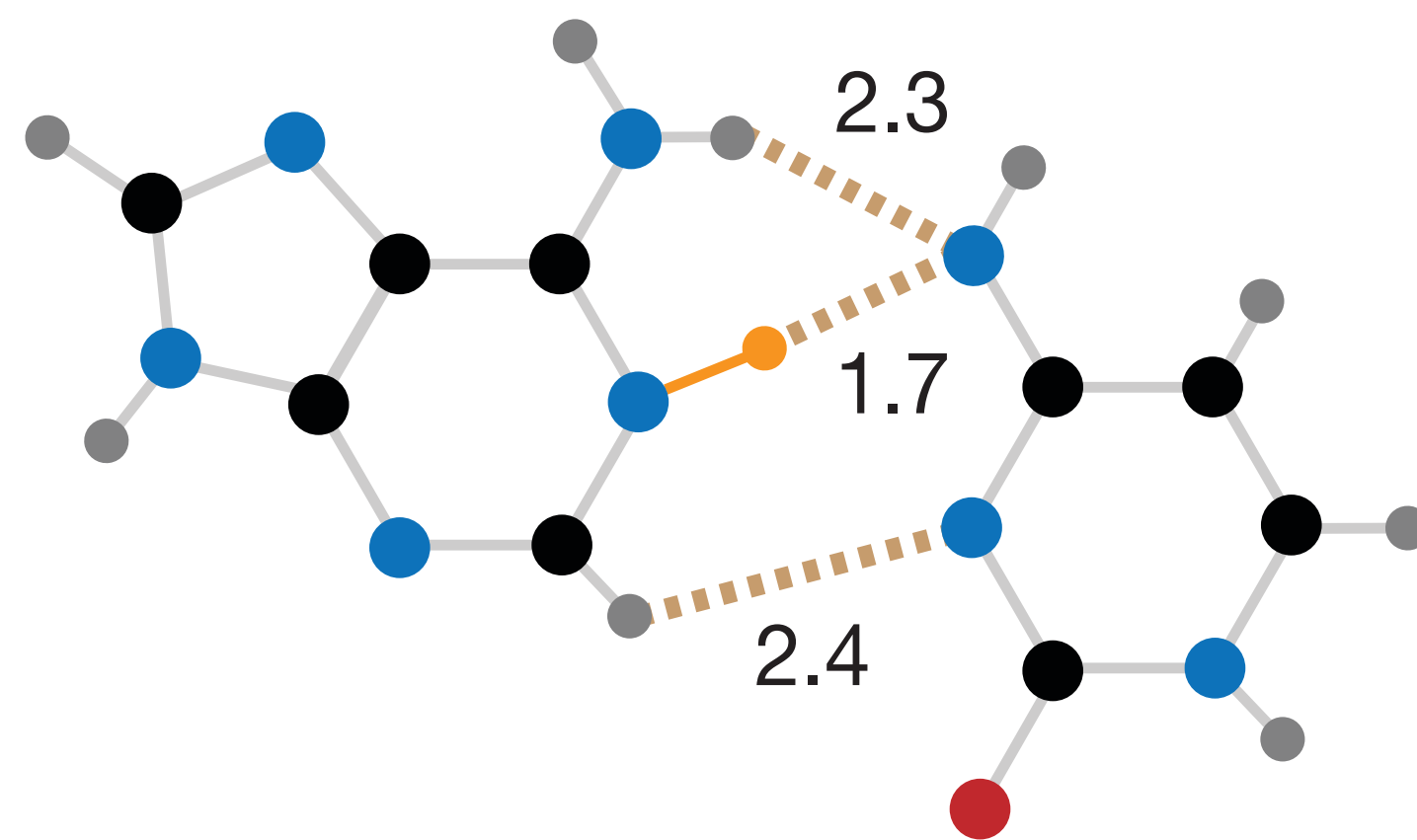
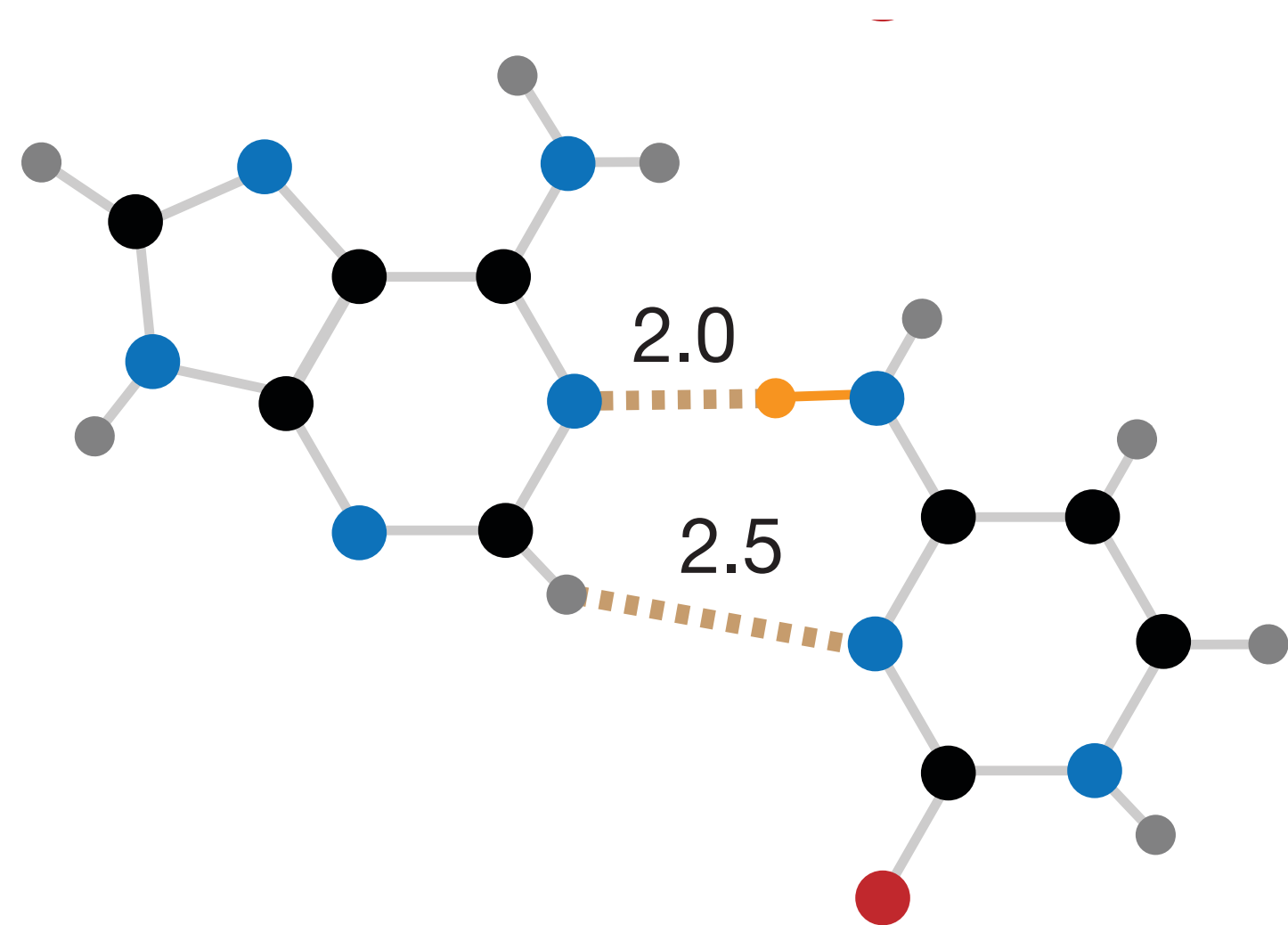
Uncolored areas are known to be undifferentiated.



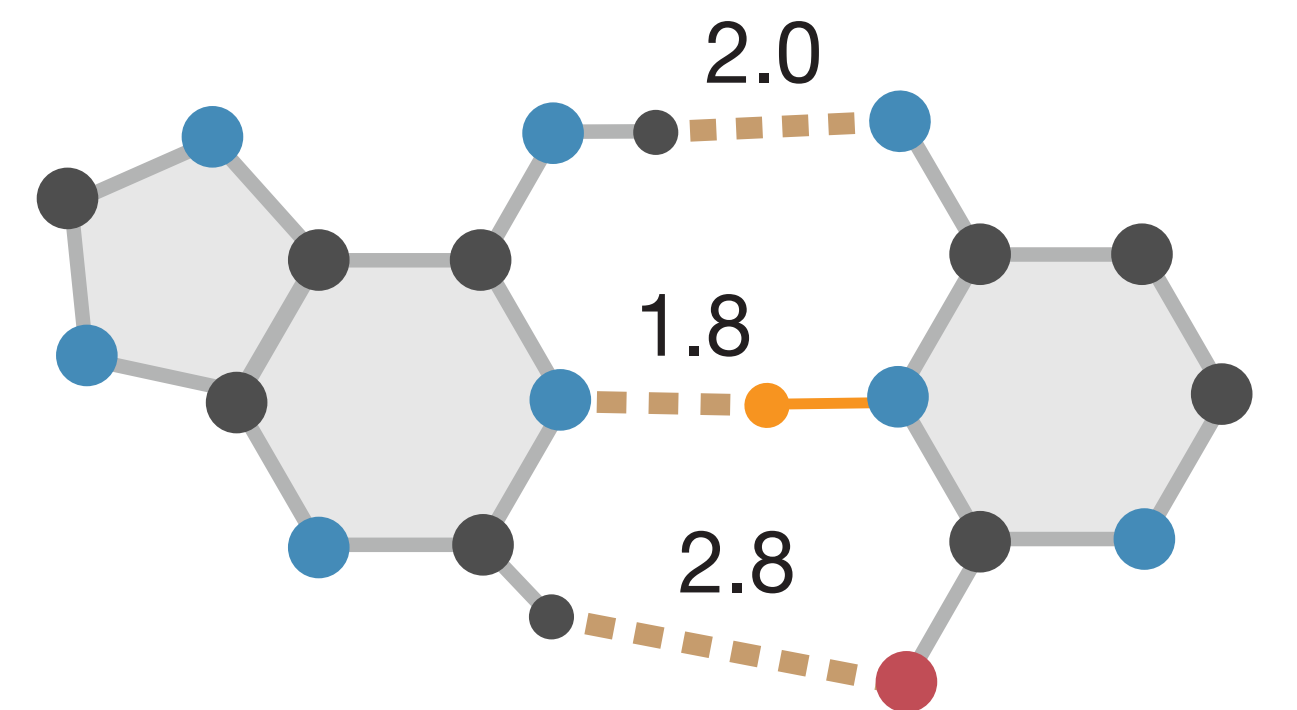
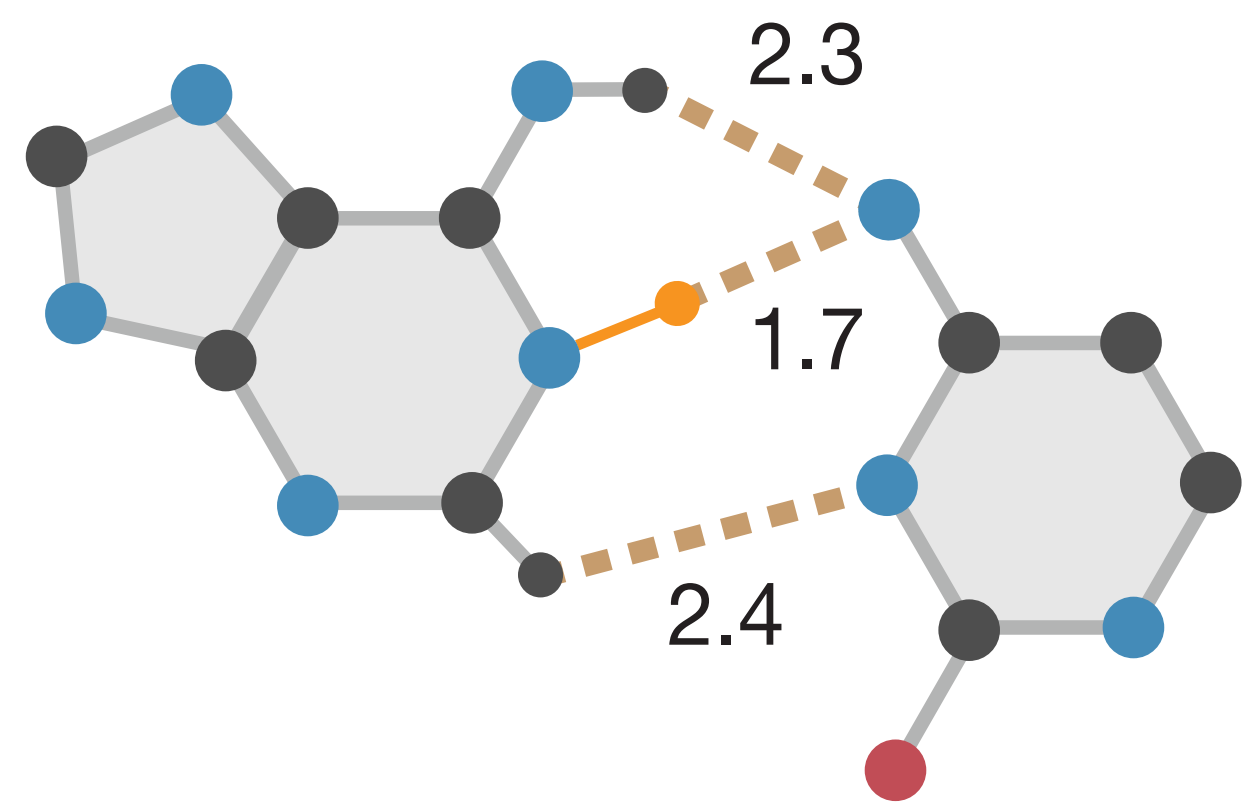
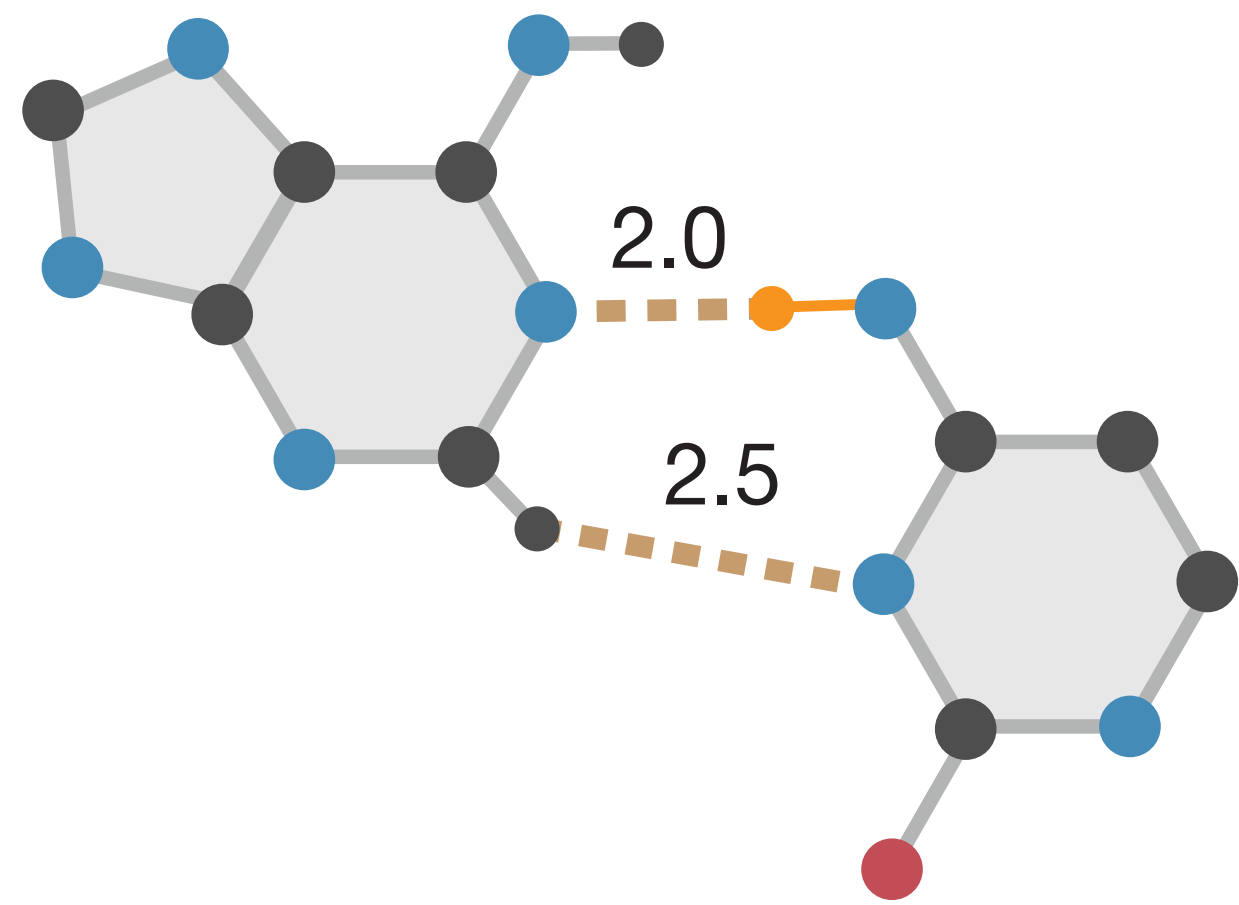
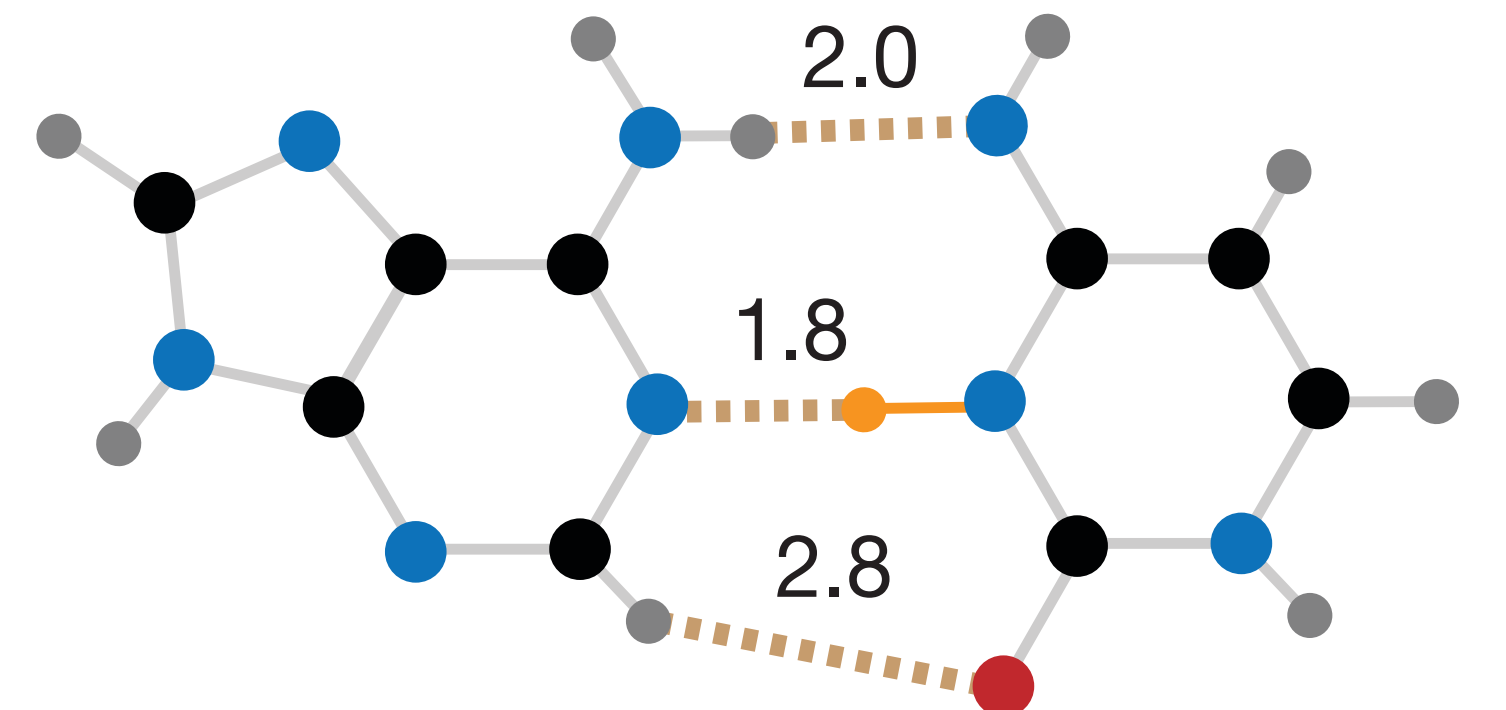
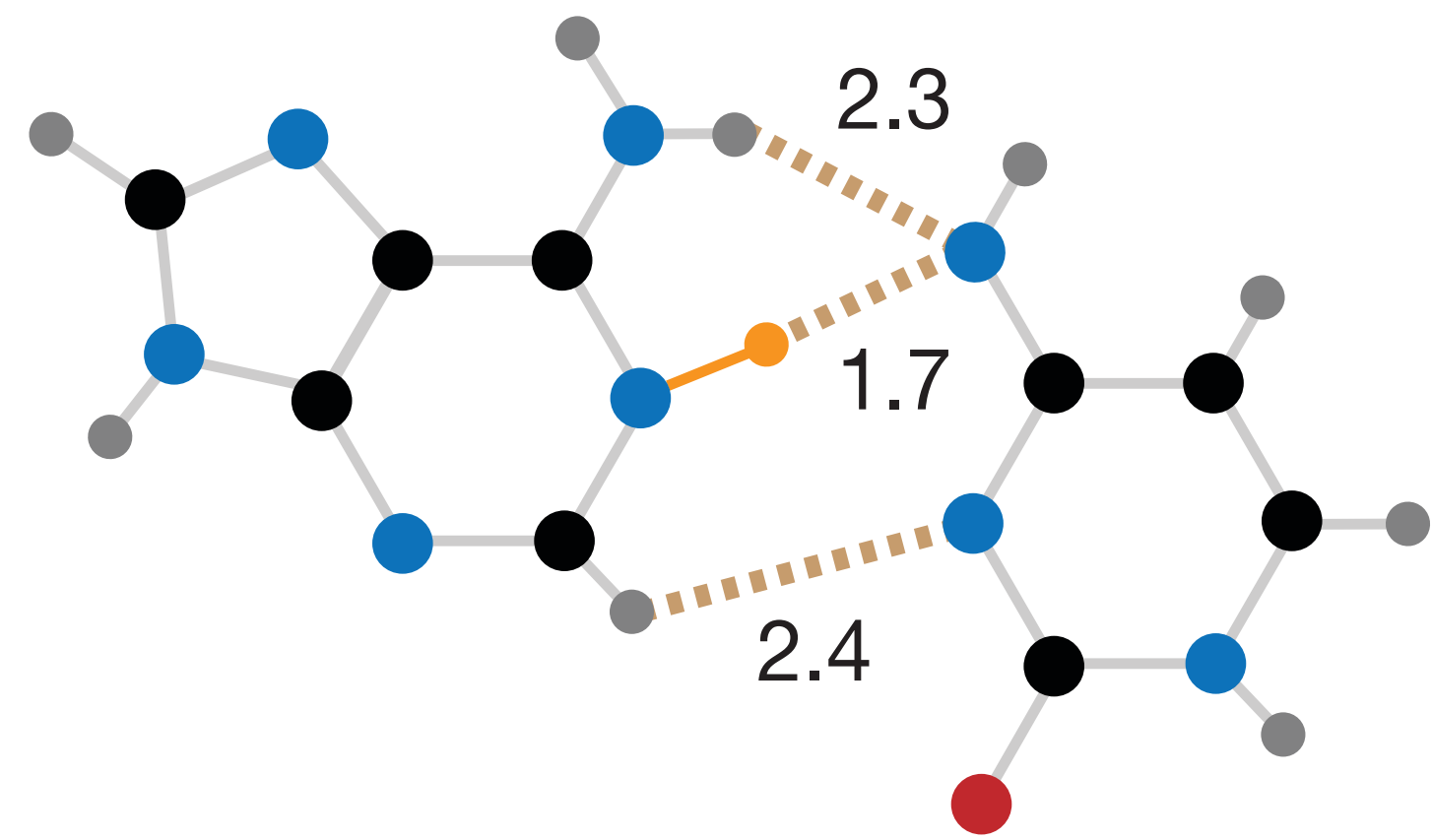
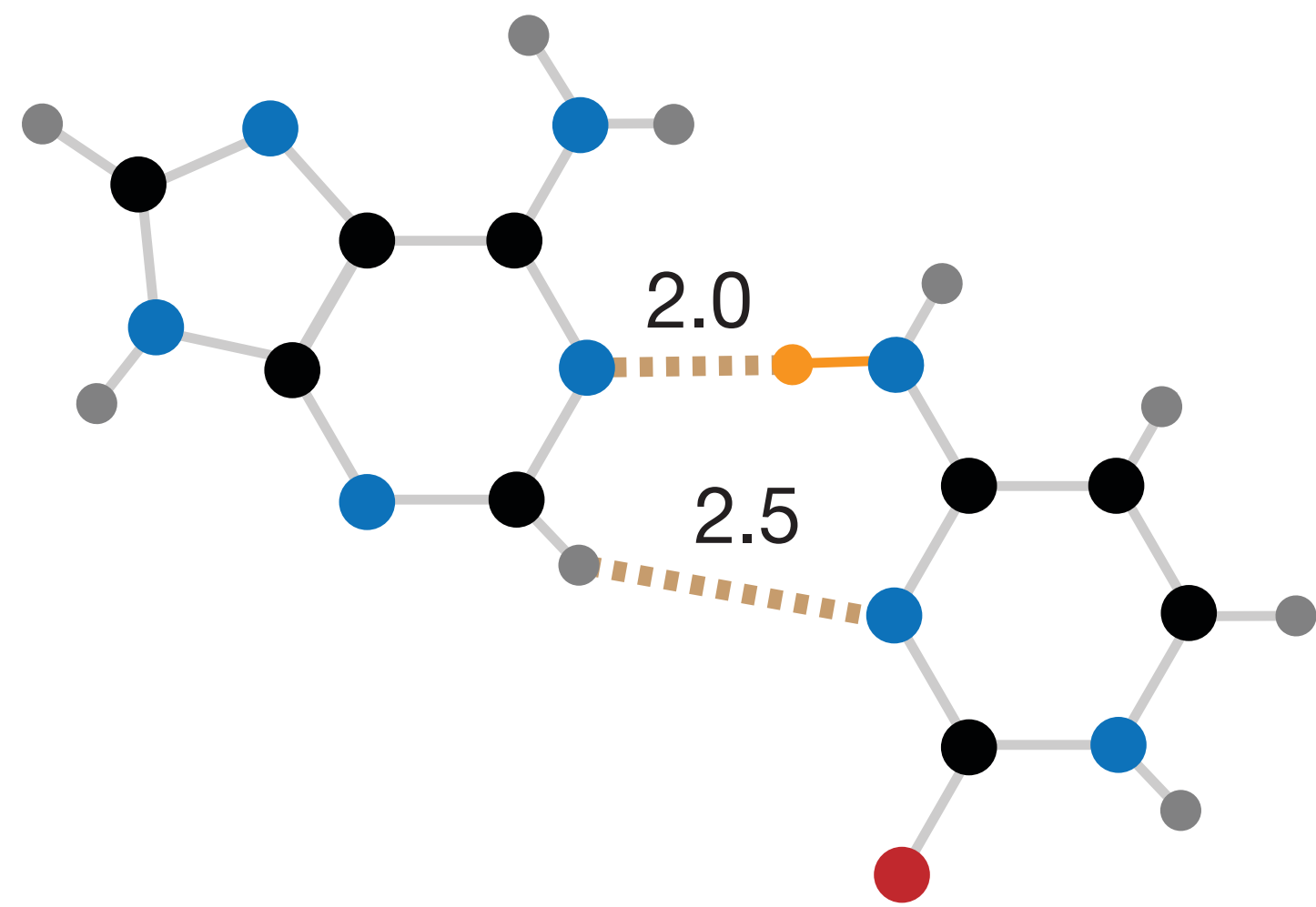
**compartments**

inside or outside?



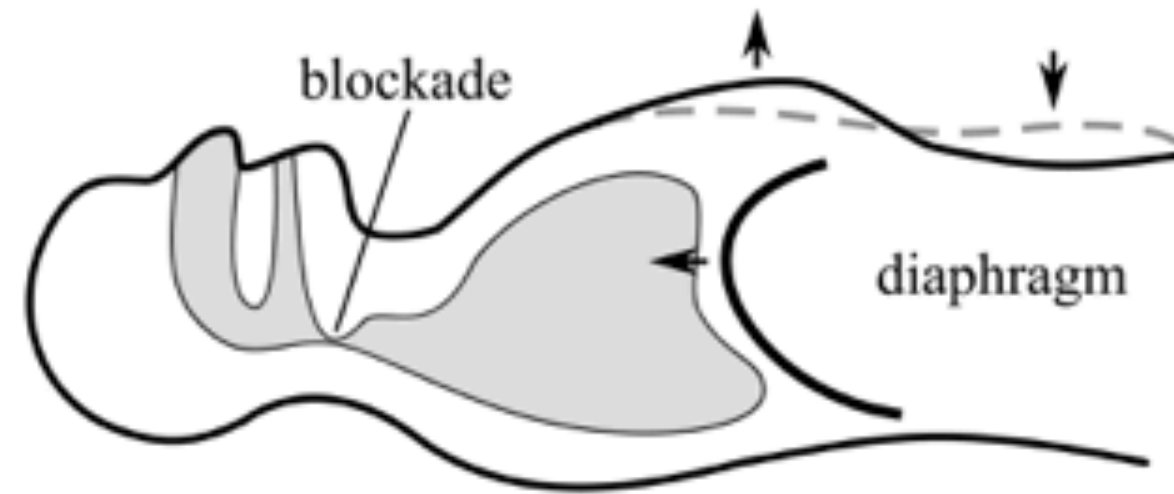






### Introduction

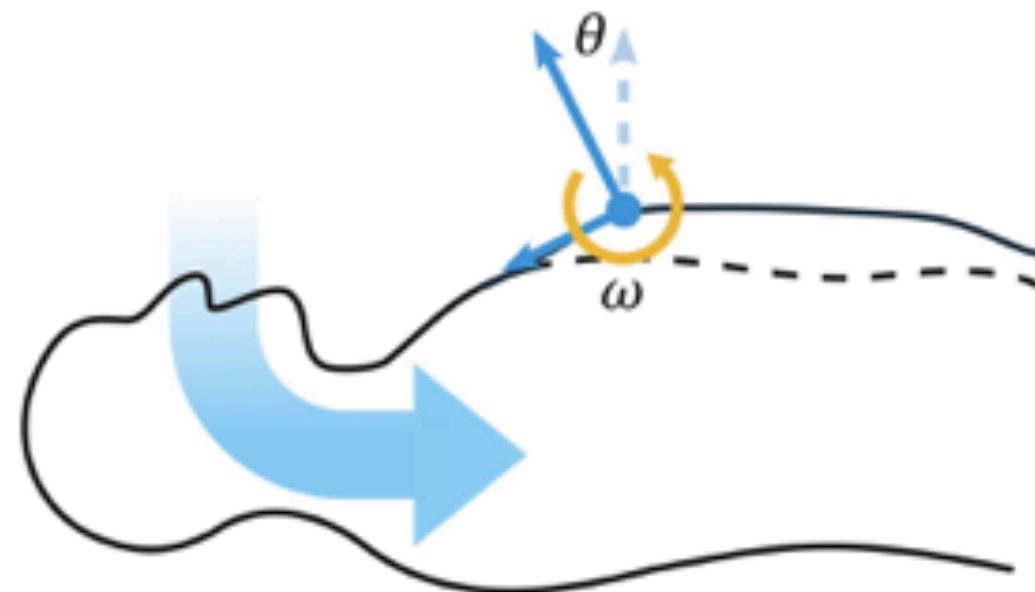
- Sleep apnea is now a widespread sleep disorder, and 75–80% of cases are still undiagnosed [1].
- Standard diagnostic methods have a high technology related cost and have a limited availability.
- Using inertial measurement units (IMU) can reduce the costs of, and improve sleep monitoring systems.



The obstruction of the airways is the cause of obstructive sleep apnea syndrome (OSAS), the most common sleep apnea syndrome.

### Monitoring RE with IMU

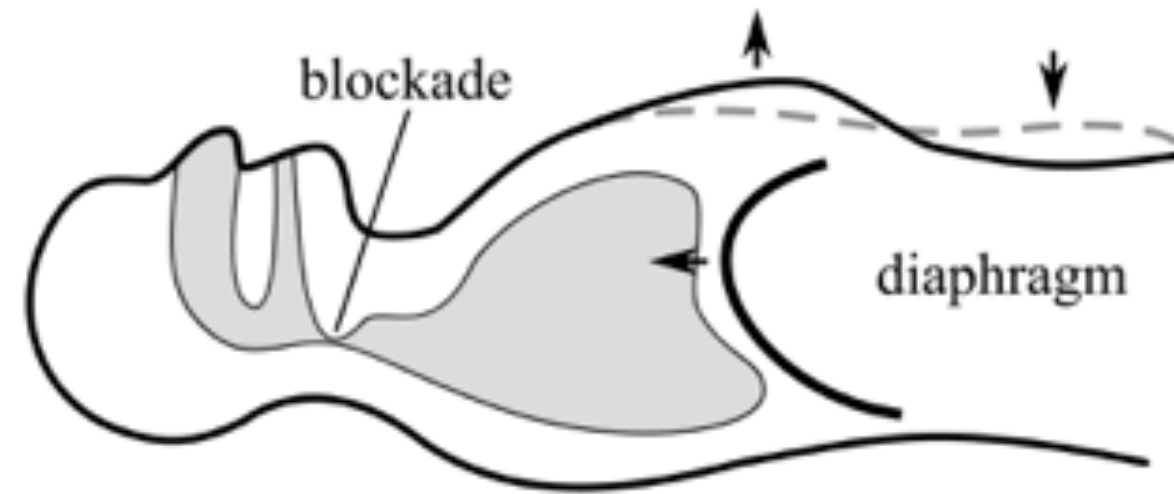
- Breathing expands the chest in a dome-like shape.
- The resulting angular motion of the chest walls can be correlated to the patient's respiratory effort (RE).
- An IMU can be placed on the chest to measure this angle.
- A wireless microcontroller (MCU) can process and send the data to a central device, increasing comfort.





### Introduction

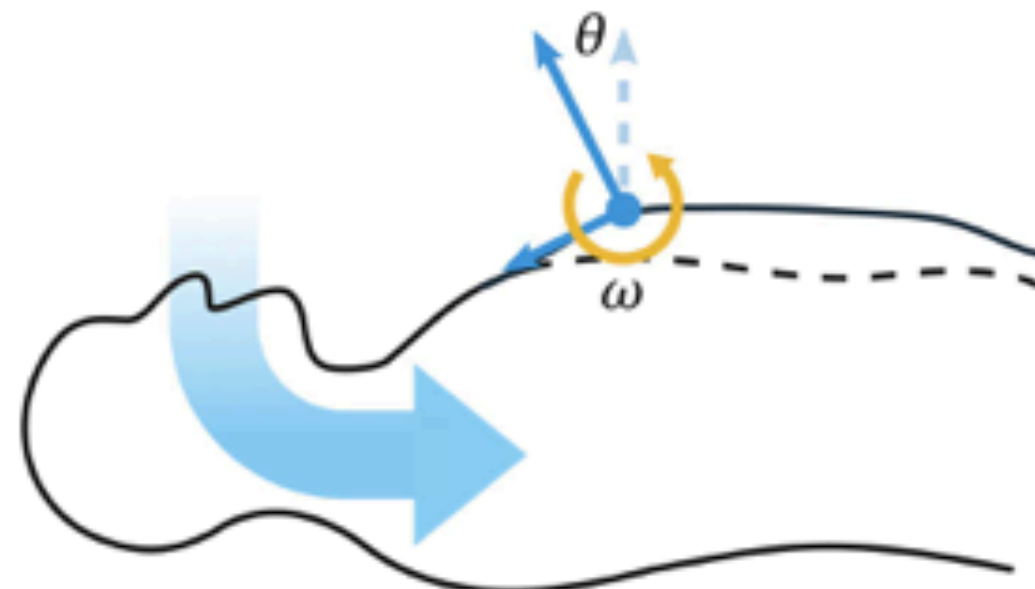
- Sleep apnea is now a widespread sleep disorder, and 75–80% of cases are still undiagnosed [1].
- Standard diagnostic methods have a high technology related cost and have a limited availability.
- Using inertial measurement units (IMU) can reduce the costs of, and improve sleep monitoring systems.



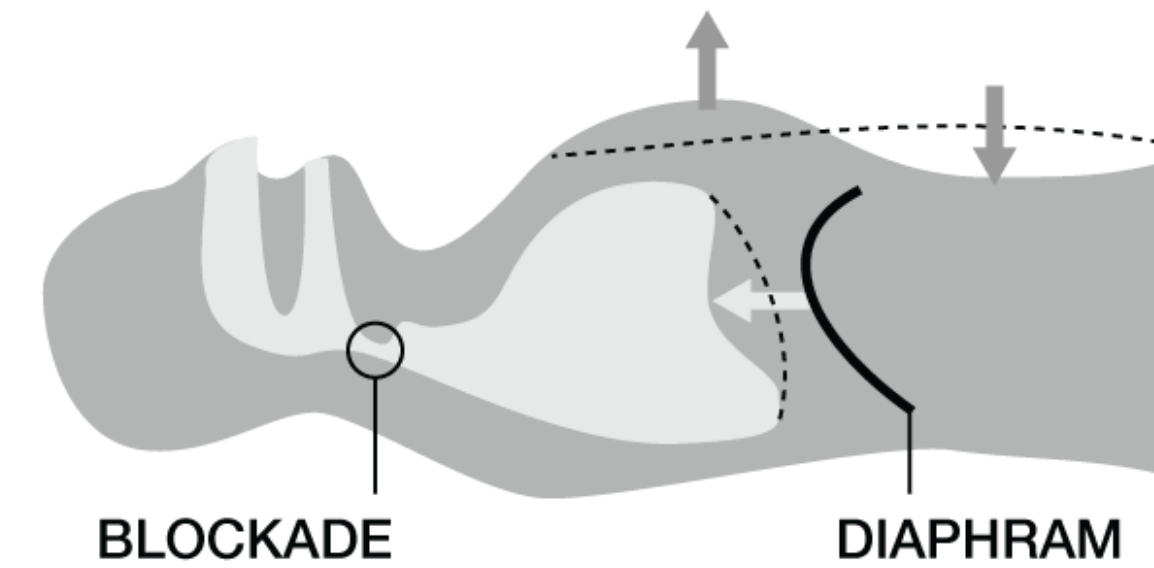
The obstruction of the airways is the cause of obstructive sleep apnea syndrome (OSAS), the most common sleep apnea syndrome.

### Monitoring RE with IMU

- Breathing expands the chest in a dome-like shape.
- The resulting angular motion of the chest walls can be correlated to the patient's respiratory effort (RE).
- An IMU can be placed on the chest to measure this angle.
- A wireless microcontroller (MCU) can process and send the data to a central device, increasing comfort.



Sleep apnea is now a widespread sleep disorder, and 75–80% of cases are still undiagnosed [1]. Standard diagnostic methods have a high technology related cost and have a limited availability. Using inertial measurement units (IMU) can reduce the costs of, and improve sleep monitoring systems.

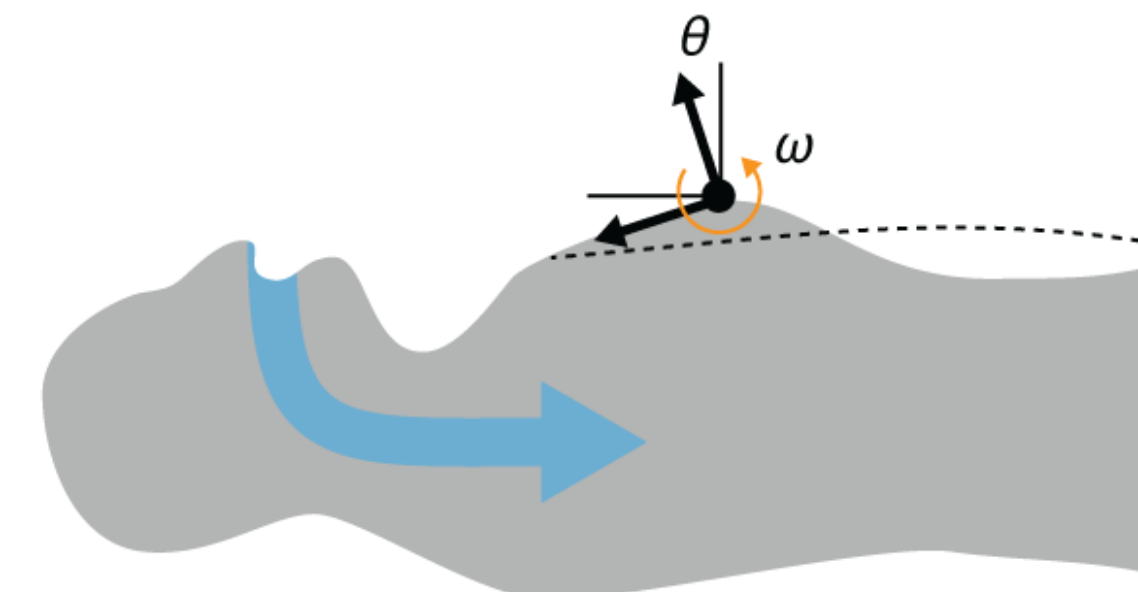


The obstruction of the airways is the cause of obstructive sleep apnea syndrome (OSAS), the most common sleep apnea syndrome.

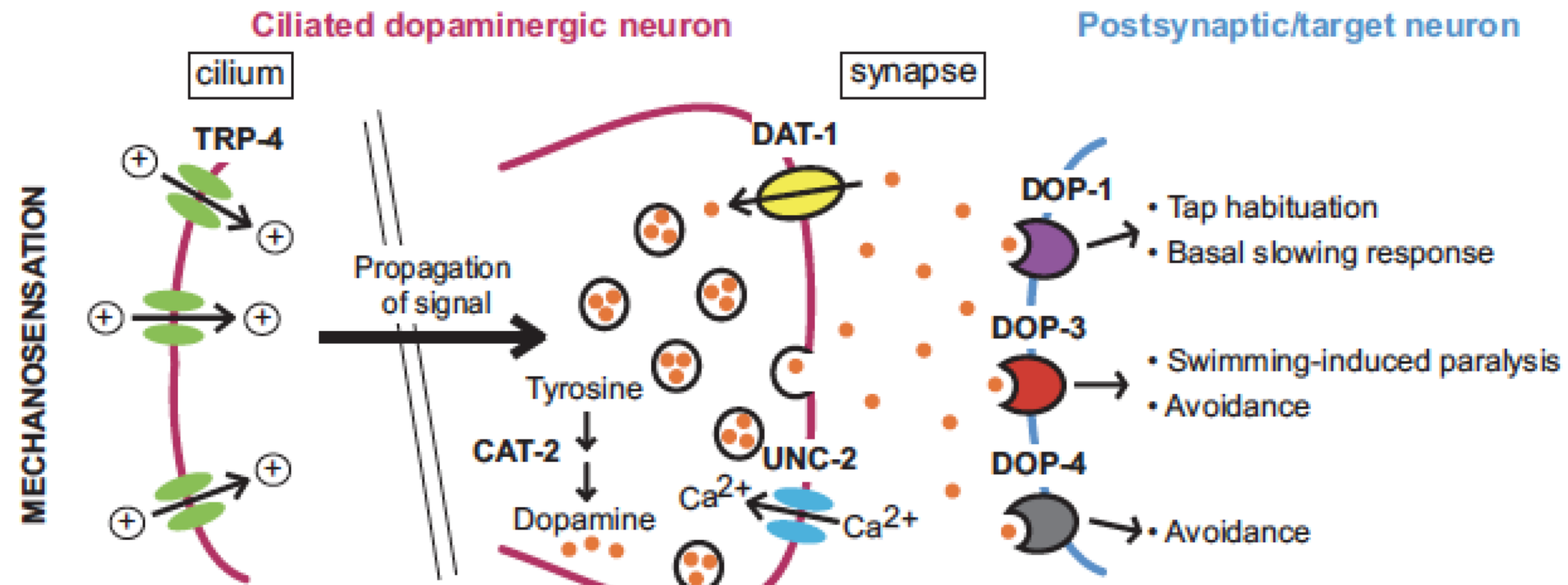
### MONITORING RE WITH IMU

Breathing expands the chest in a dome-like shape. The resulting angular motion of the chest walls can be correlated to the patient's respiratory effort (RE).

Fusing the data from the acceleration, rotation, and heading sensors makes RE monitoring more robust. We adapted the extended Kalman filter (EKF) in [2] from inertial navigation to RE monitoring, as shown in the block diagram on the right.

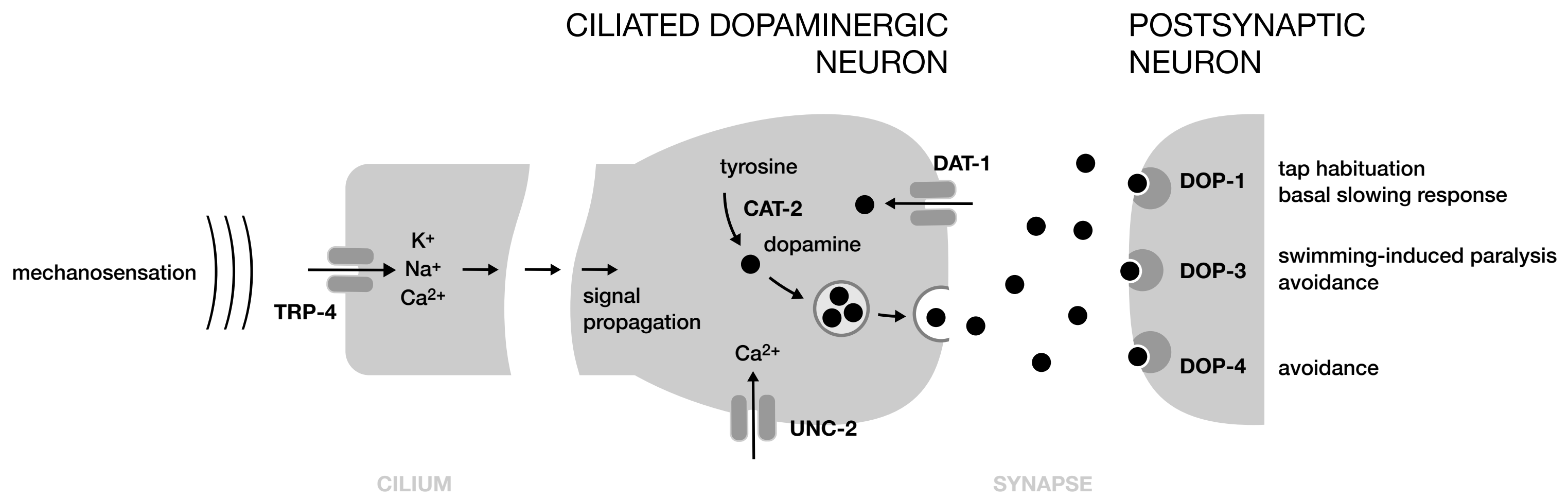
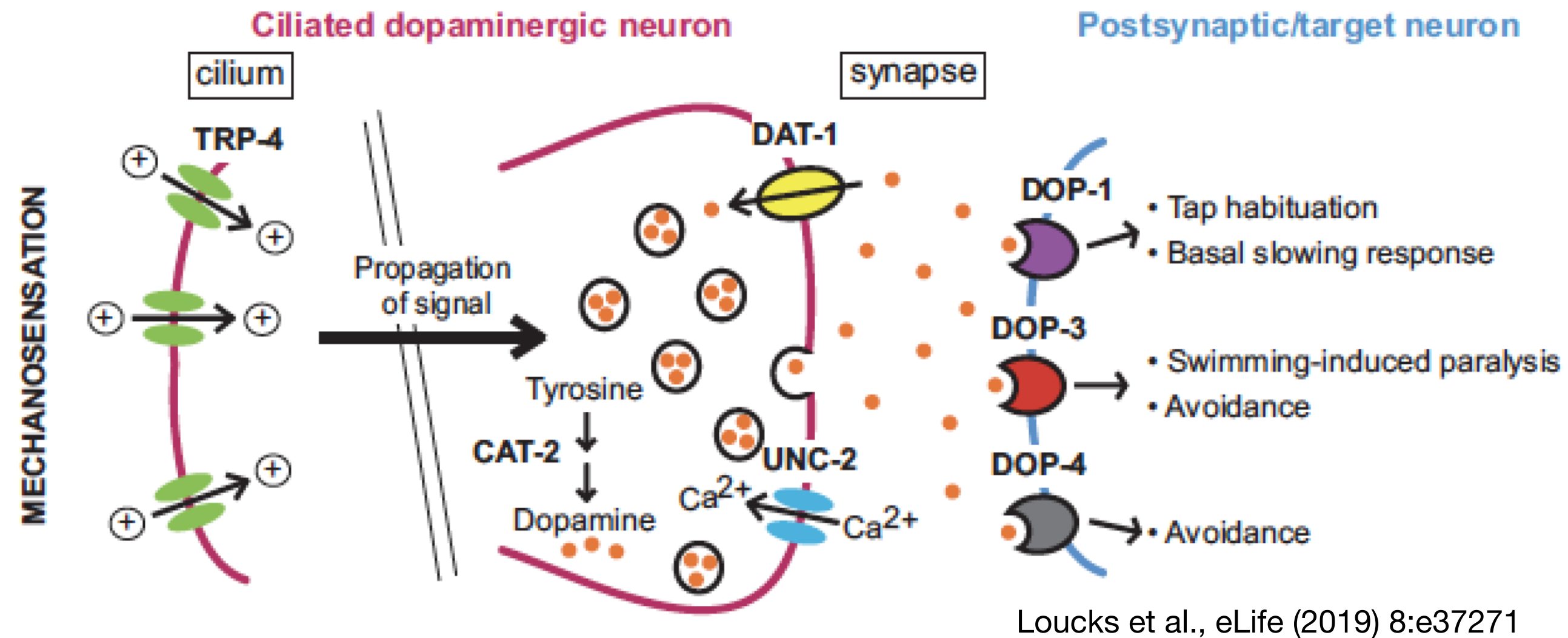


An IMU on the chest to measure the angle of the chest,  $\theta$ , while breathing. A wireless microcontroller (MCU) can process and send the data to a central device, increasing comfort.

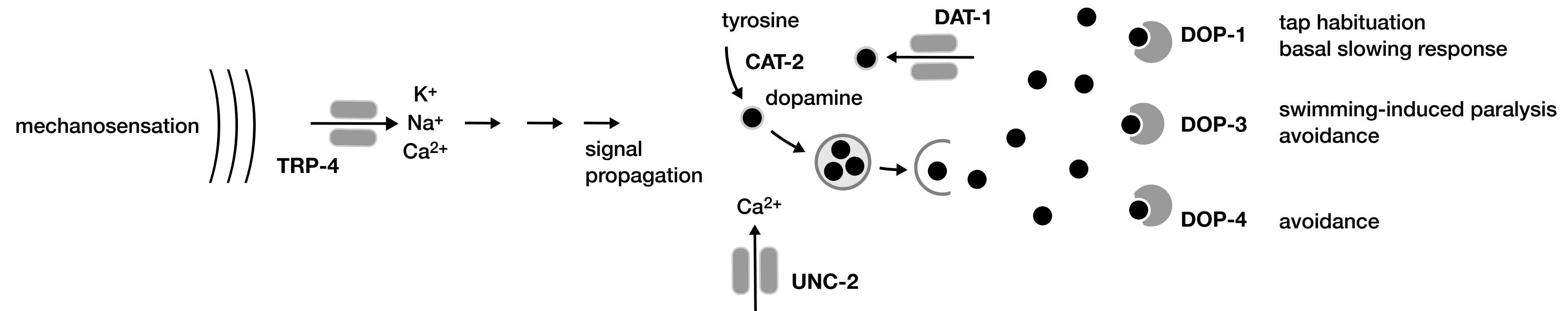
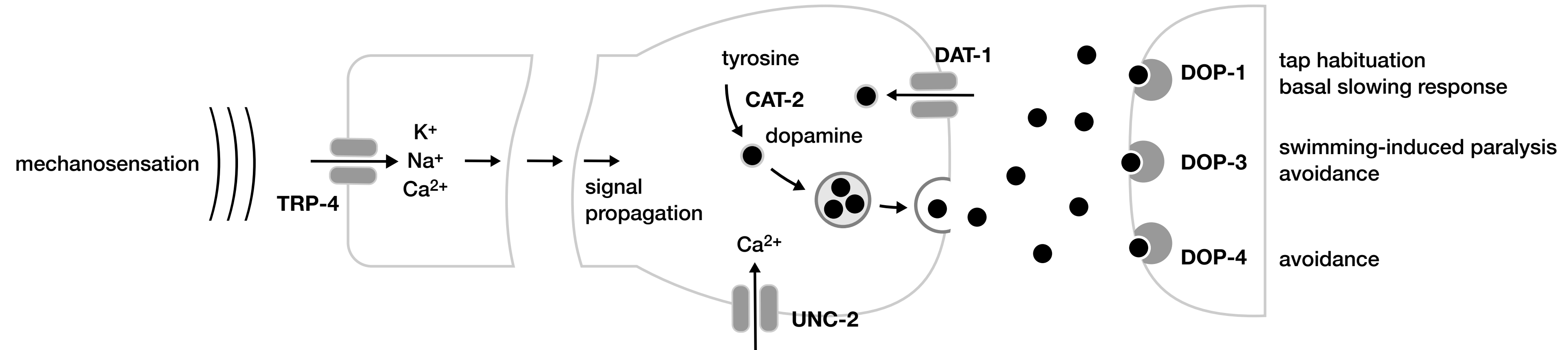
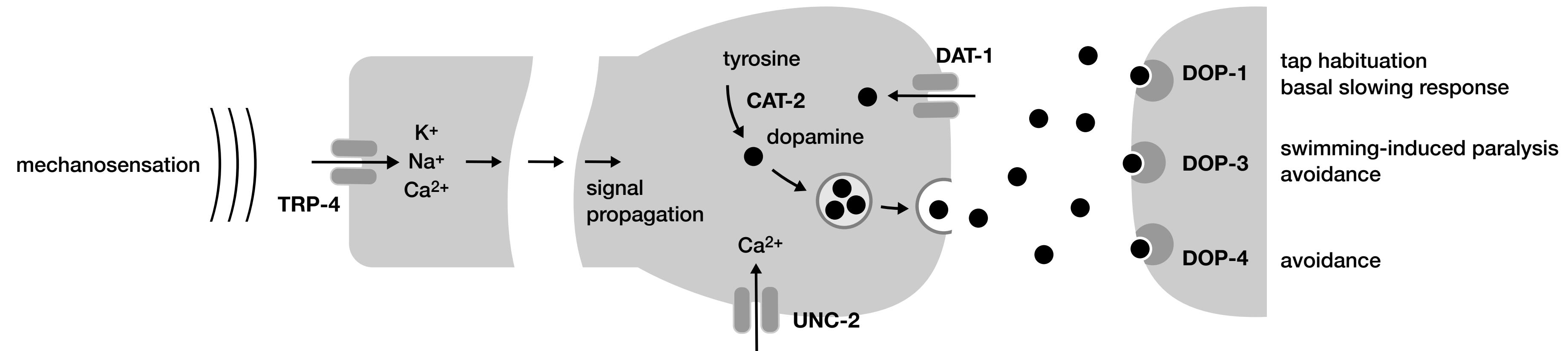


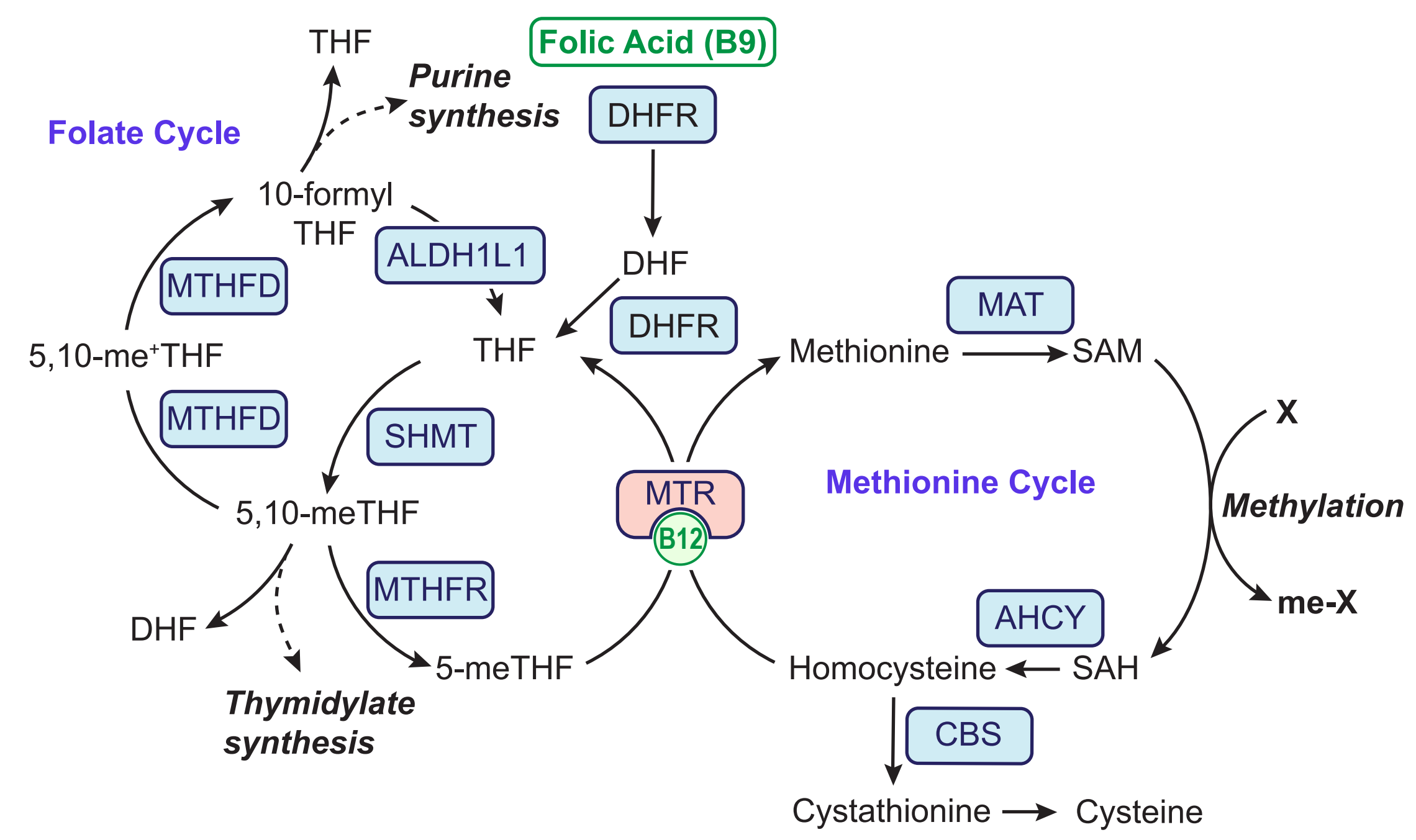
Loucks et al., eLife (2019) 8:e37271

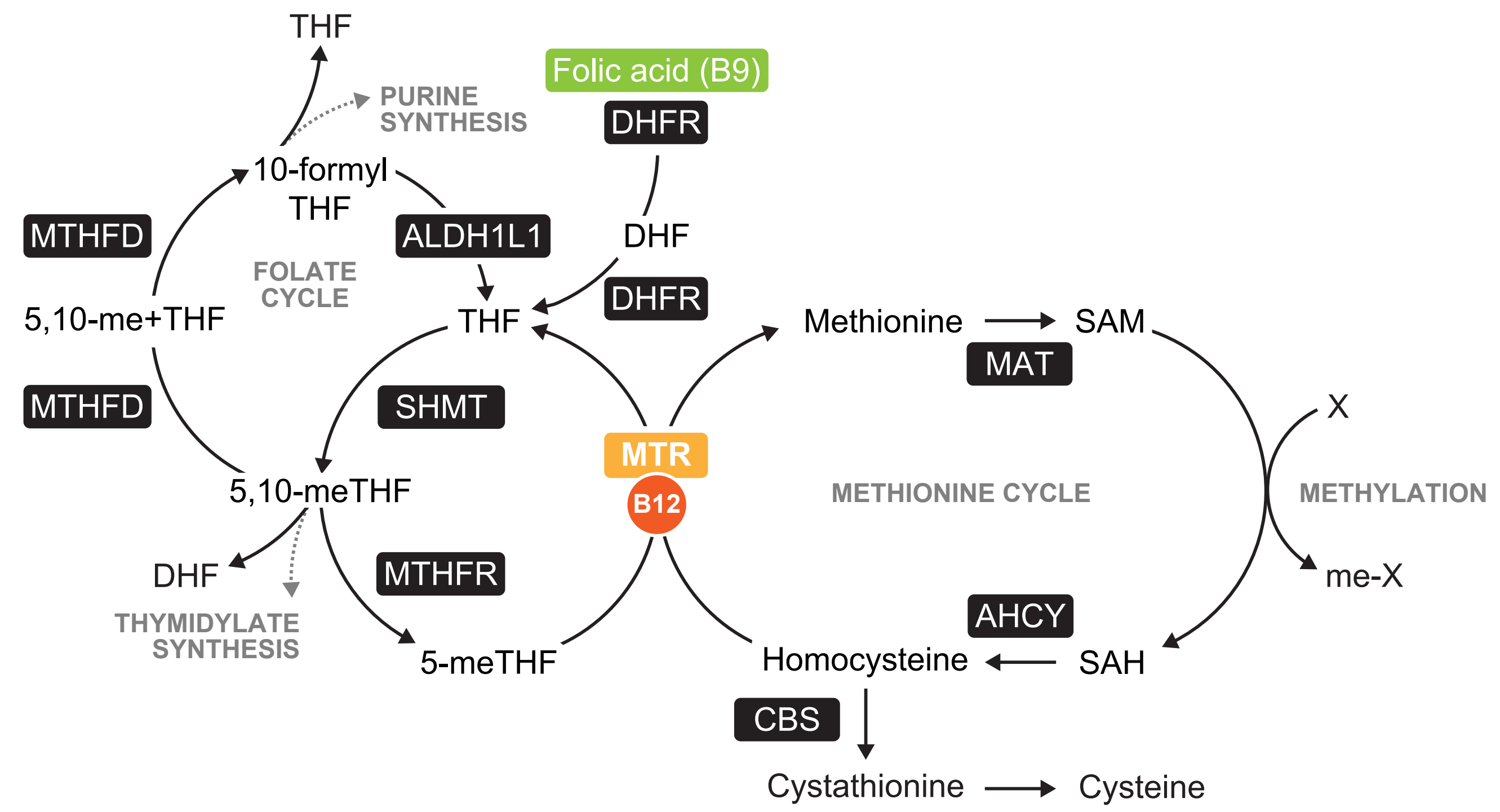
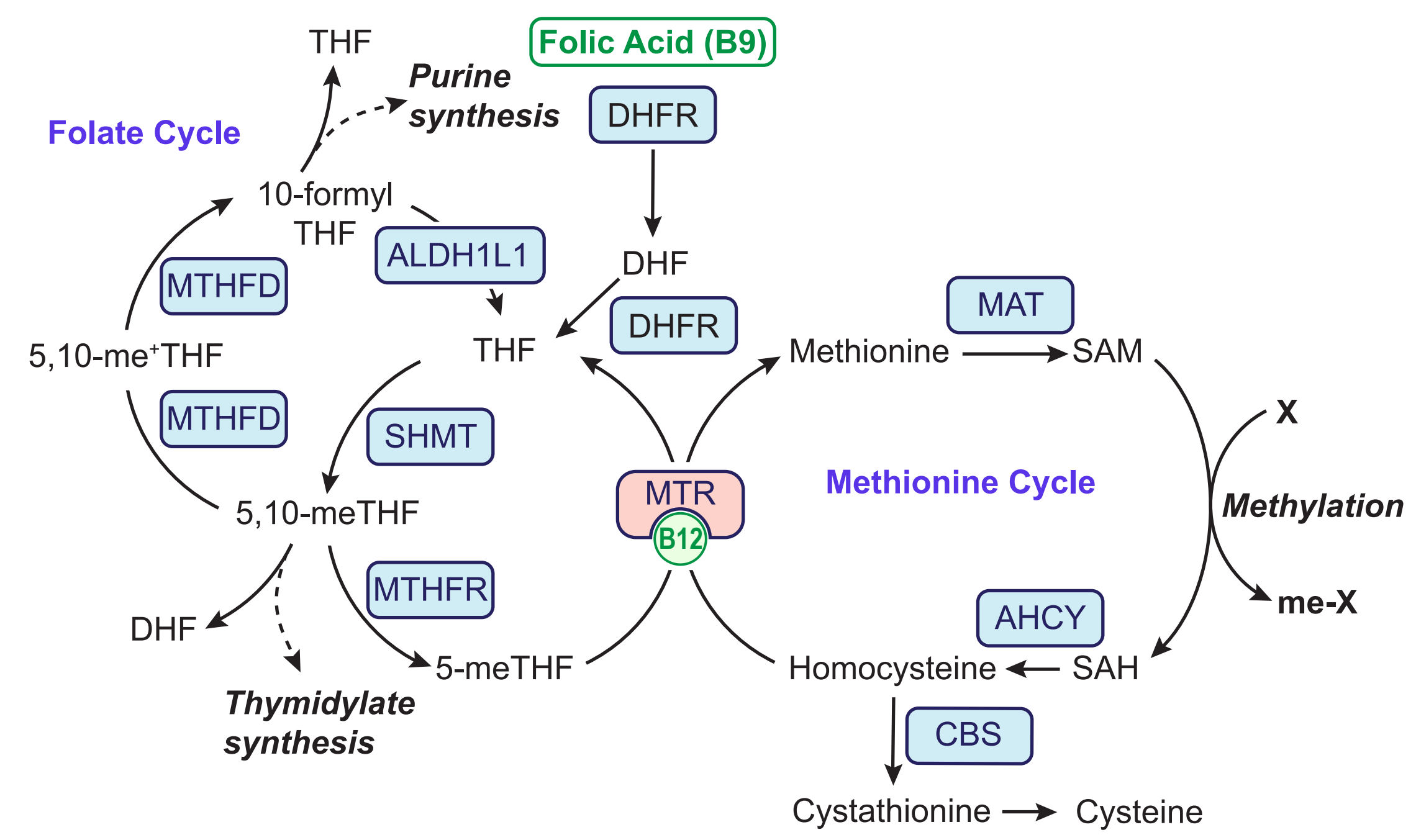


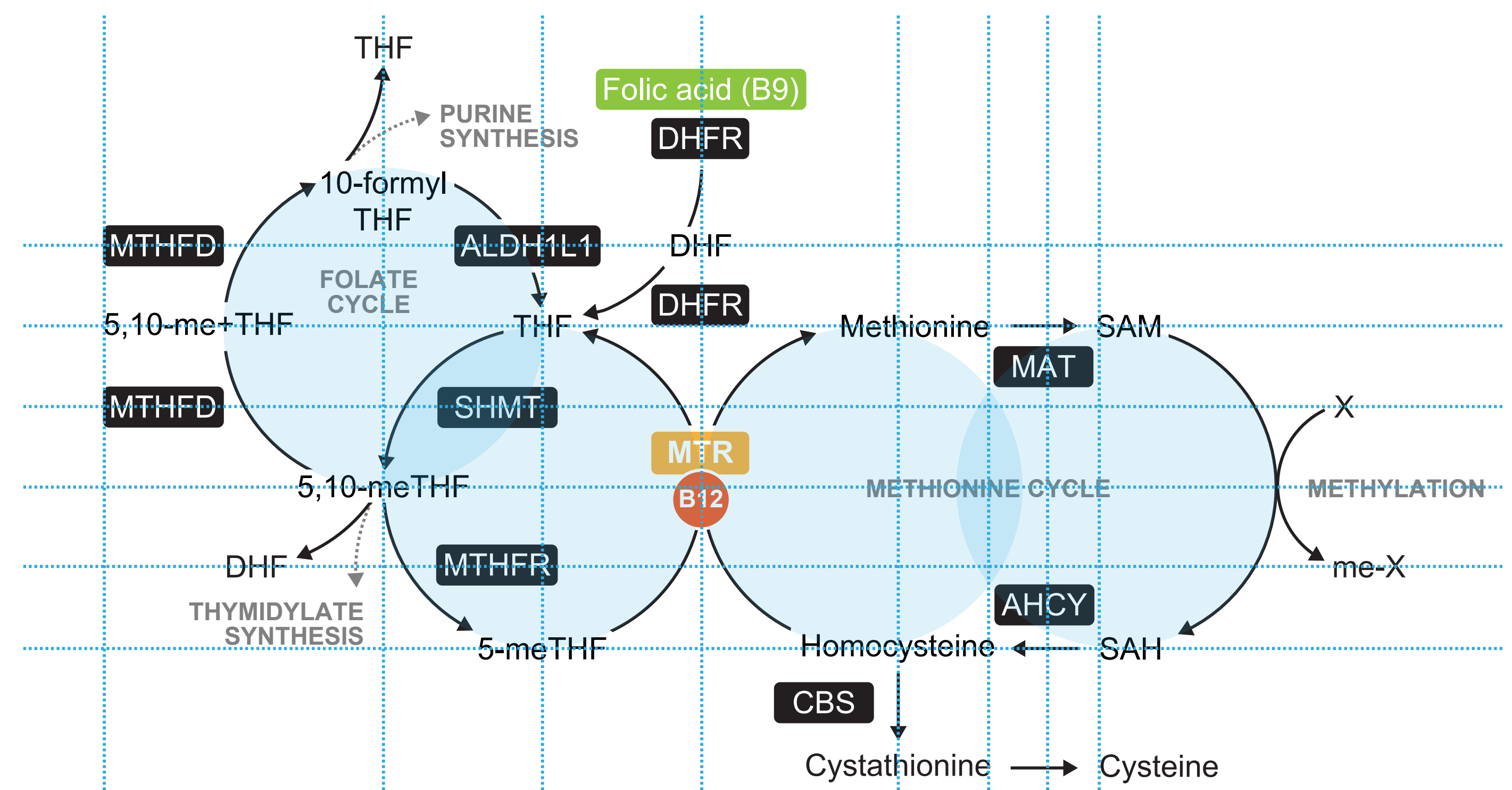
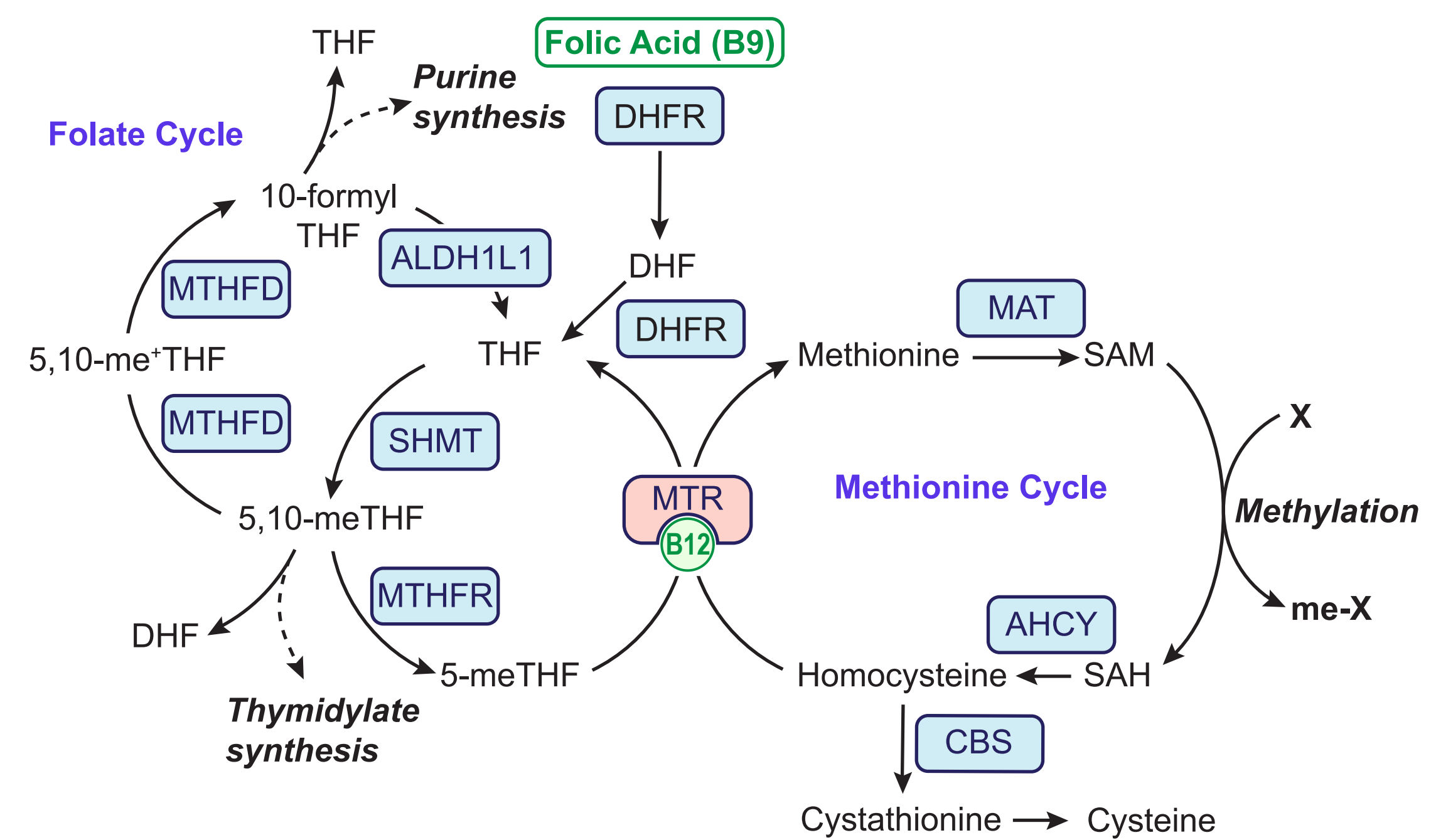


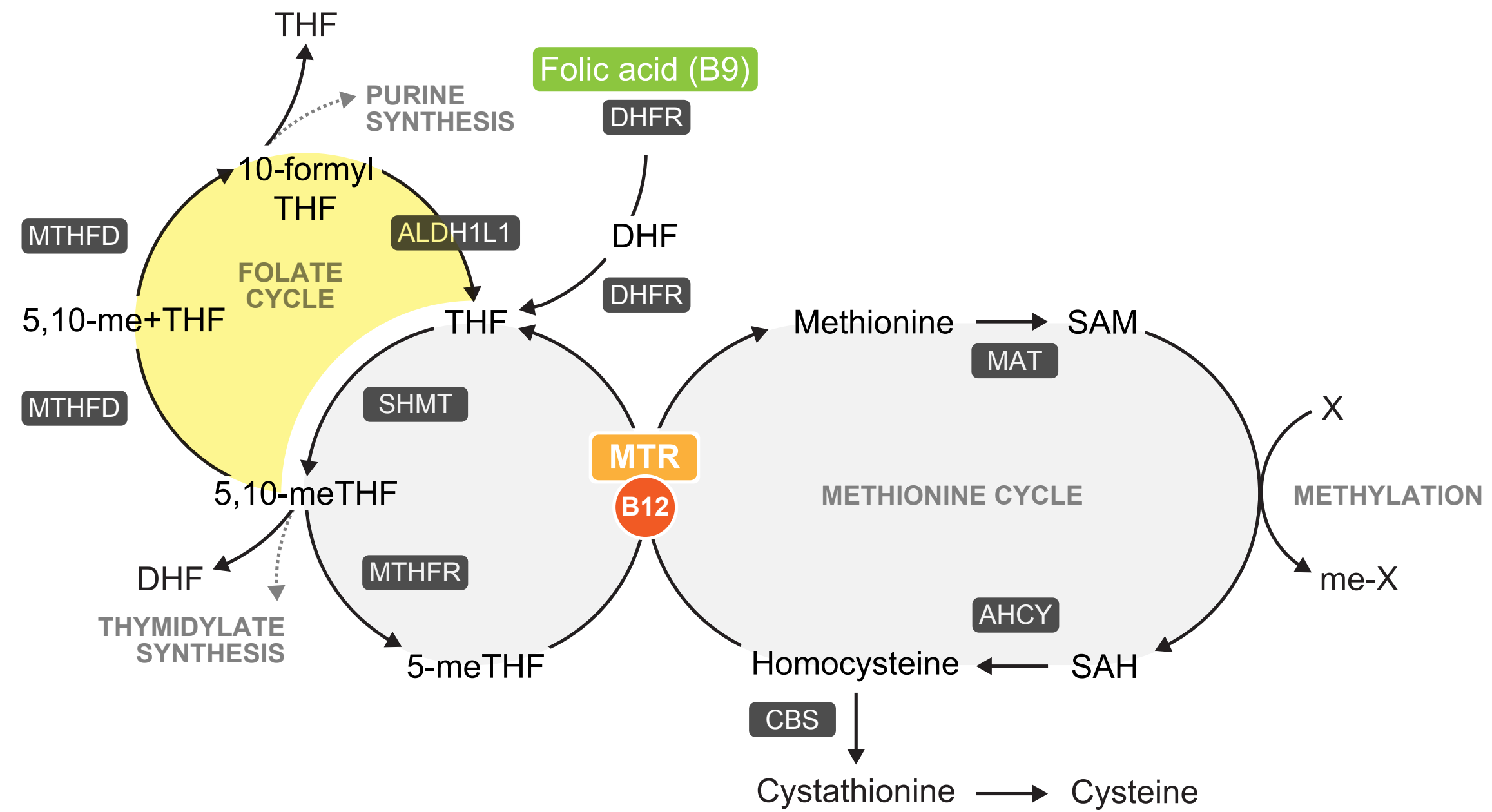
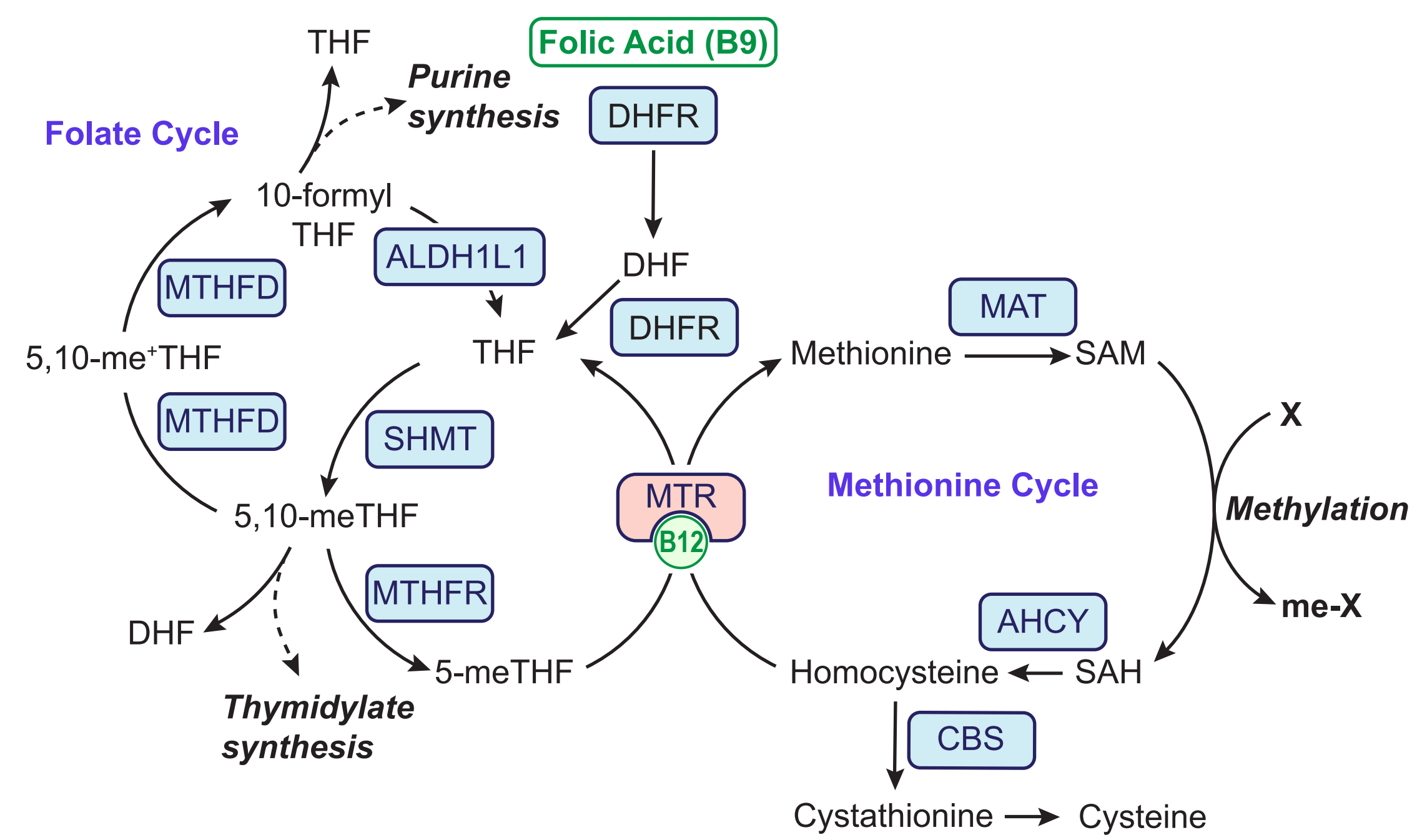




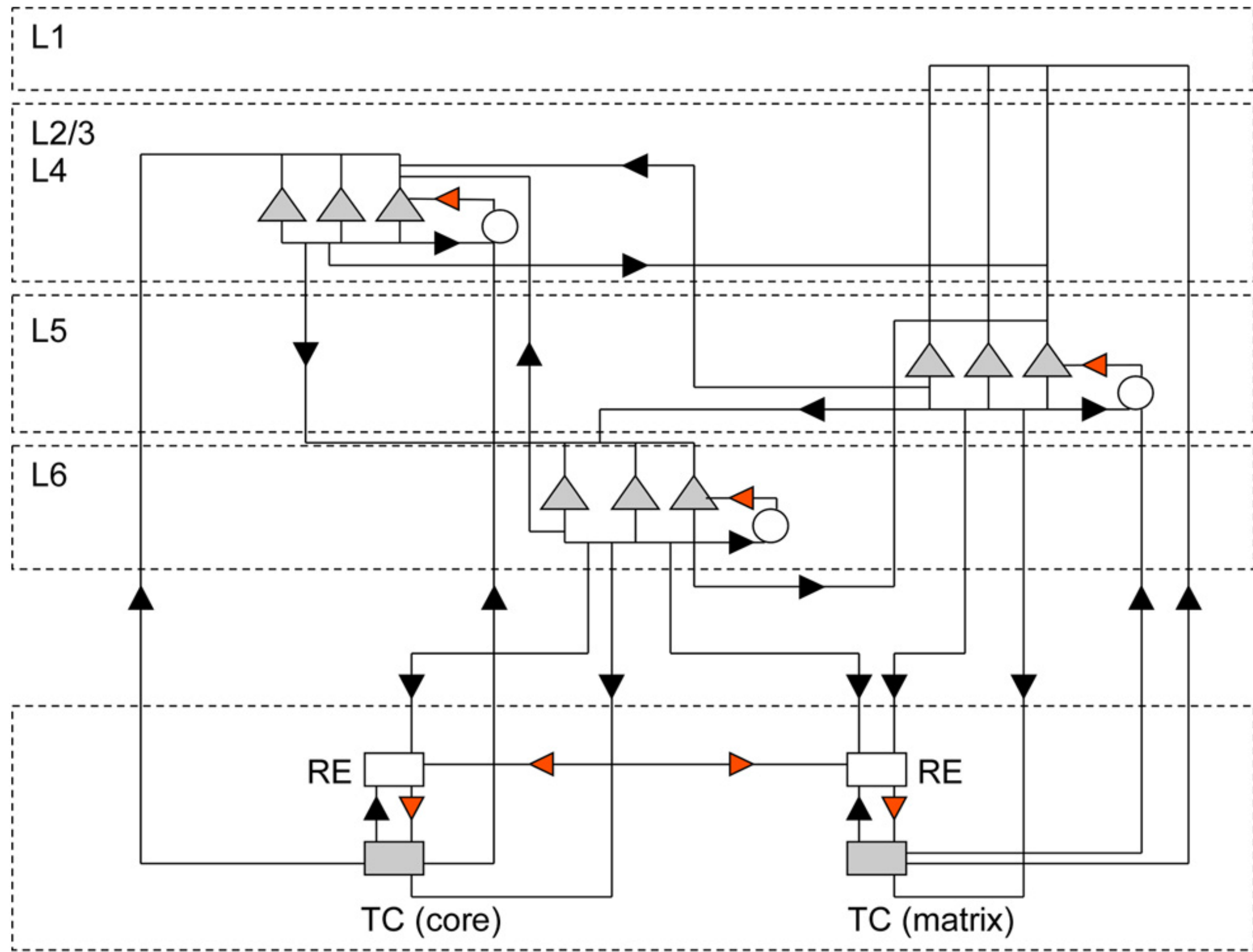


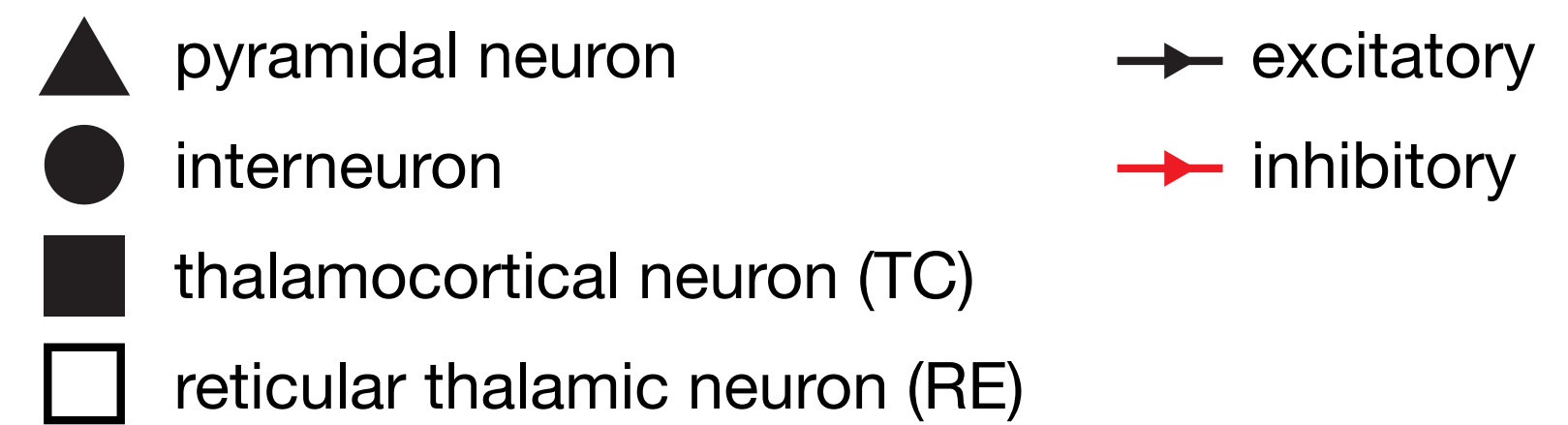
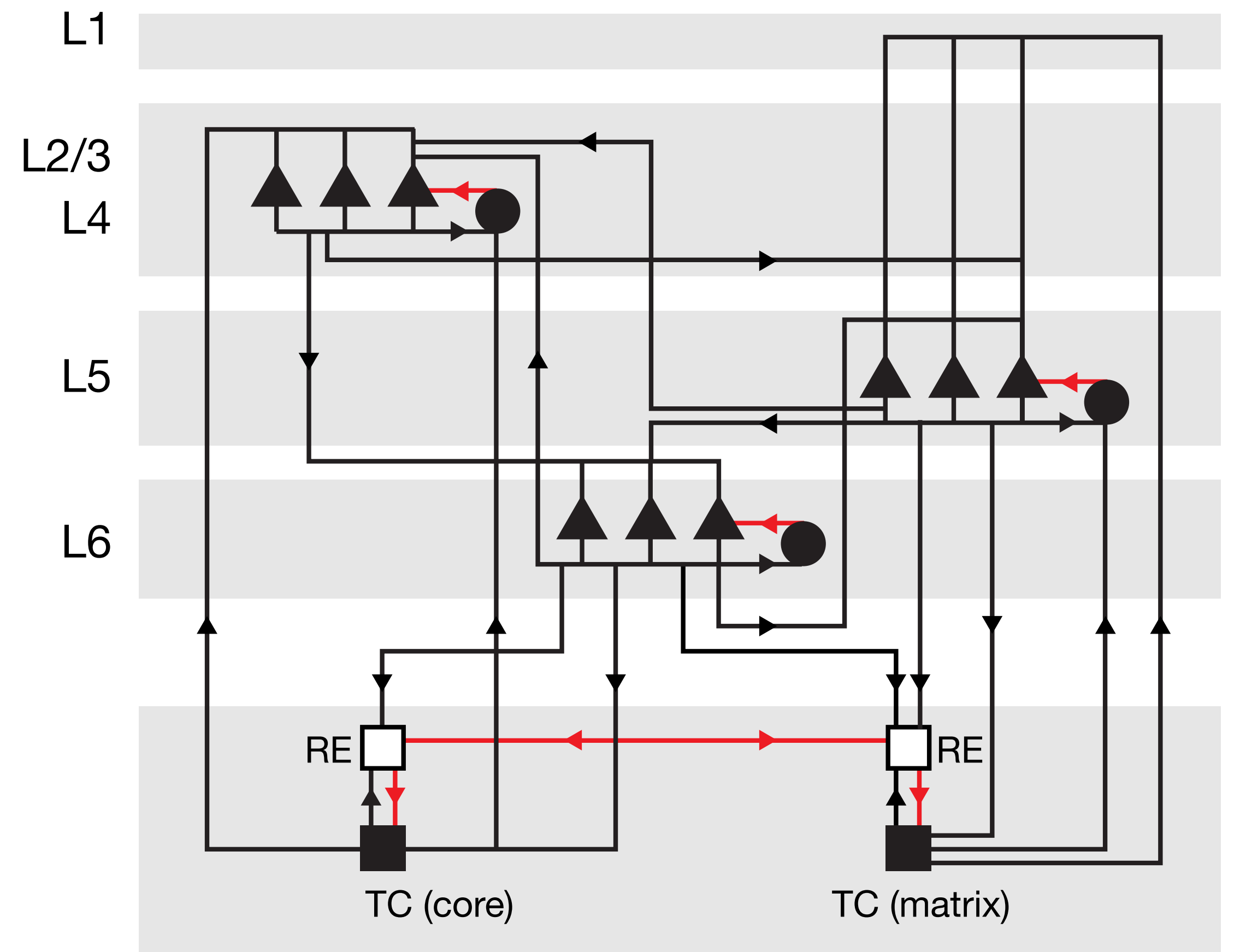
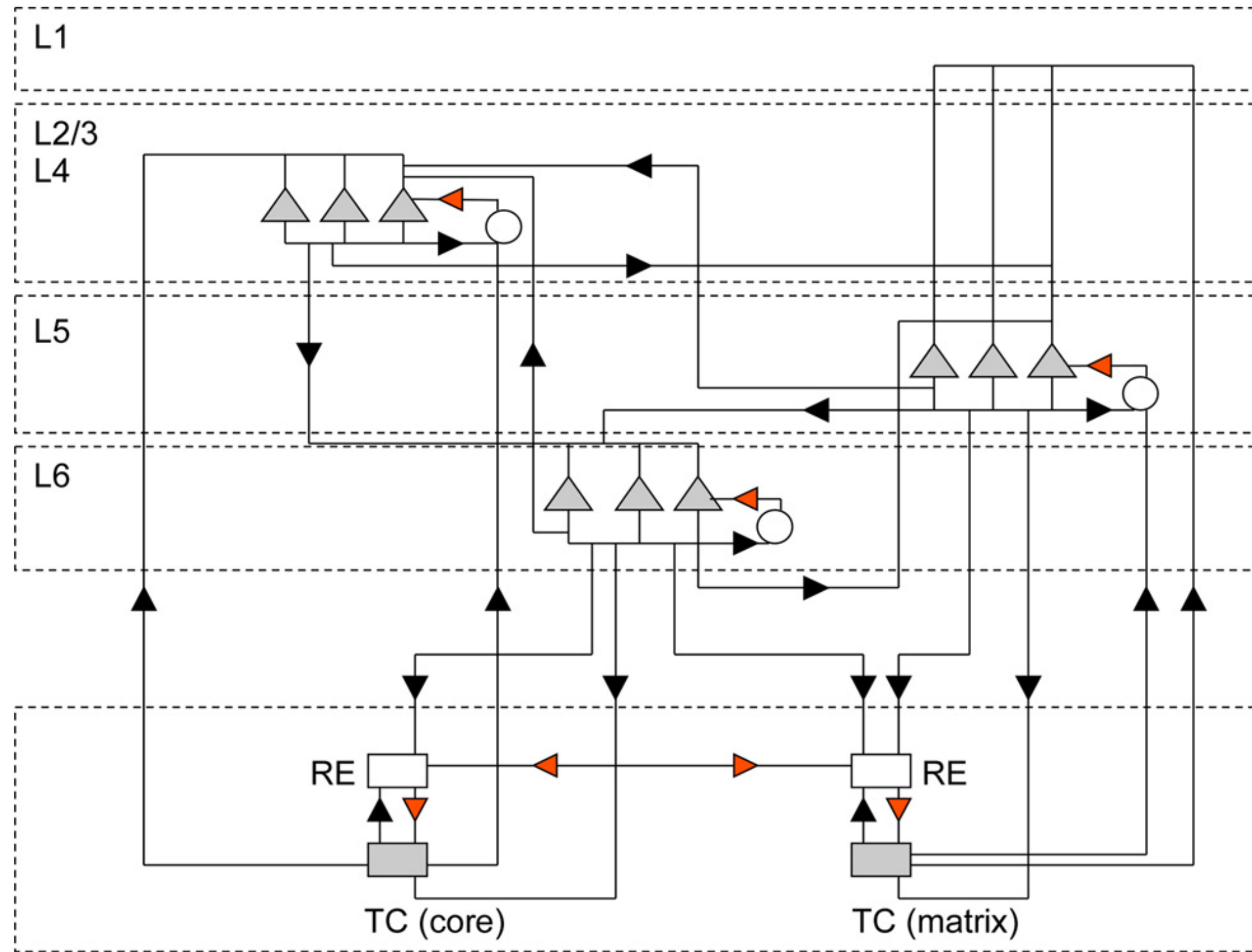














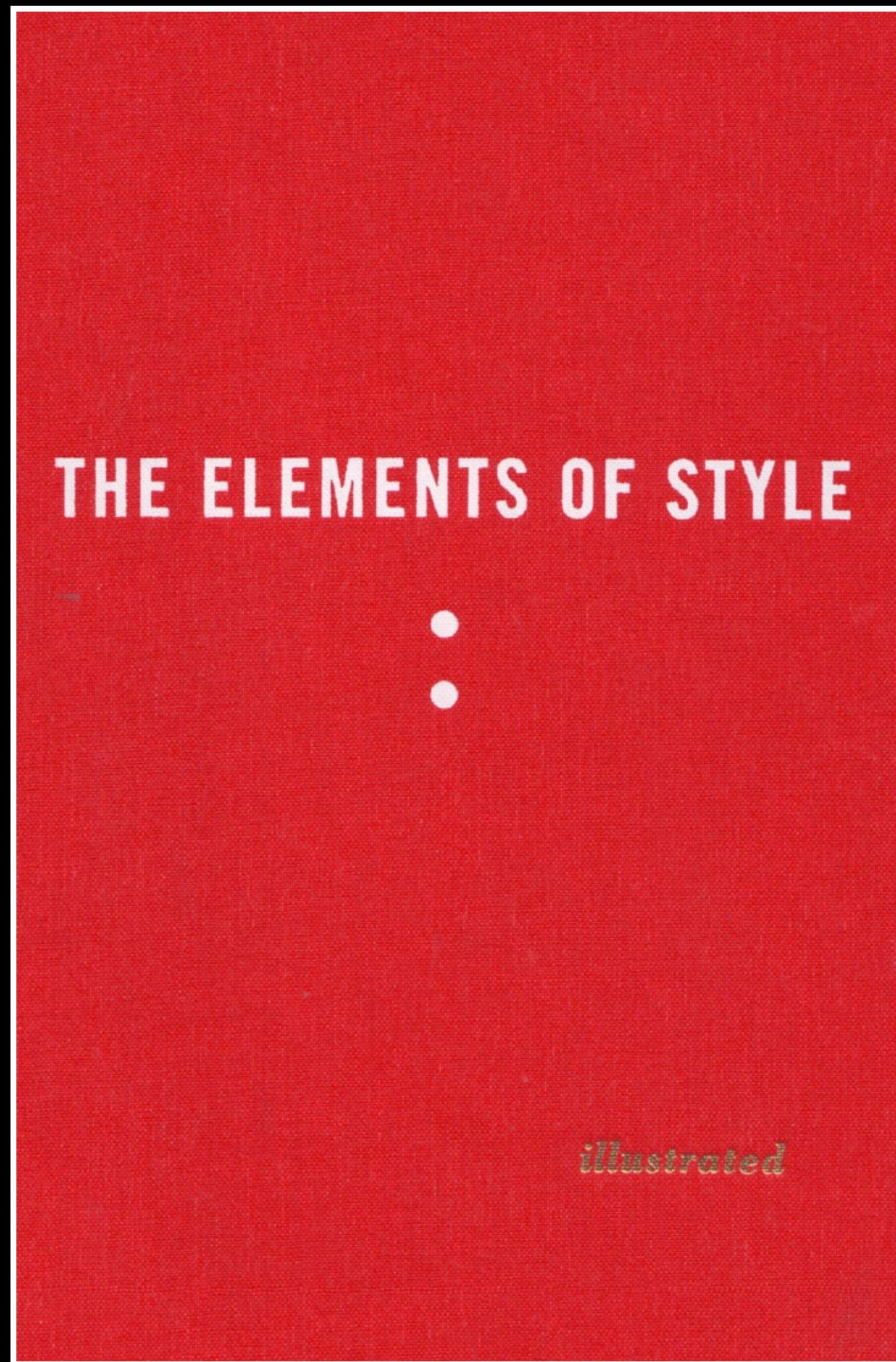
**pretty**

explain

inspire

provide perspective





"Rich, ornate prose is hard to digest, generally unwholesome and sometimes nauseating."



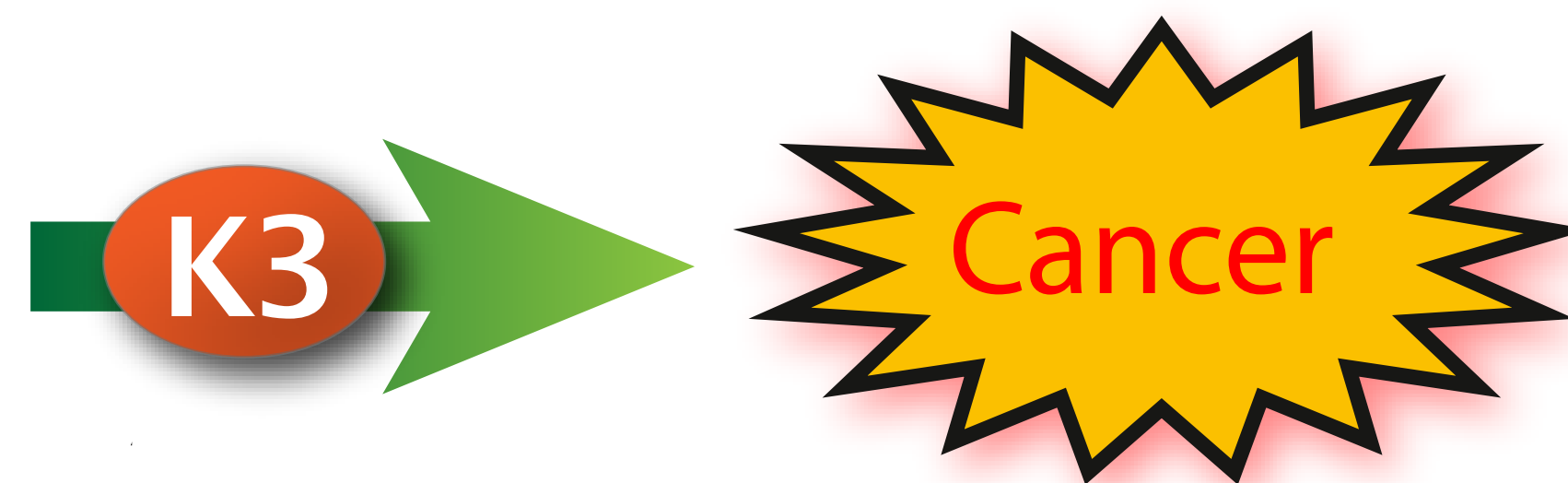
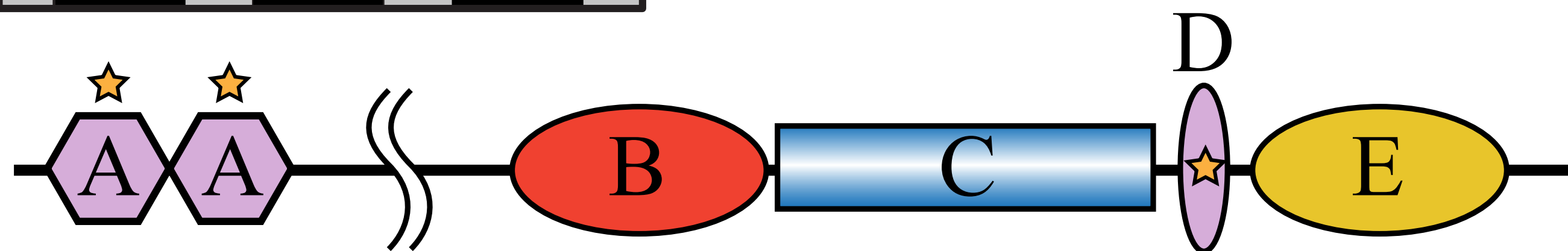
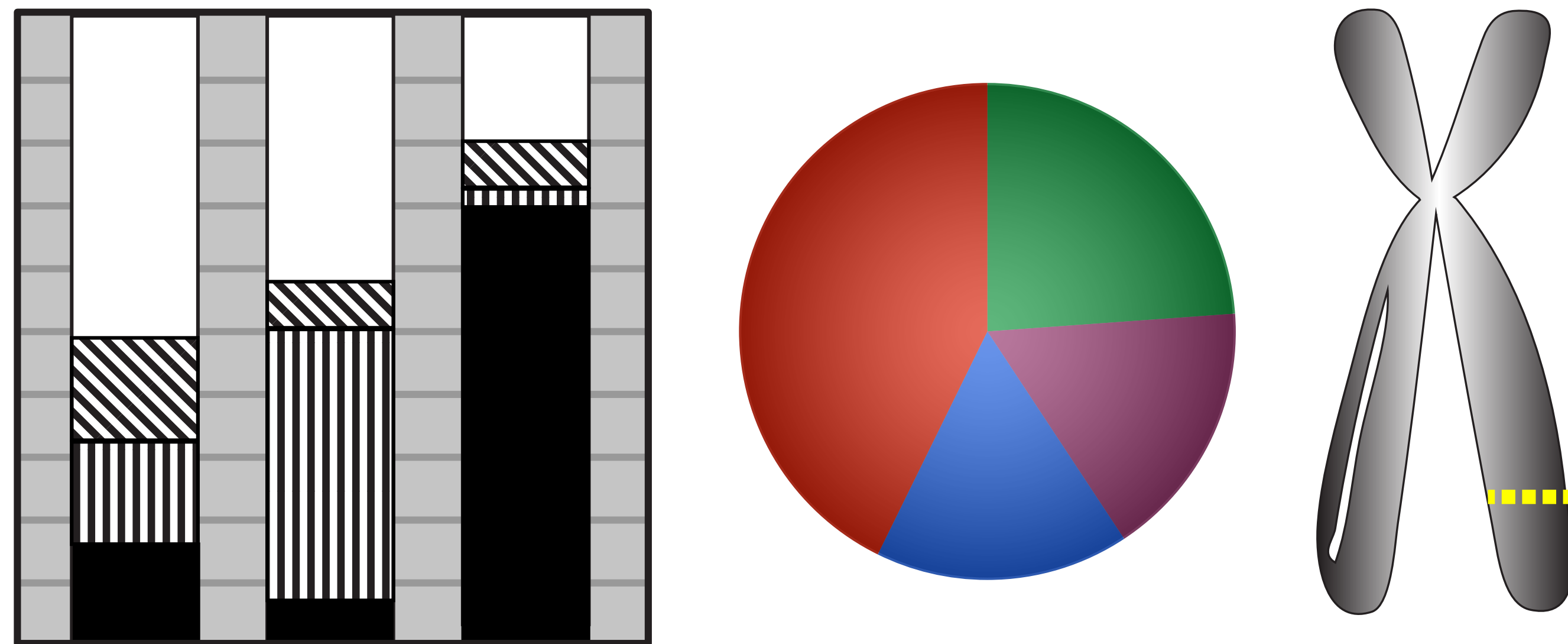
# nature biotechnology

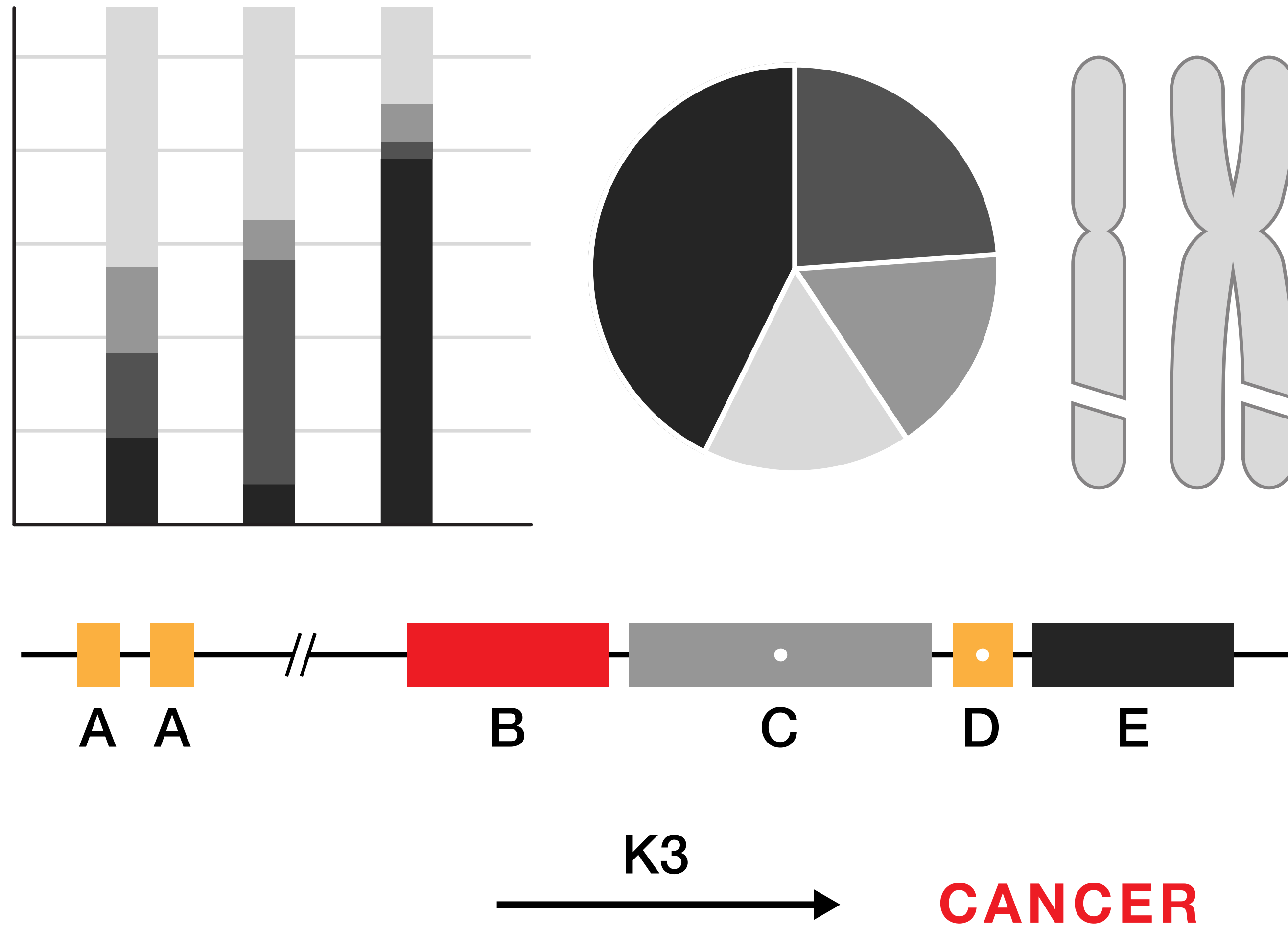


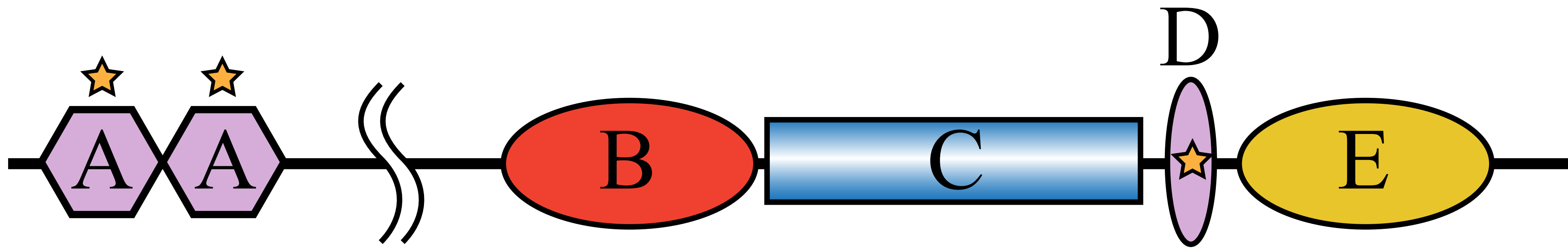
---

**Phylogeny estimation at scale**







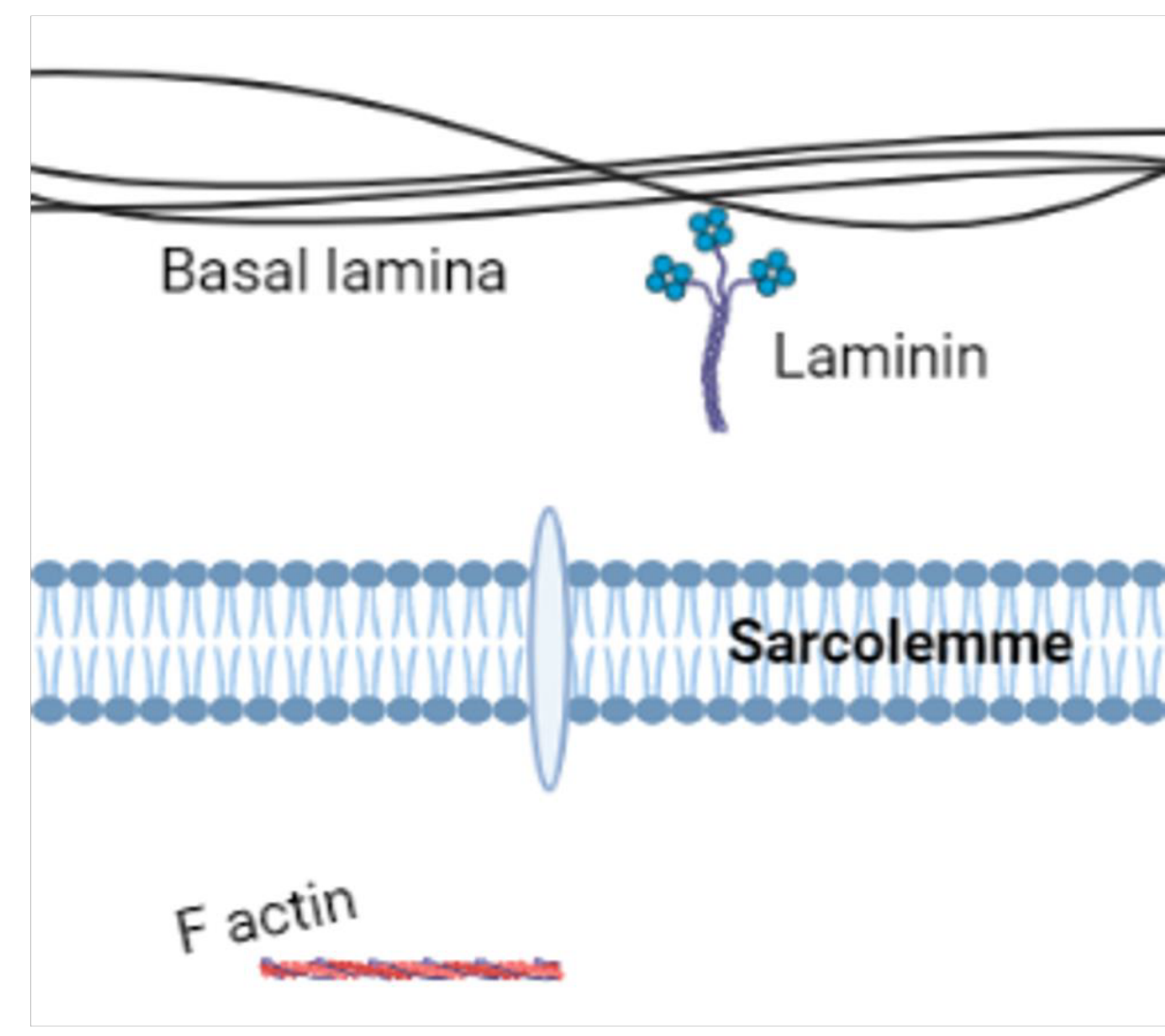
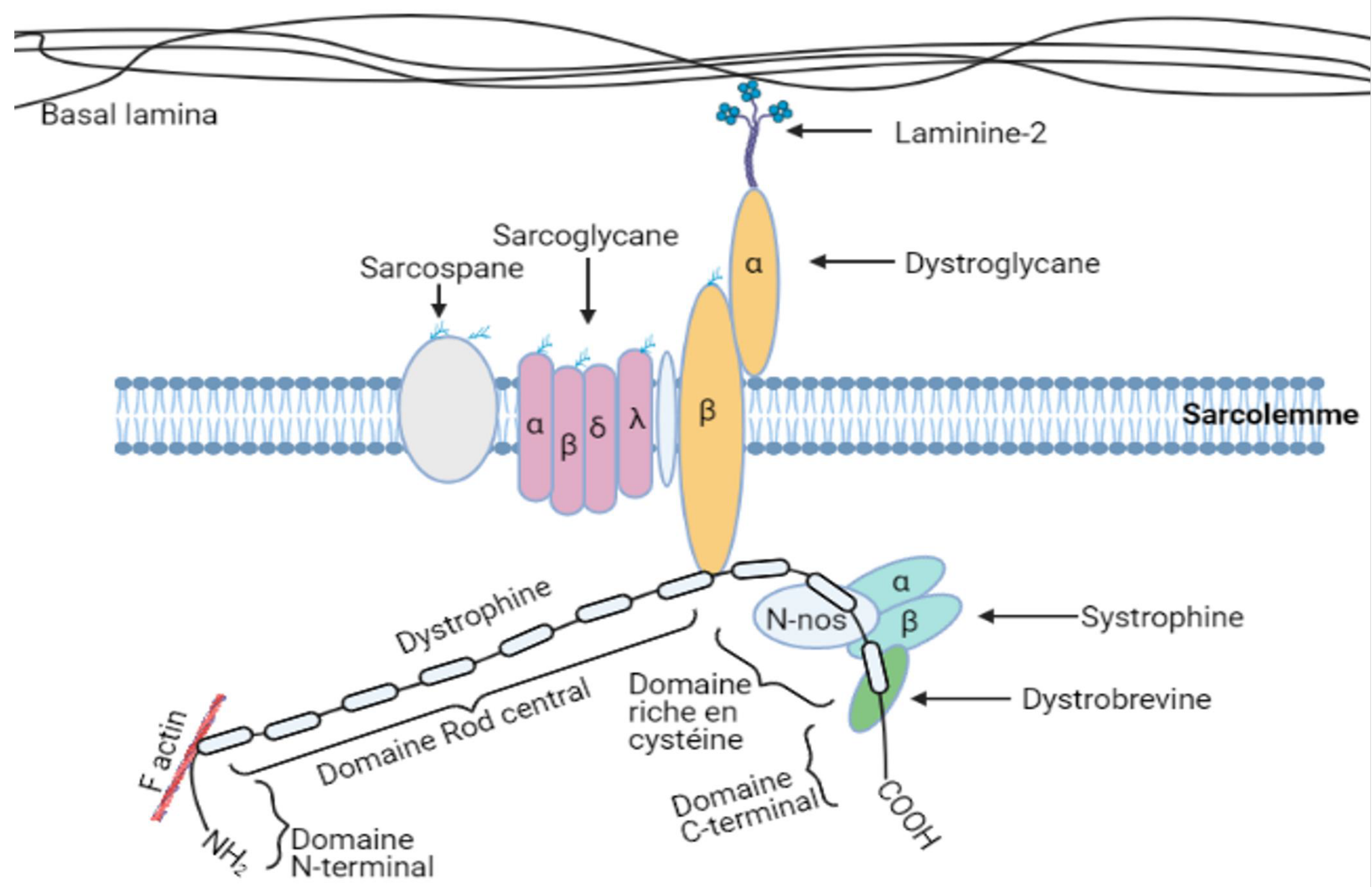




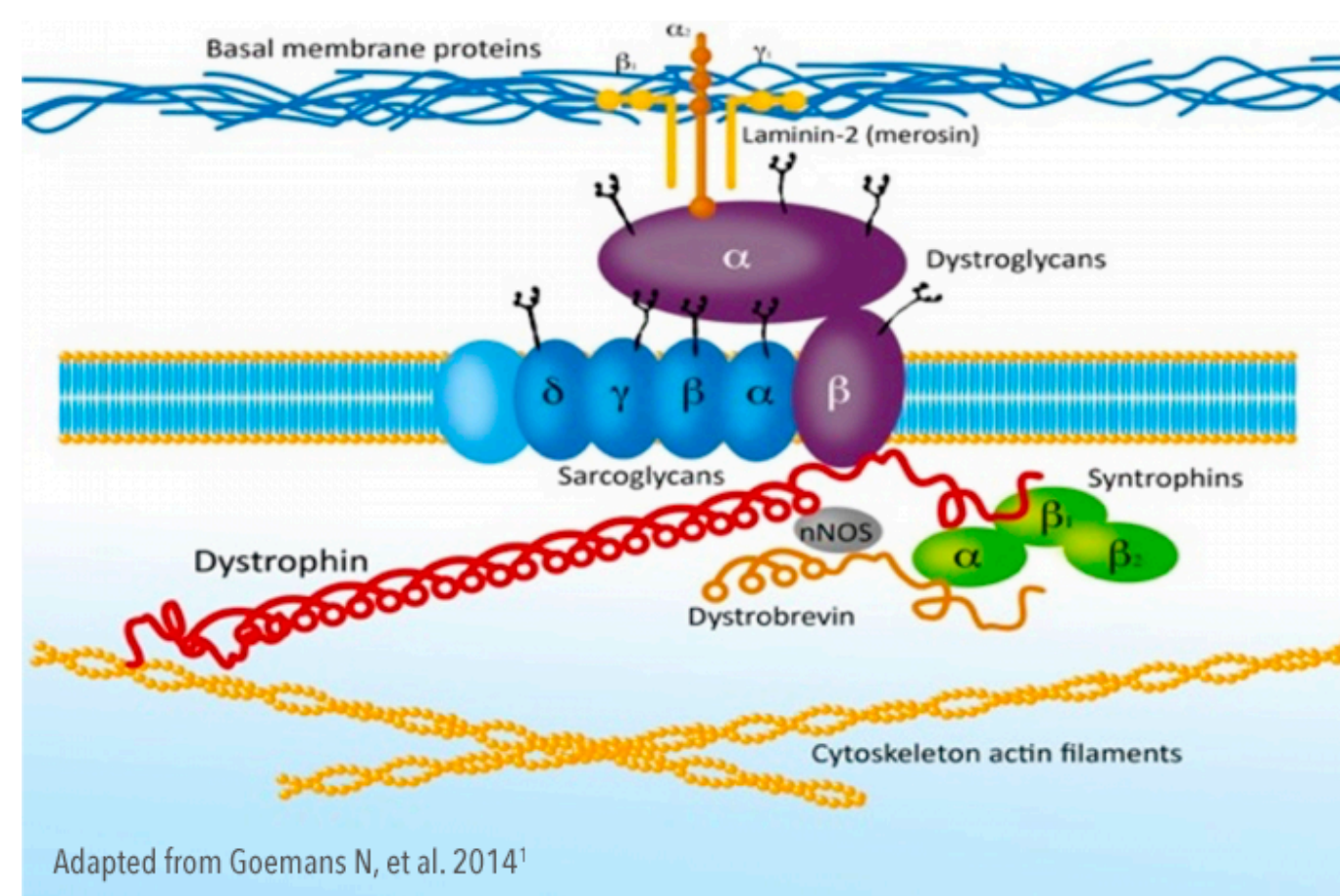
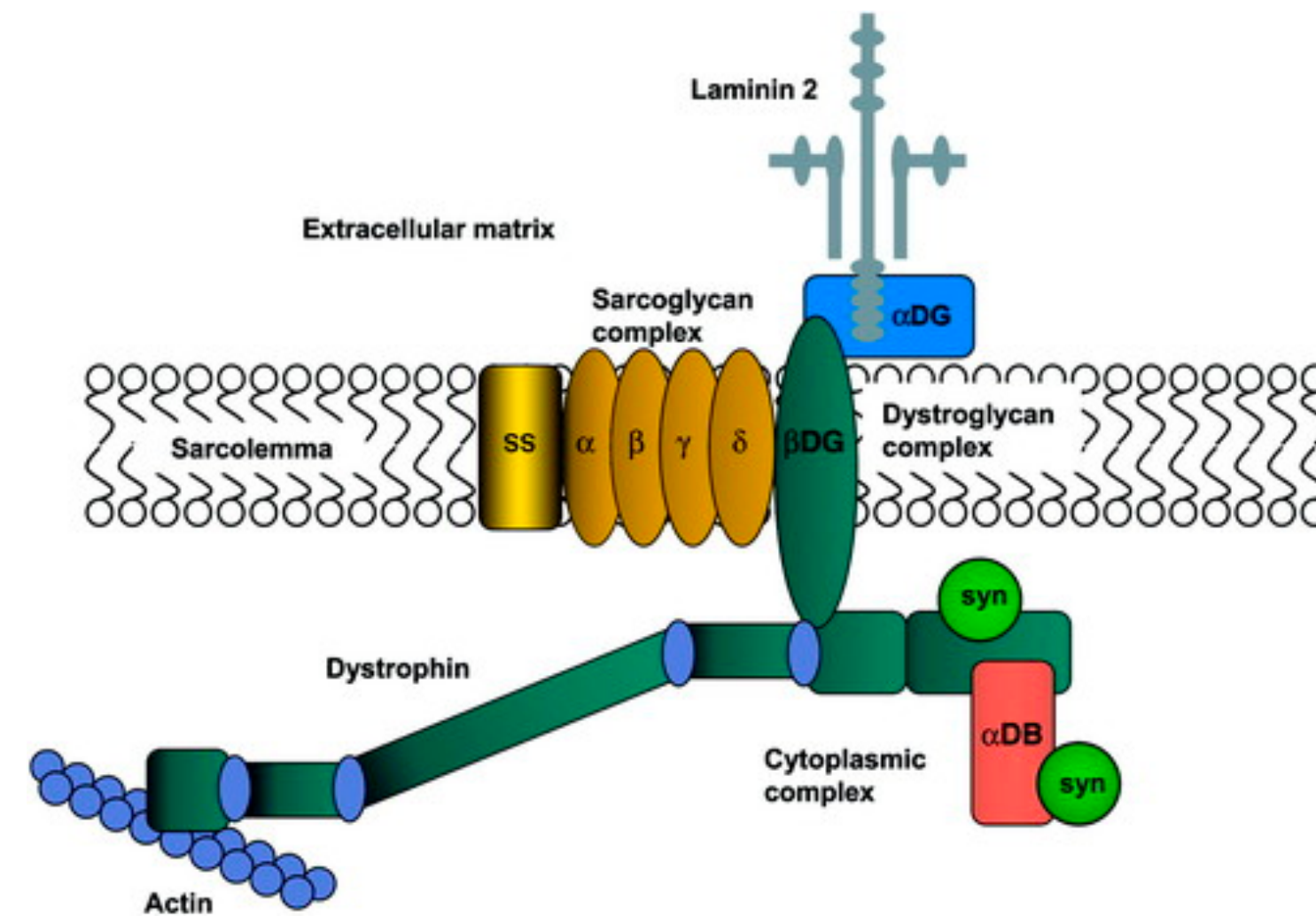
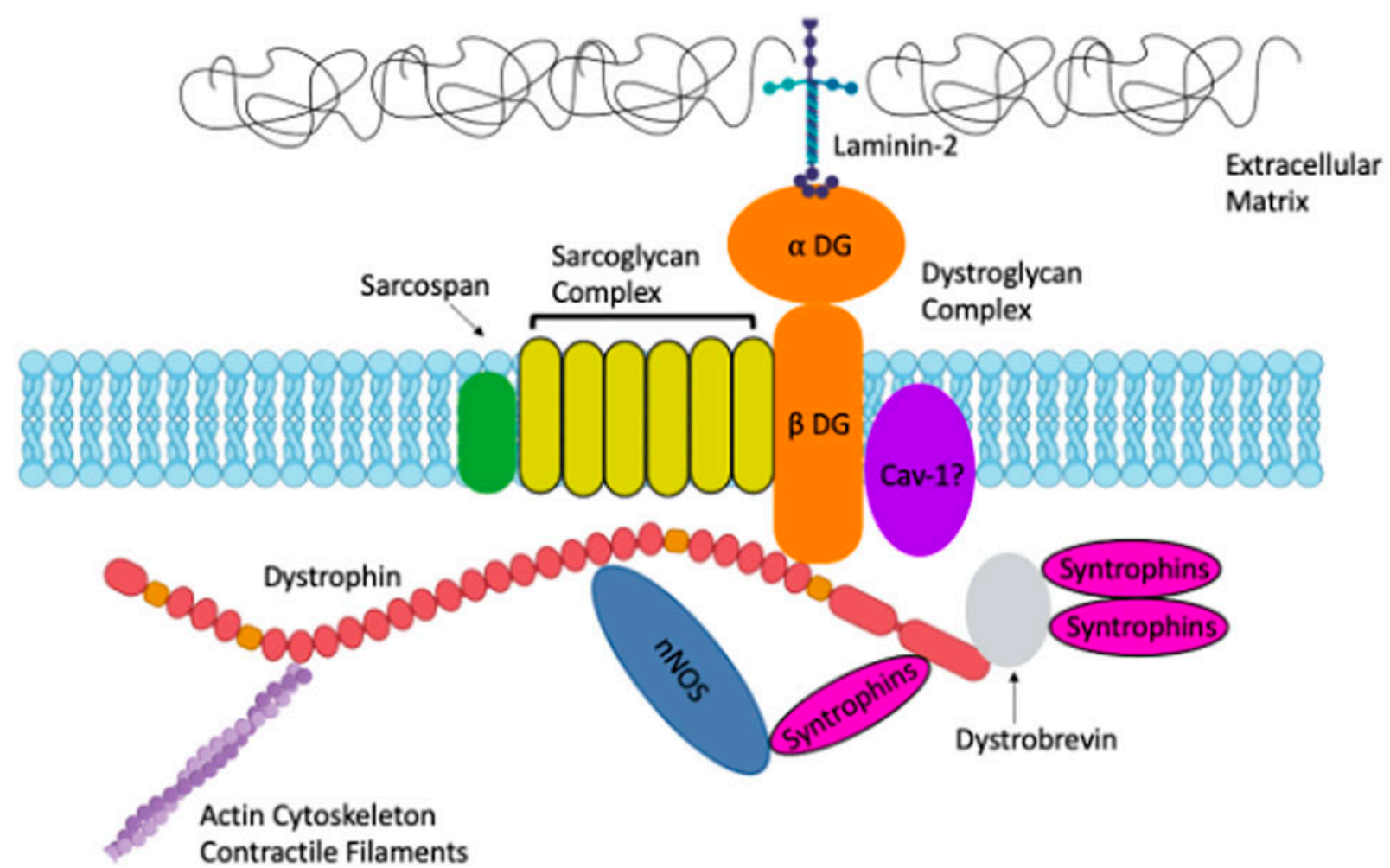
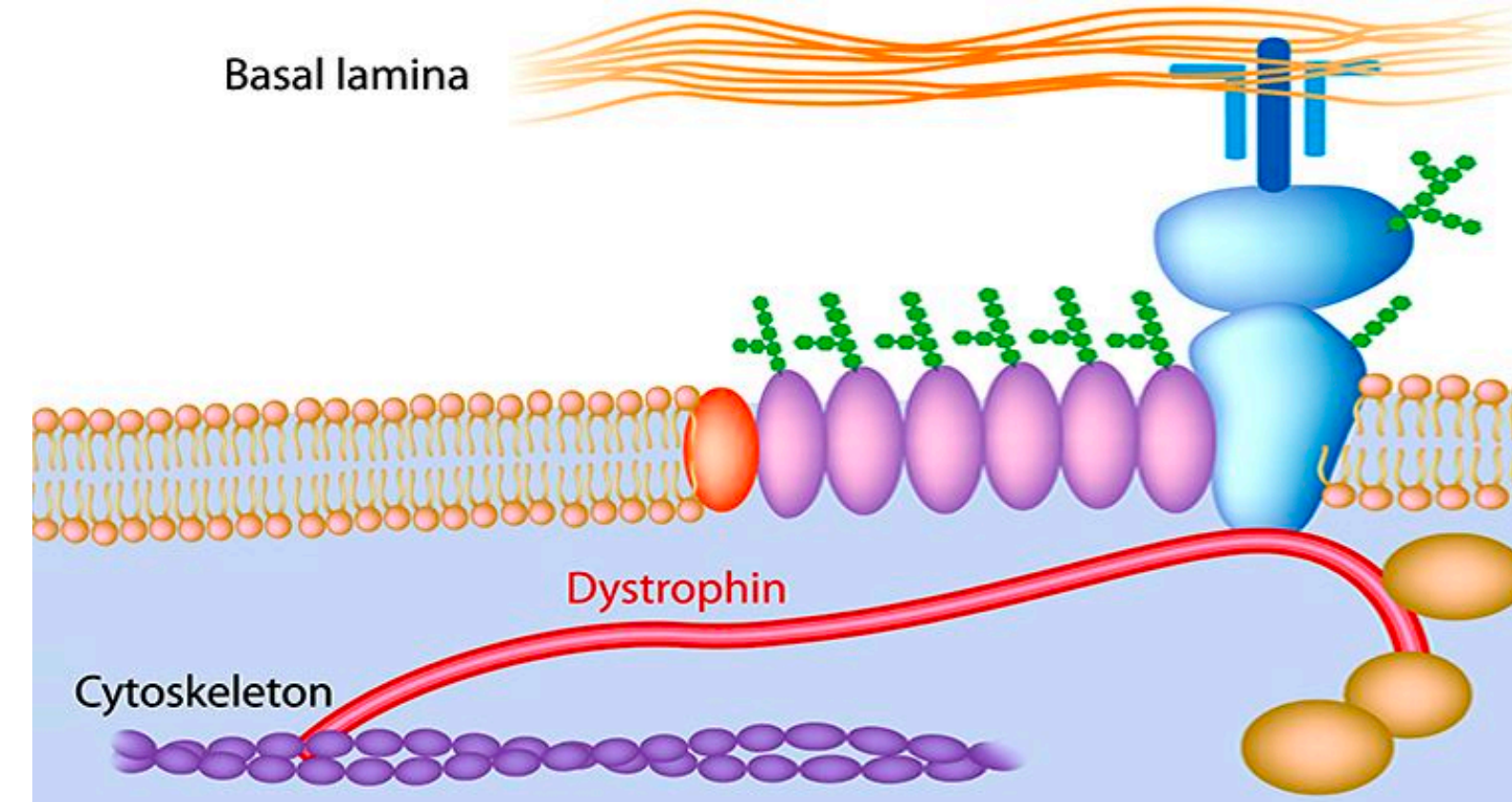
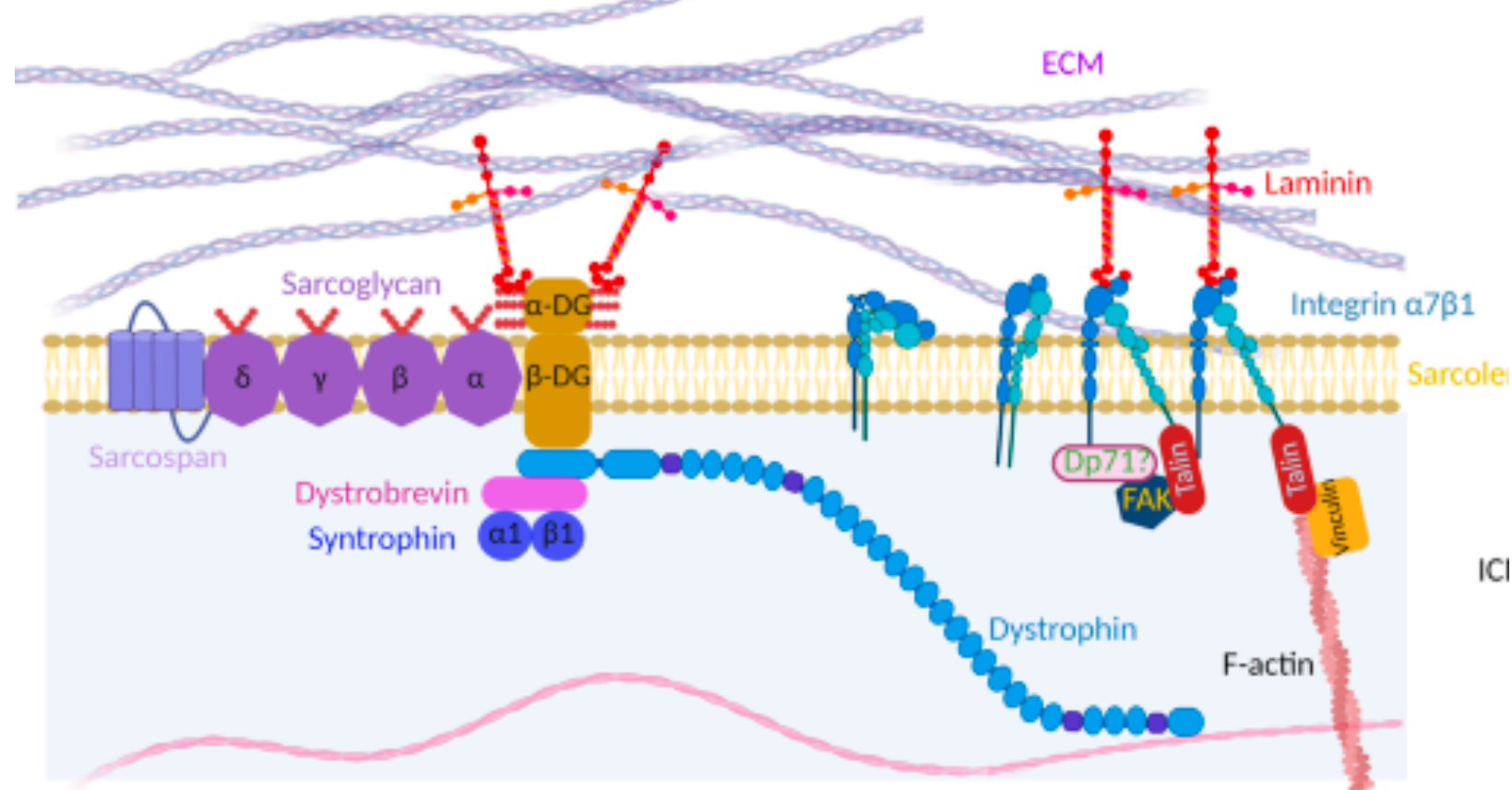
# **conventions**

luggage or baggage?

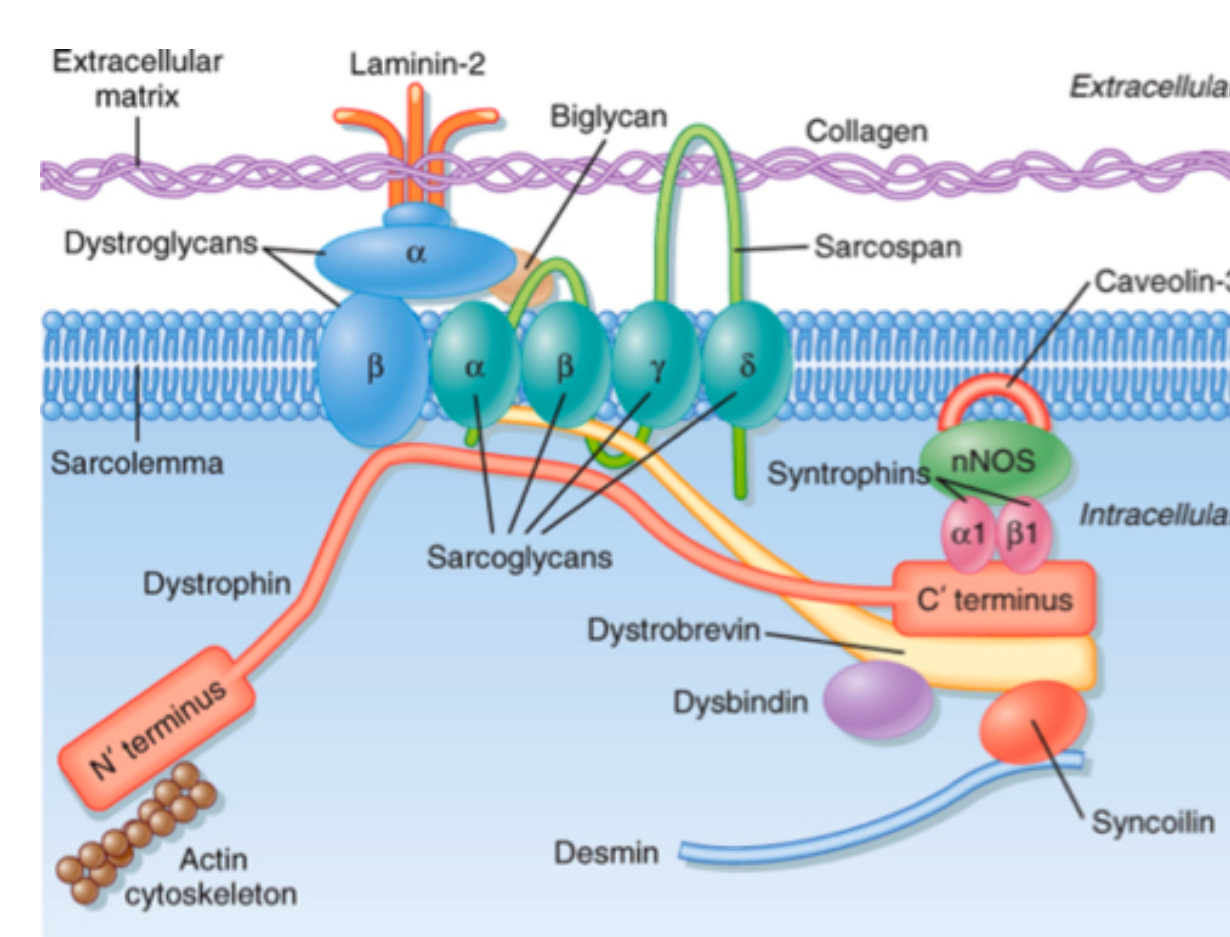




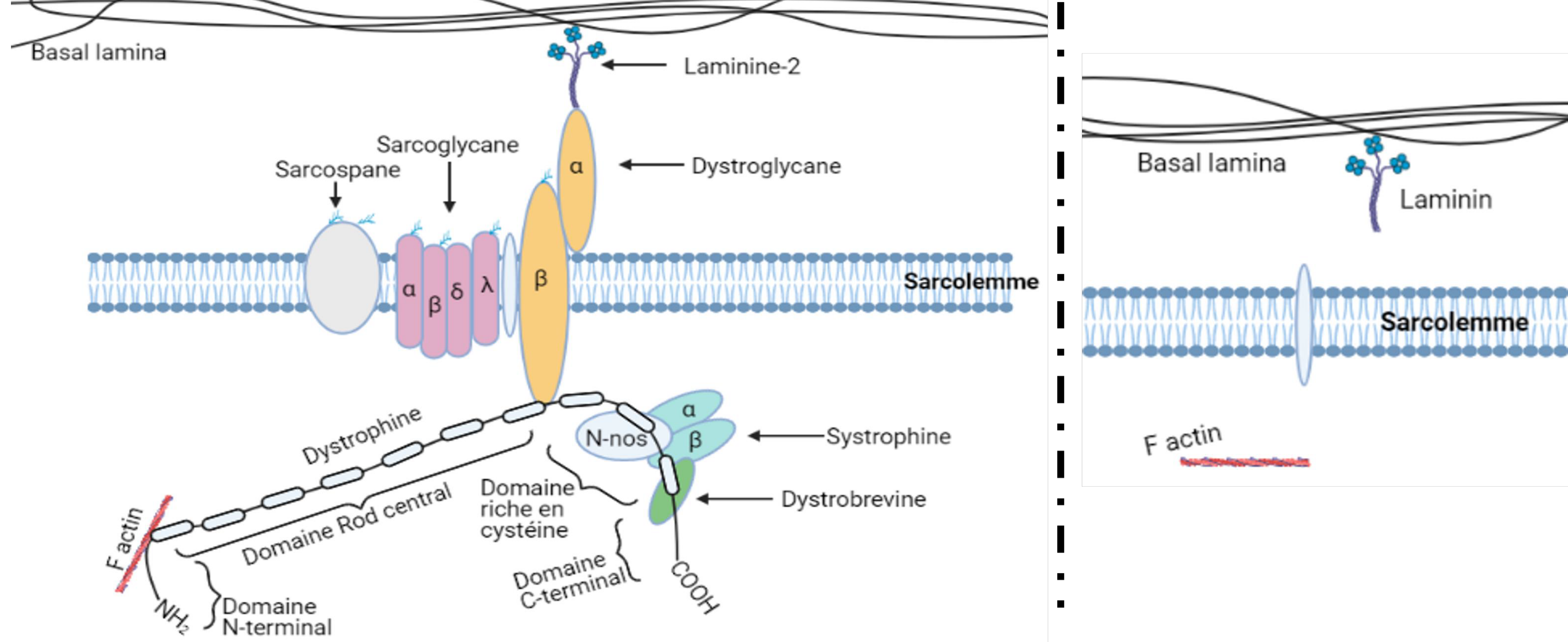




Adapted from Goemans N, et al. 2014<sup>1</sup>

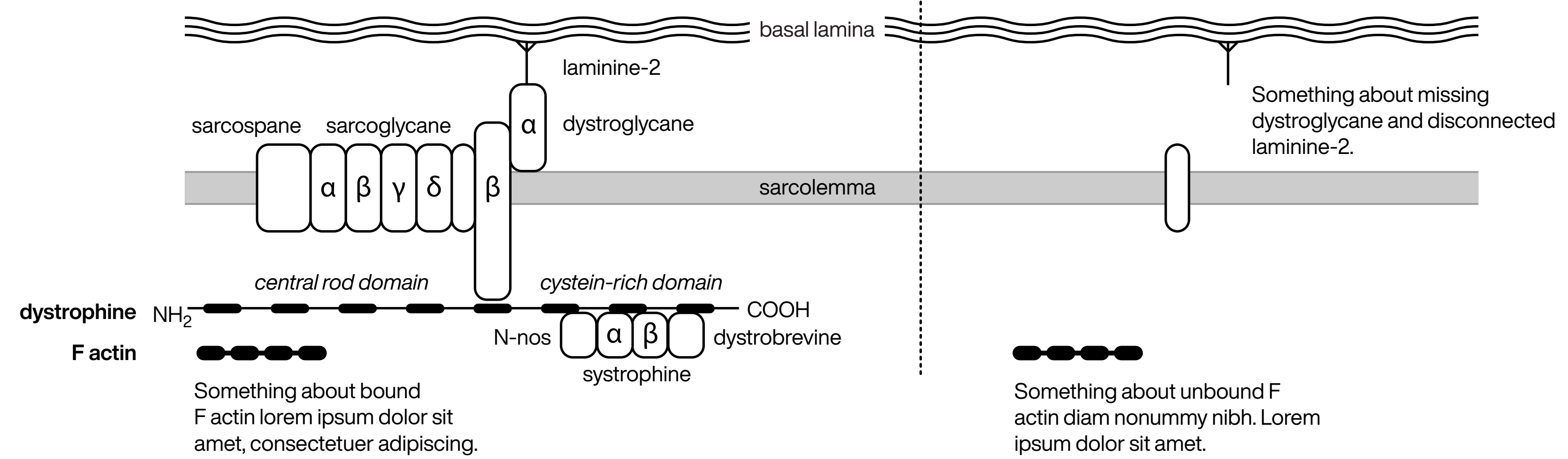






Dystrophin-associated protein complex is needed for lorem ipsum dolor sit amet, consectetur adipiscing.

Absence of dystrophin results in membrane destabilization and muscle wasting.

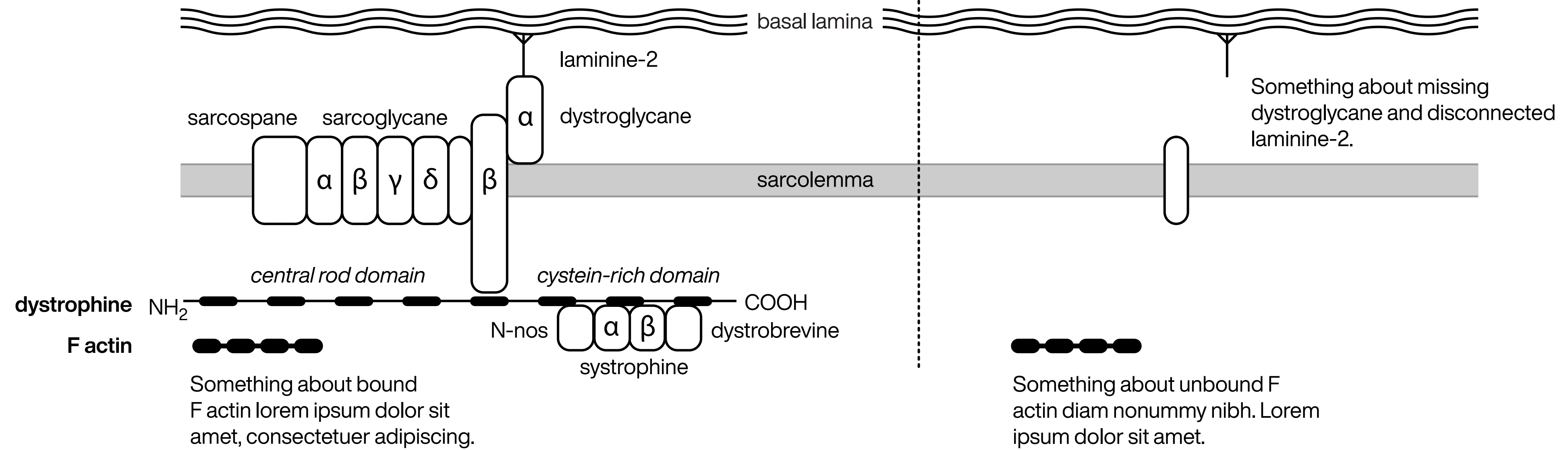


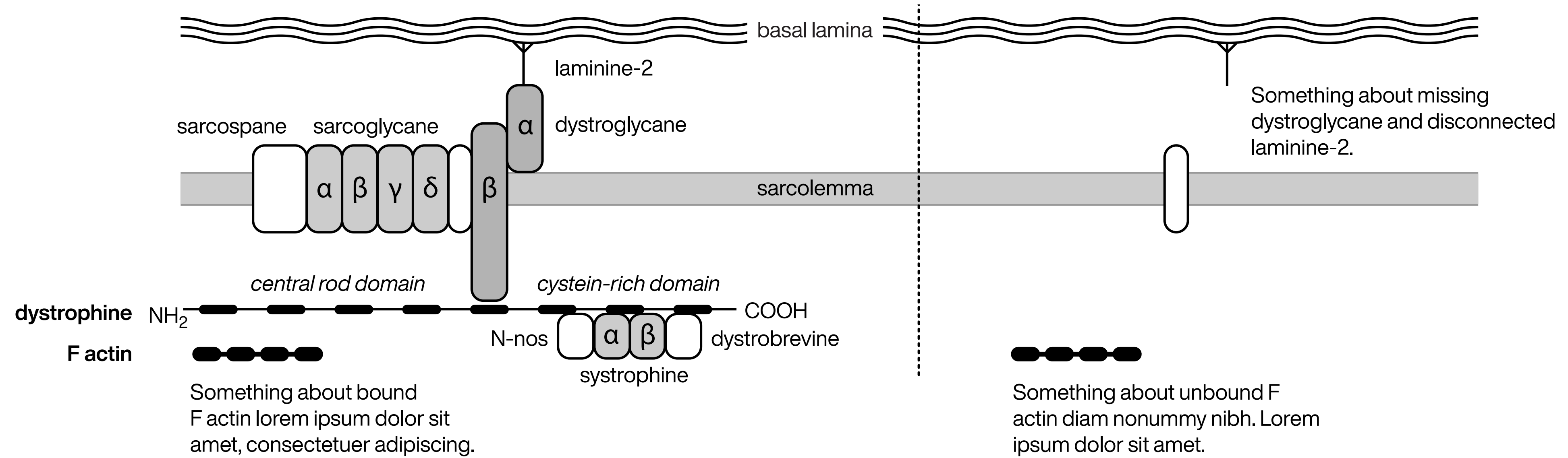
Something about bound F actin lorem ipsum dolor sit amet, consectetur adipiscing.

Something about unbound F actin diam nonummy nibh. Lorem ipsum dolor sit amet.

Dystrophin-associated protein complex is needed for lorem ipsum dolor sit amet, consectetur adipiscing.

Absence of dystrophin results in membrane destabilization and muscle wasting.

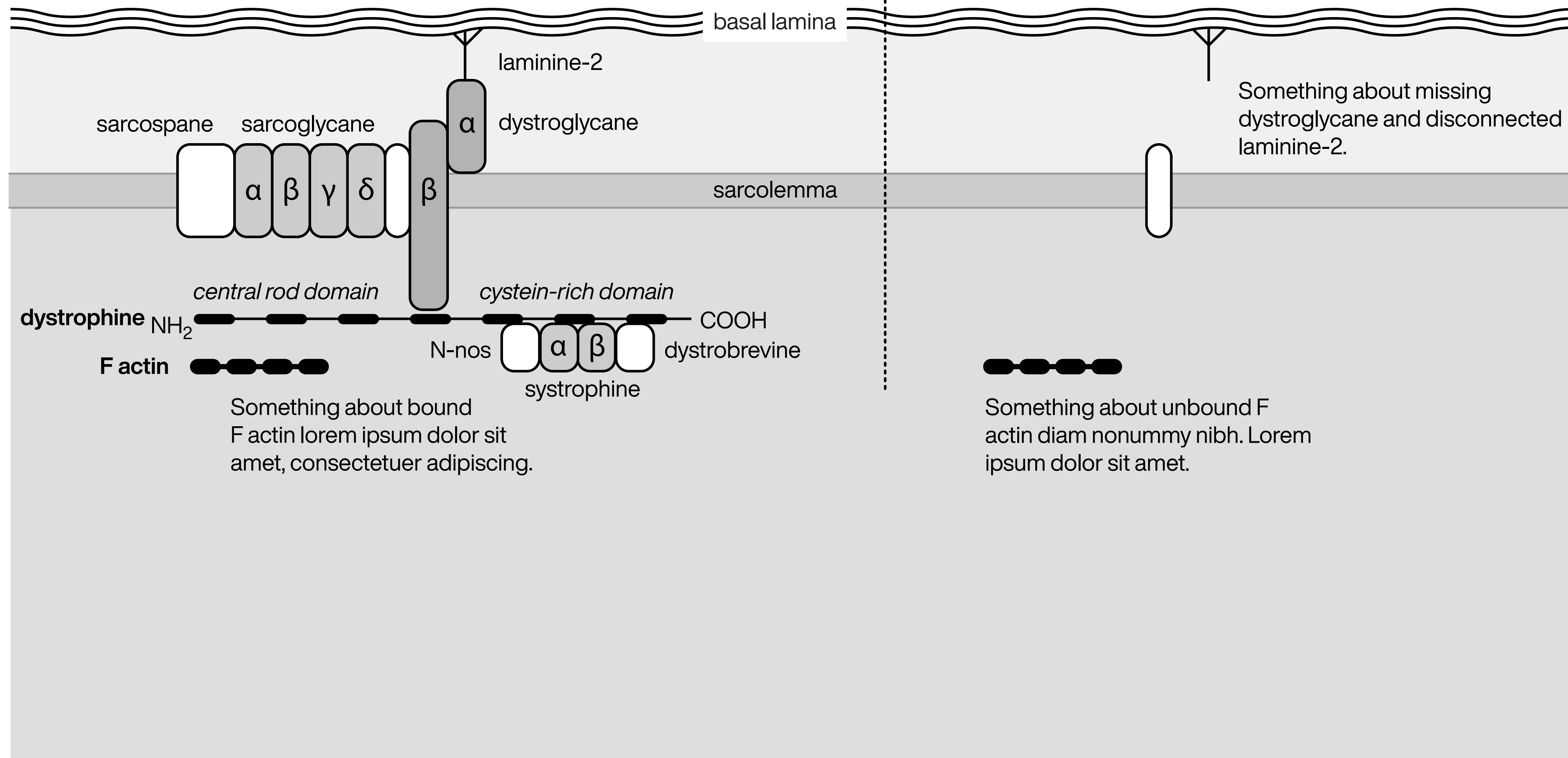


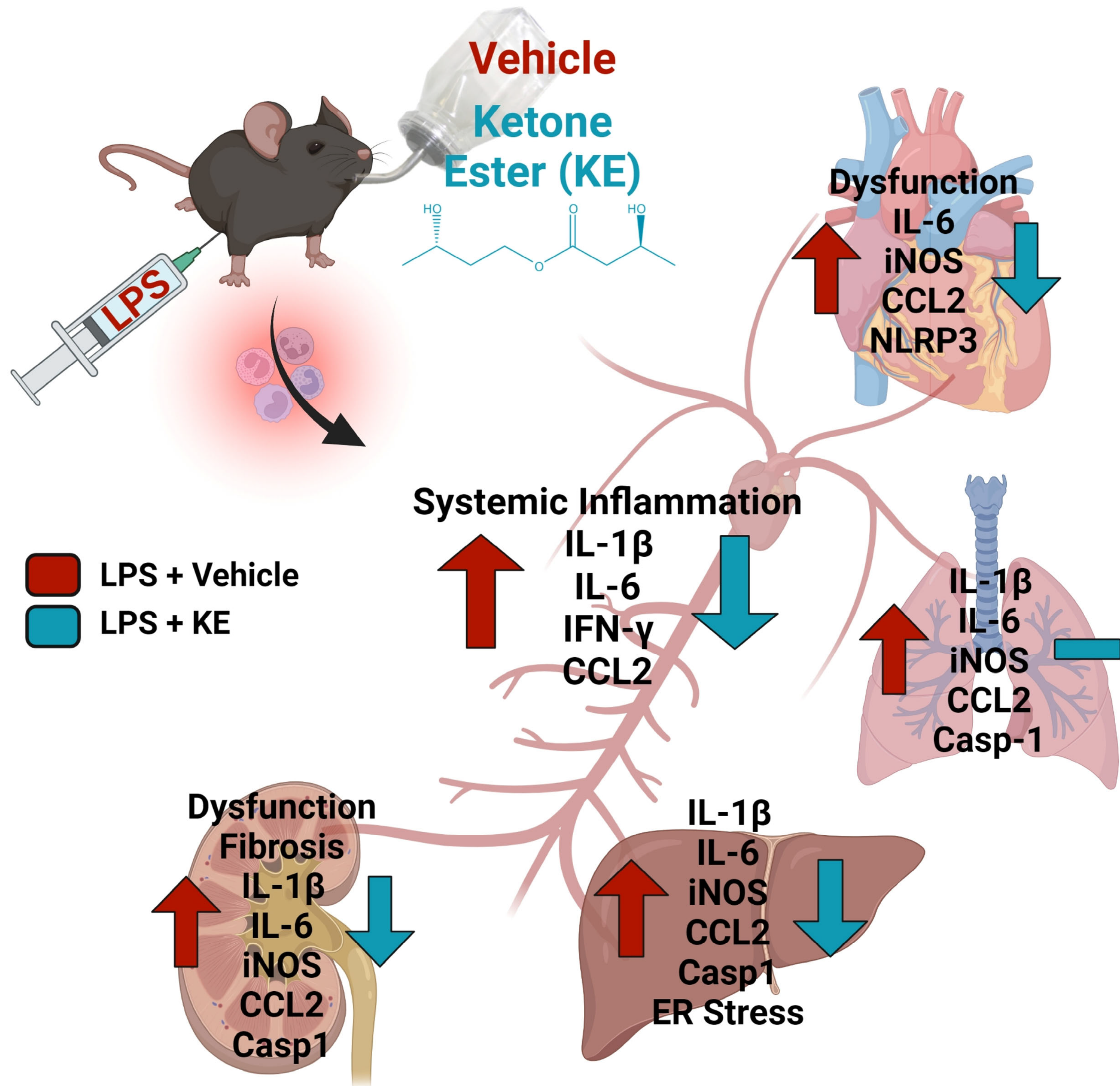


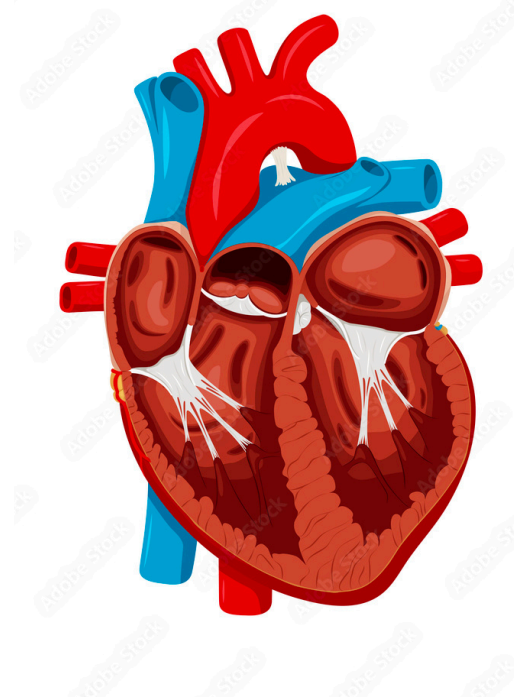
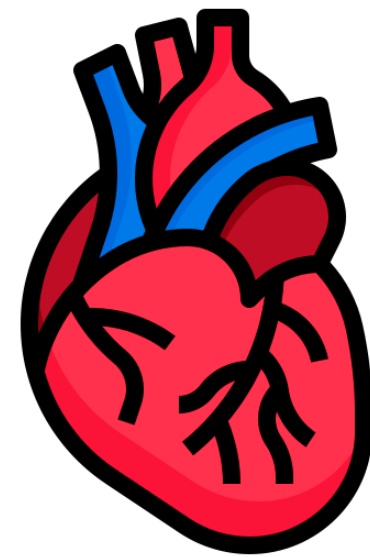
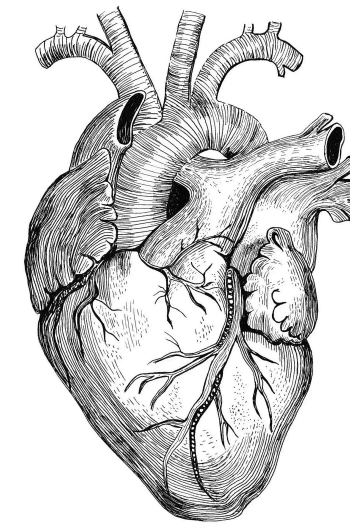
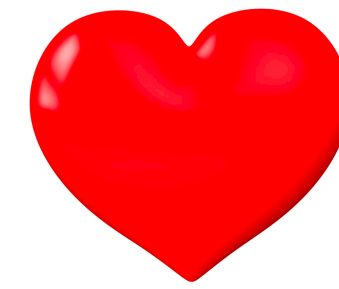
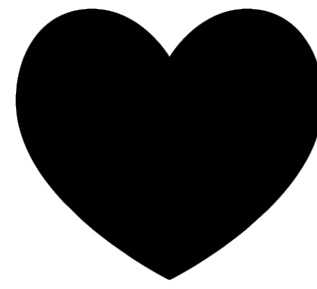


Dystrophin-associated protein complex is needed for lorem ipsum dolor sit amet, consectetur adipiscing.

Absence of dystrophin results in membrane destabilization and muscle wasting.

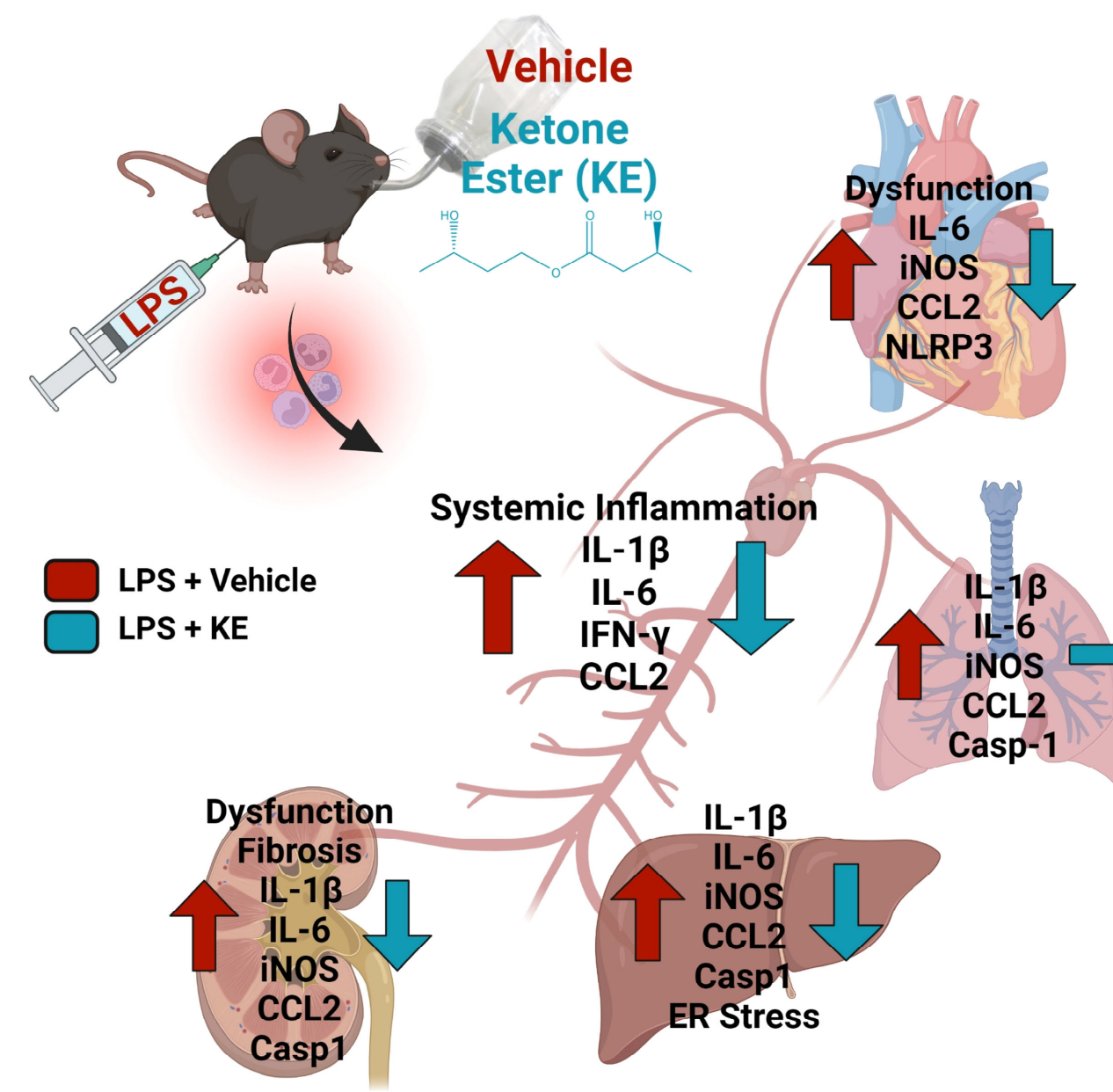







heart





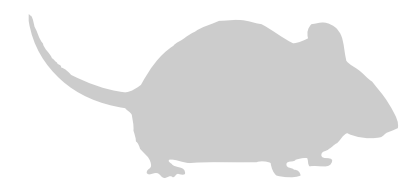
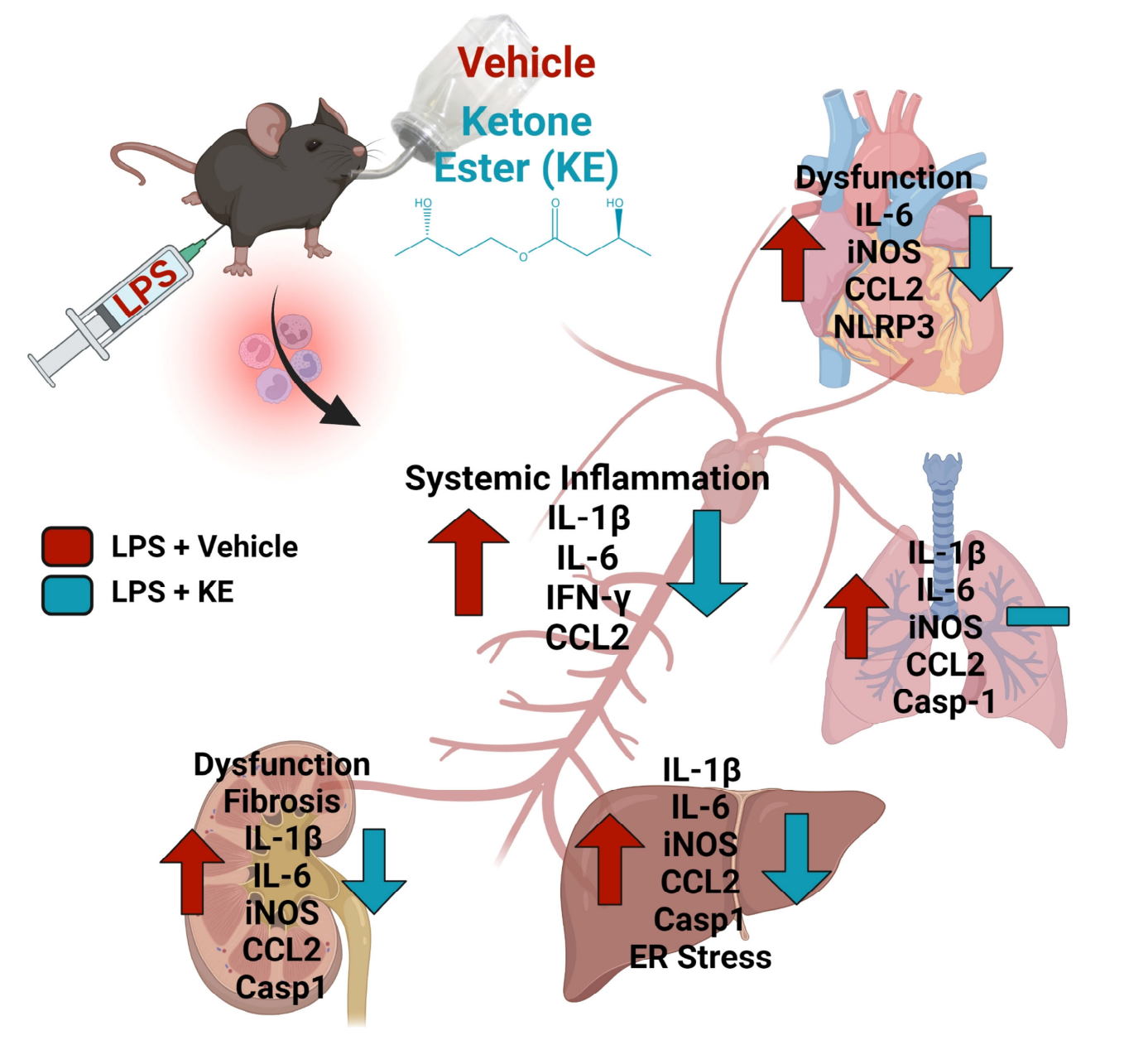
  


---

**LPS**    **LPS**  
**vehicle**   **ketone**

broad effect                    CCL2    IL-6    IL-1 $\beta$     iNOS    Casp1    NLRP3    IFN- $\gamma$

liver  
 kidney  
 lungs  
 heart  
 circulatory system

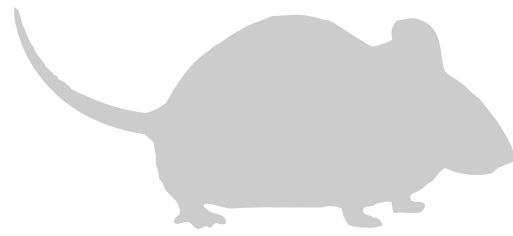


	LPS vehicle	LPS ketone		CCL2	IL-6	IL-1 $\beta$	iNOS	Casp1	NLRP3	IFN- $\gamma$
liver	▲	▼	ER stress	●	●	●	●	●		
kidney	▲	▼	dysfunction & fibrosis	●	●	●	●	●		
lungs	▲			●	●	●	●	●		
heart	▲	▼	dysfunction	●	●		●		●	
circulatory system	▲	▼	systemic inflammation	●	●	●				●

expression  
 ▲ upregulated  
 ▼ downregulated

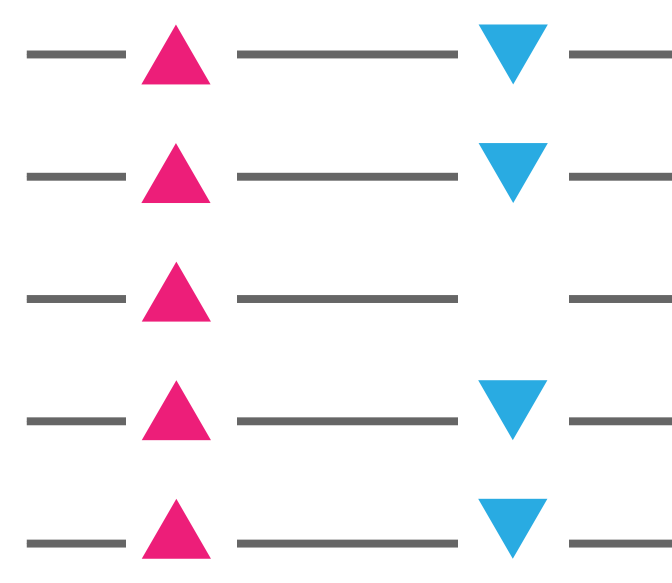
expression  
 ● same as tissue expression  
 ▲ upregulated  
 ▼ downregulated

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut



**LPS** **LPS**  
**vehicle** **ketone**

liver  
kidney  
lungs  
heart  
circulatory system

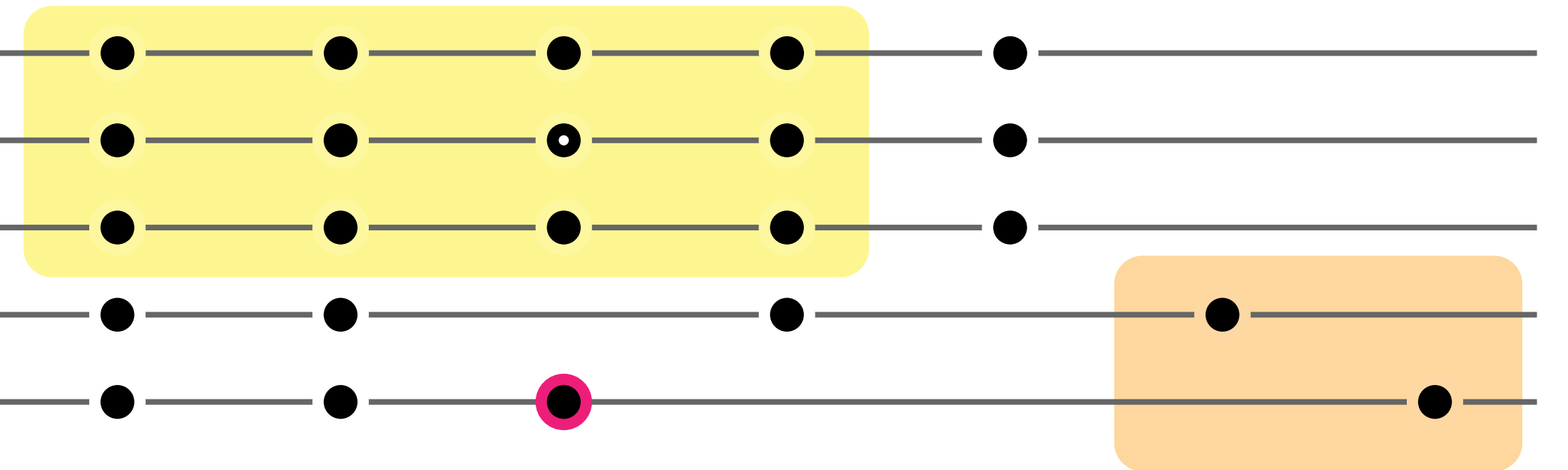


broad effect

ER stress  
dysfunction & fibrosis  
dysfunction  
systemic inflammation

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut

CCL2 IL-6 IL-1 $\beta$  iNOS Casp1 NLRP3 IFN- $\gamma$



expression

- upregulated (pink triangle)
- downregulated (blue triangle)

expression

- same as tissue expression (black dot)
- upregulated (pink triangle)
- downregulated (blue triangle)
- lorem ipsum (black dot)
- lorem ipsum (pink circle)

some other category

- lorem ipsum (yellow box)
- lorem ipsum (orange box)

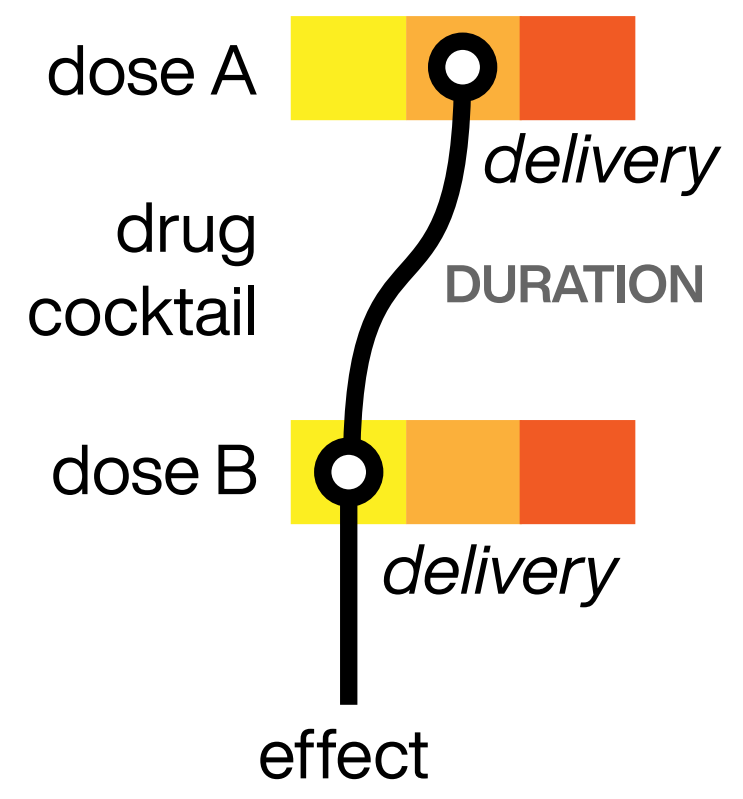
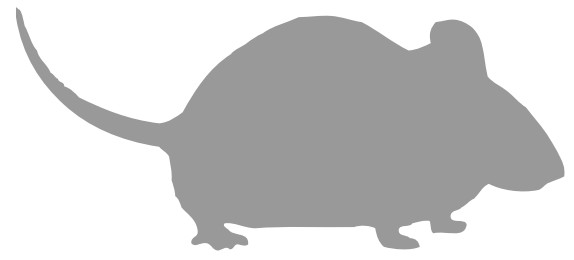


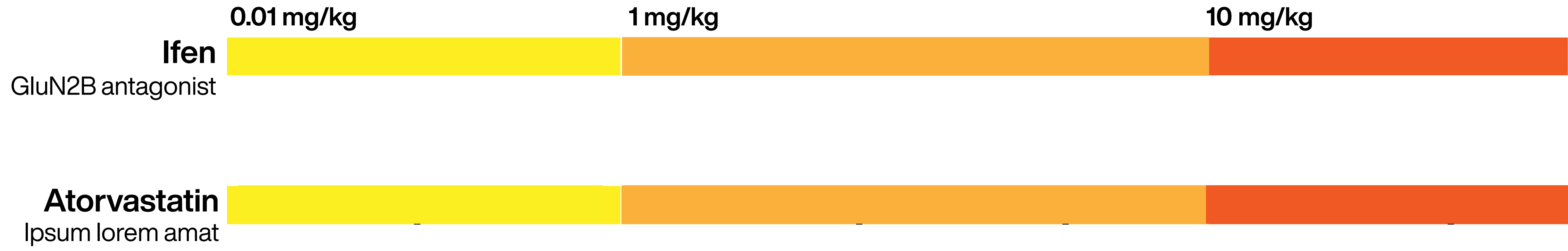
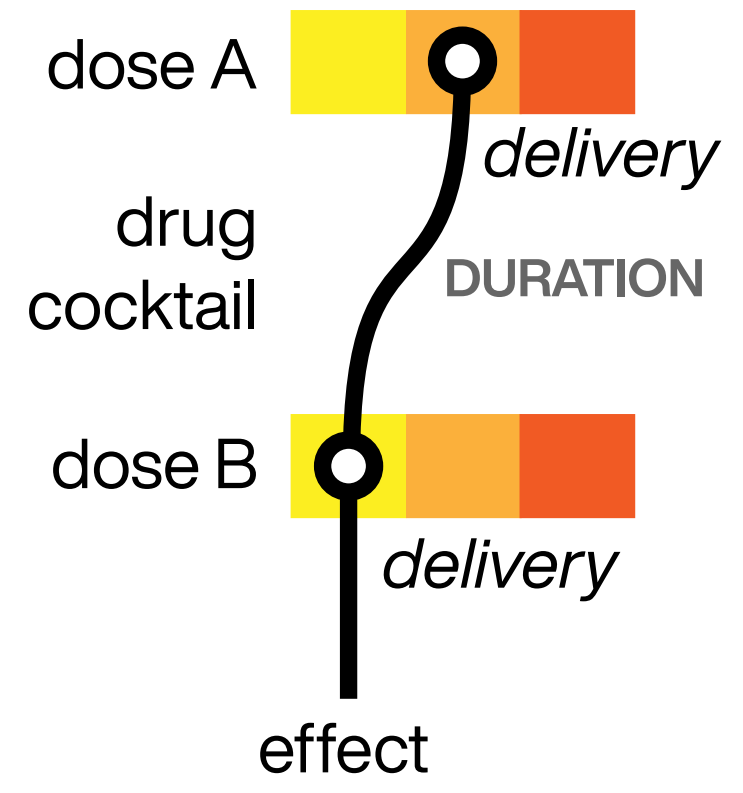
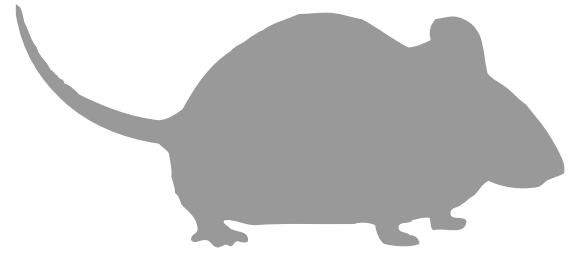
**make it easy to compare**

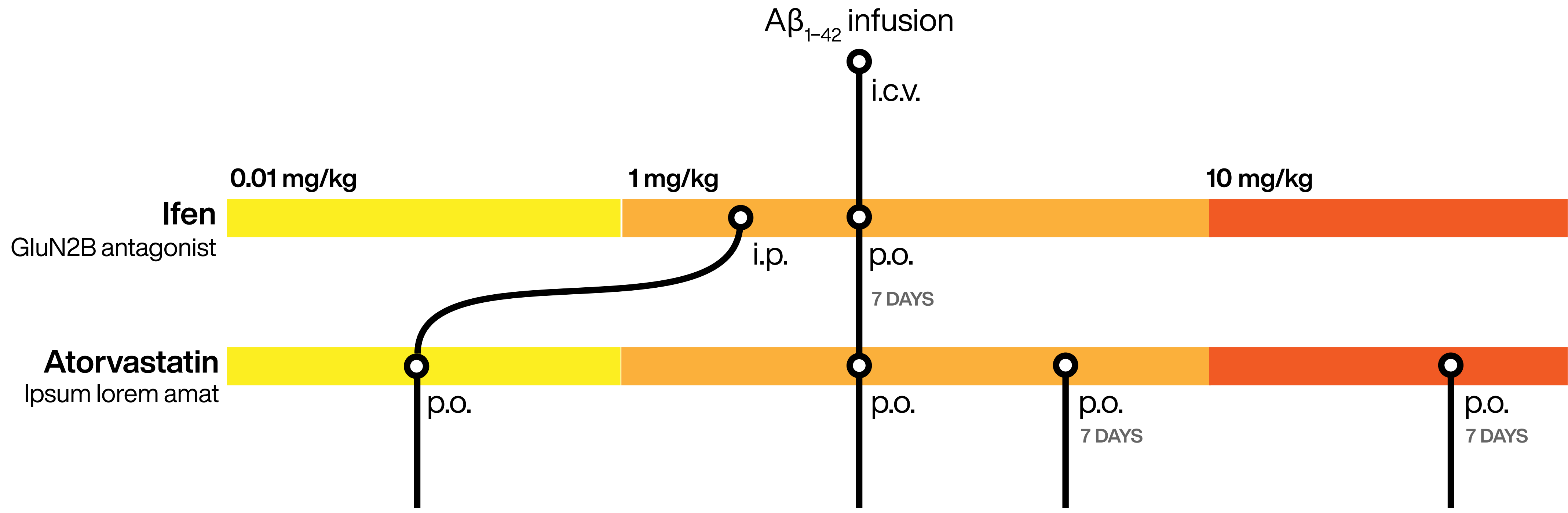
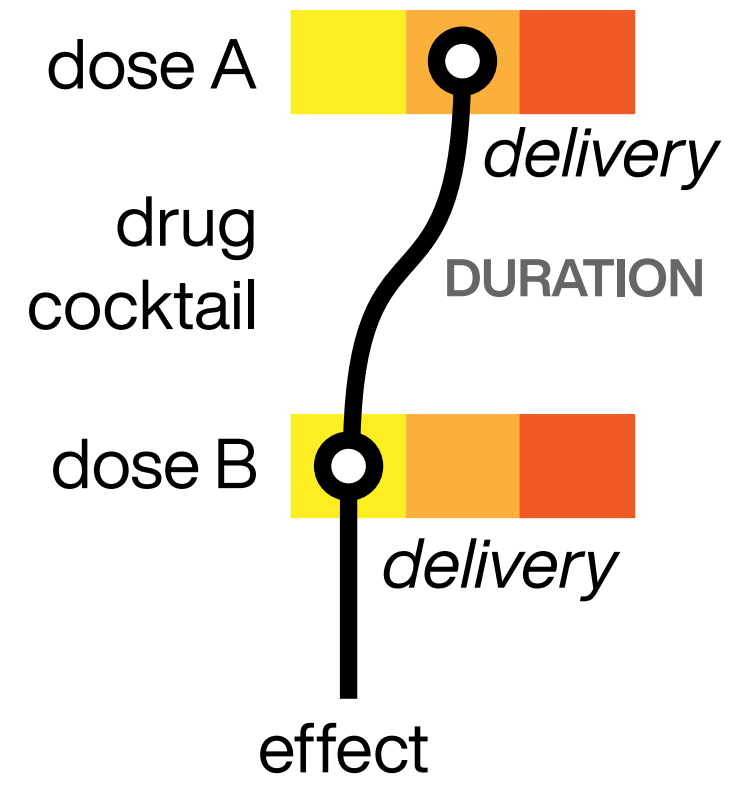
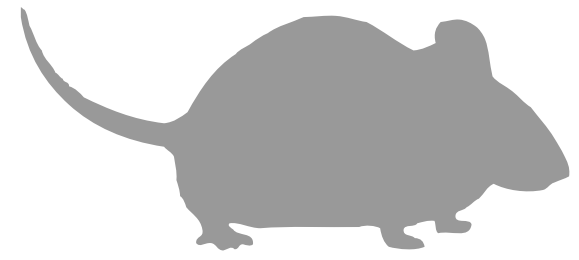
data on axis



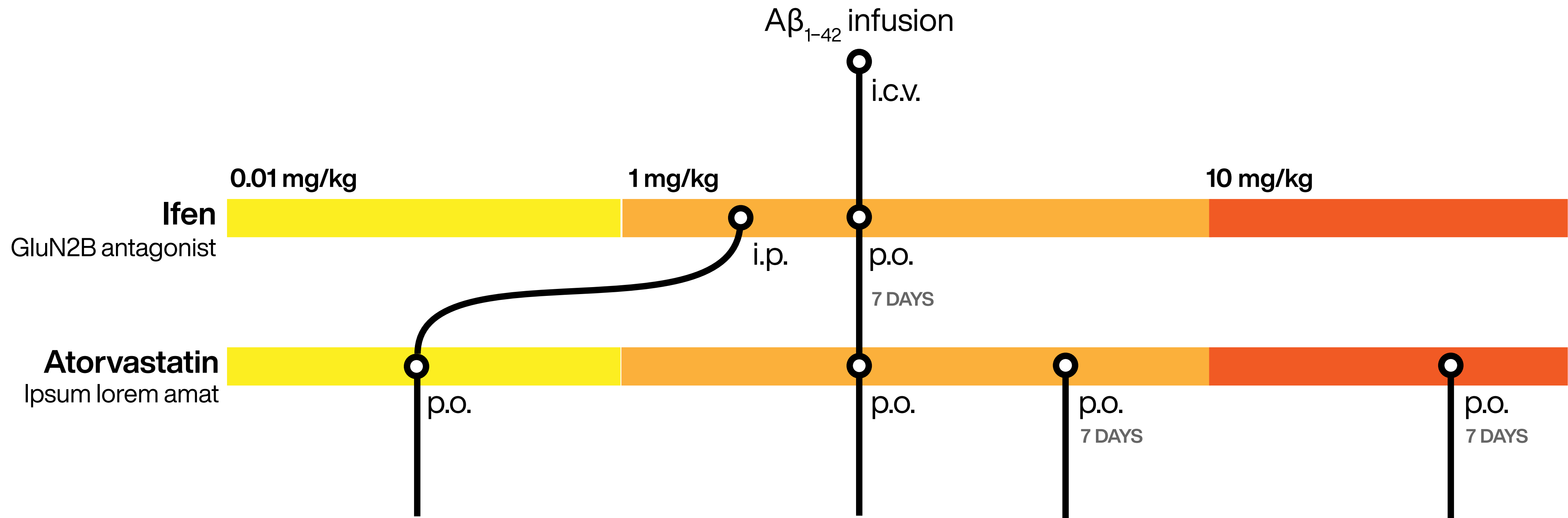
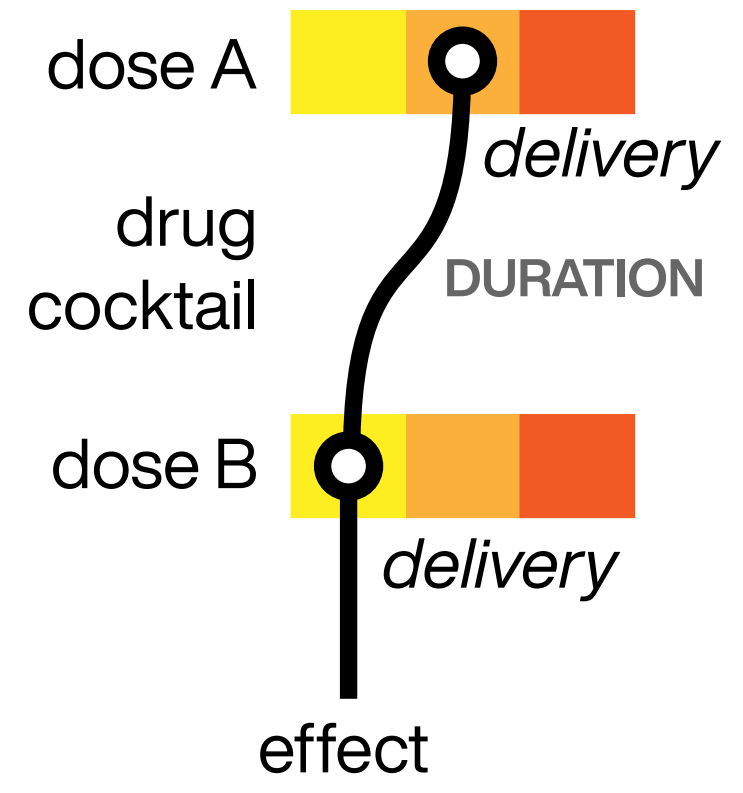
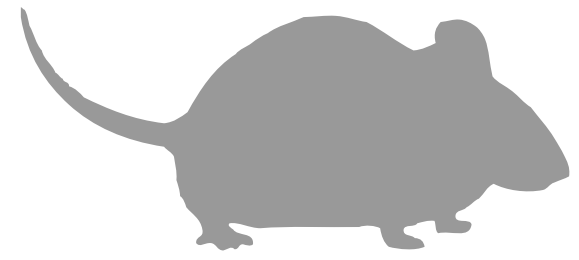






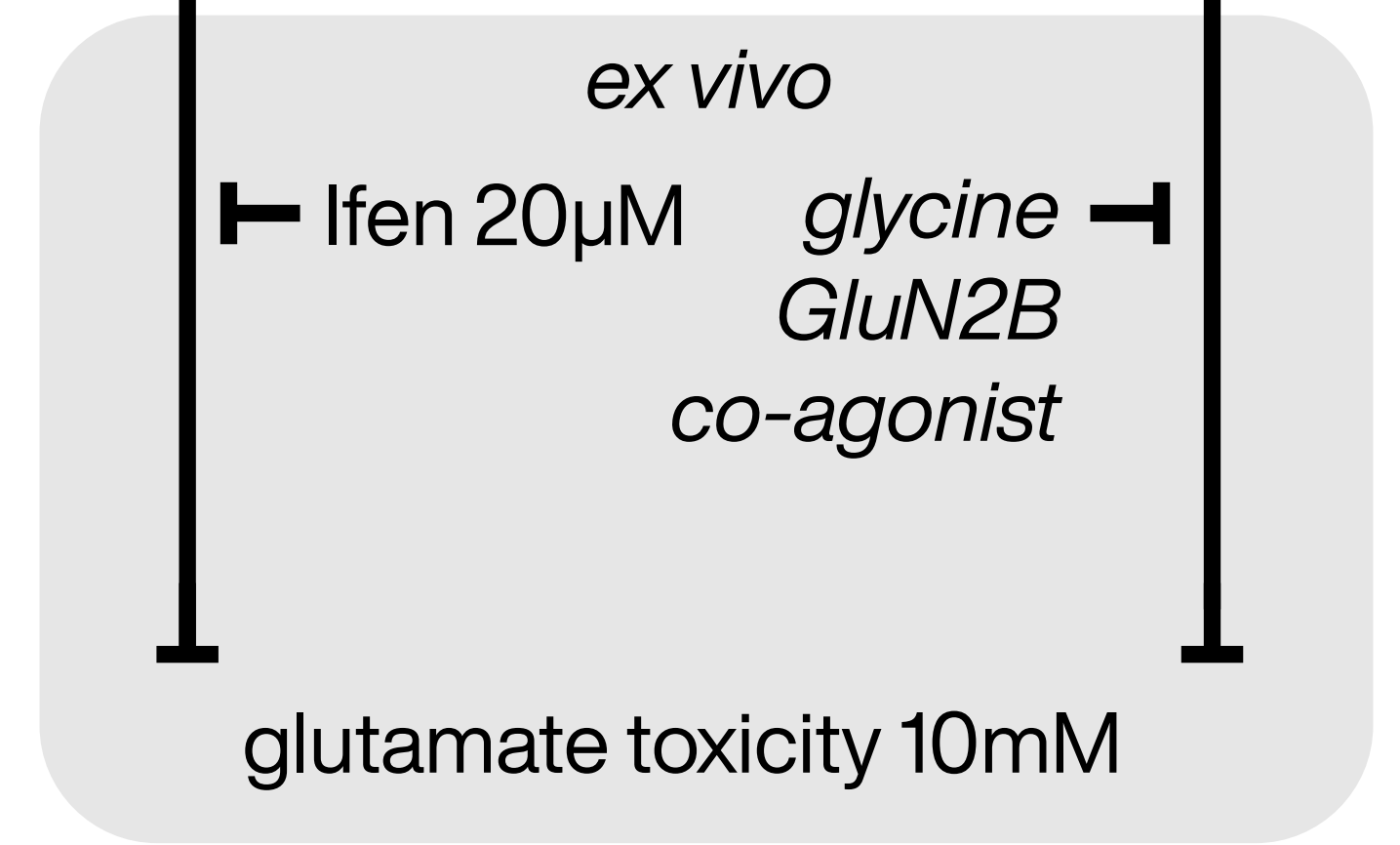


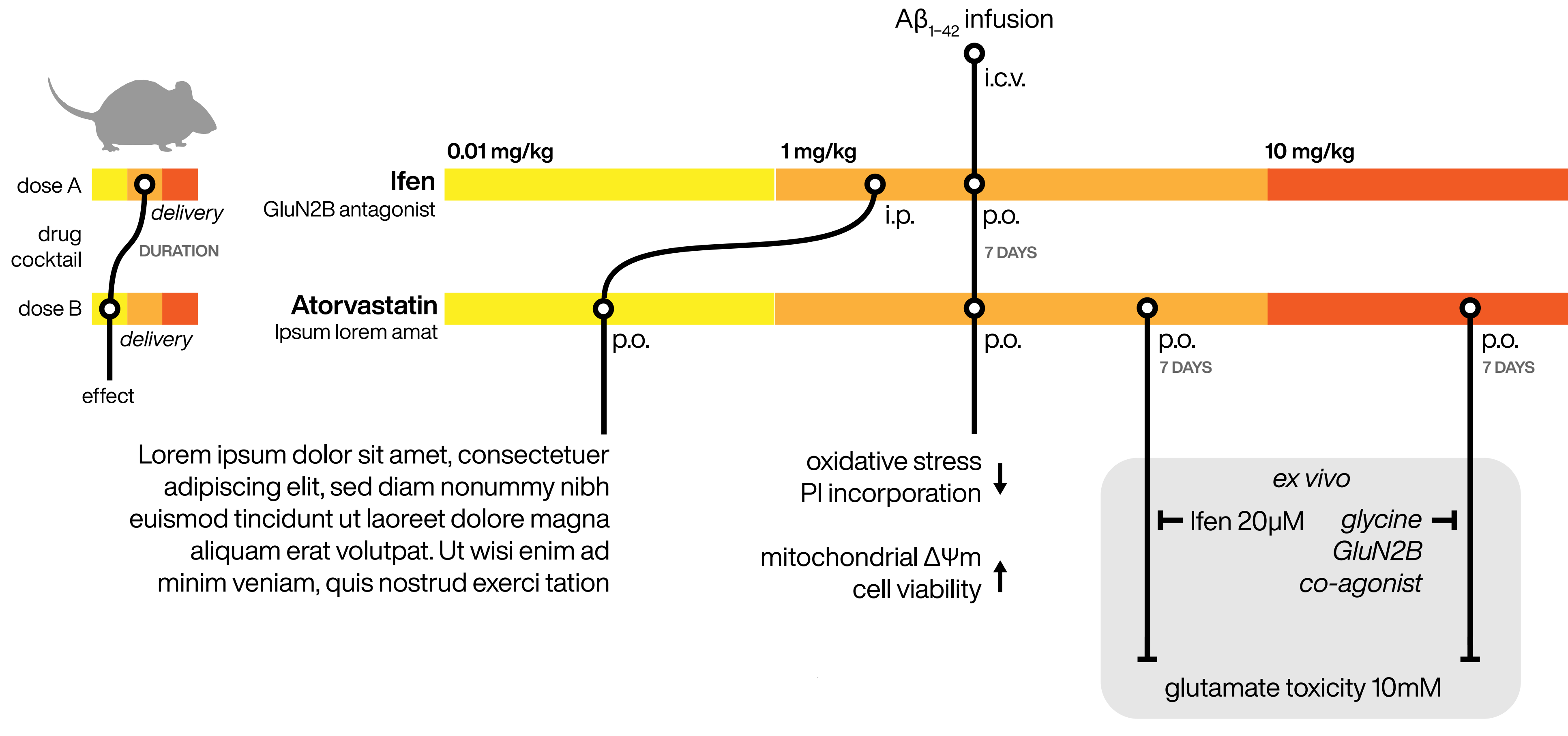




Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation

oxidative stress ↓  
PI incorporation ↓  
mitochondrial  $\Delta\Psi_m$  ↑  
cell viability ↑



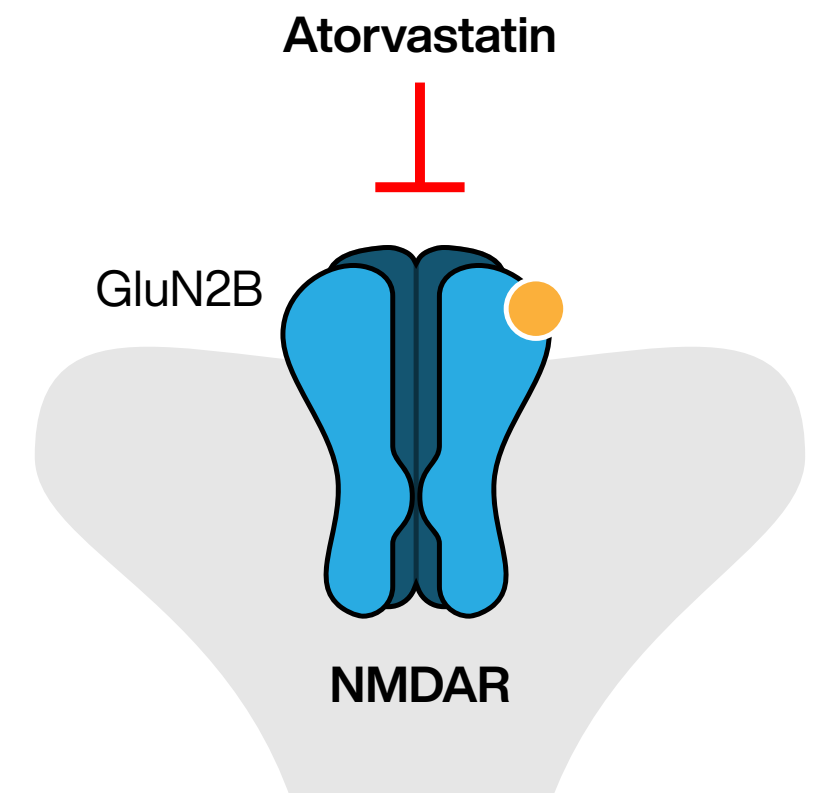


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation

**ANTIDEPRESSANT-LIKE EFFECTS**

**NEUROPROTECTIVE EFFECTS**

The mechanism of action is ...

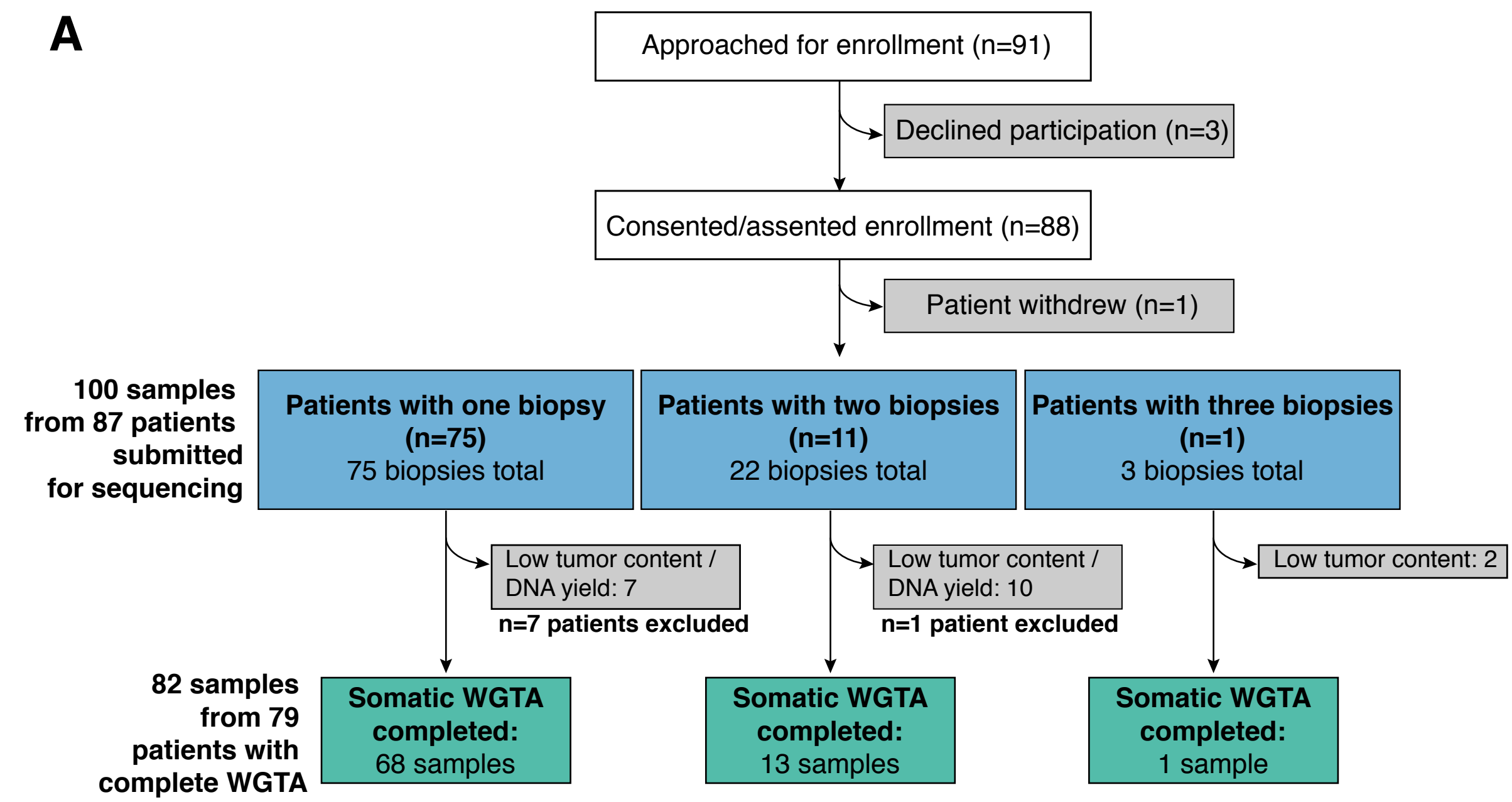




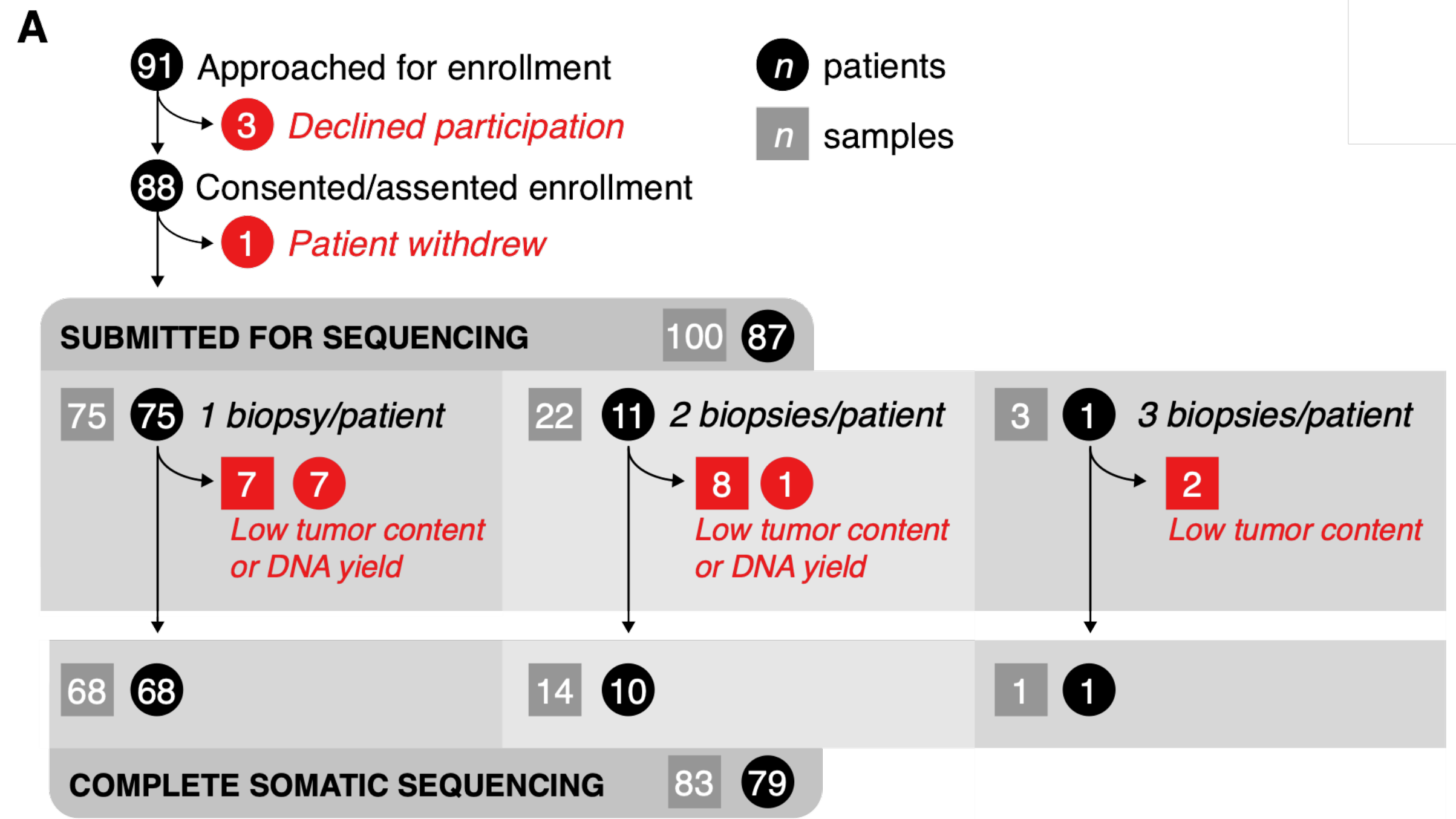
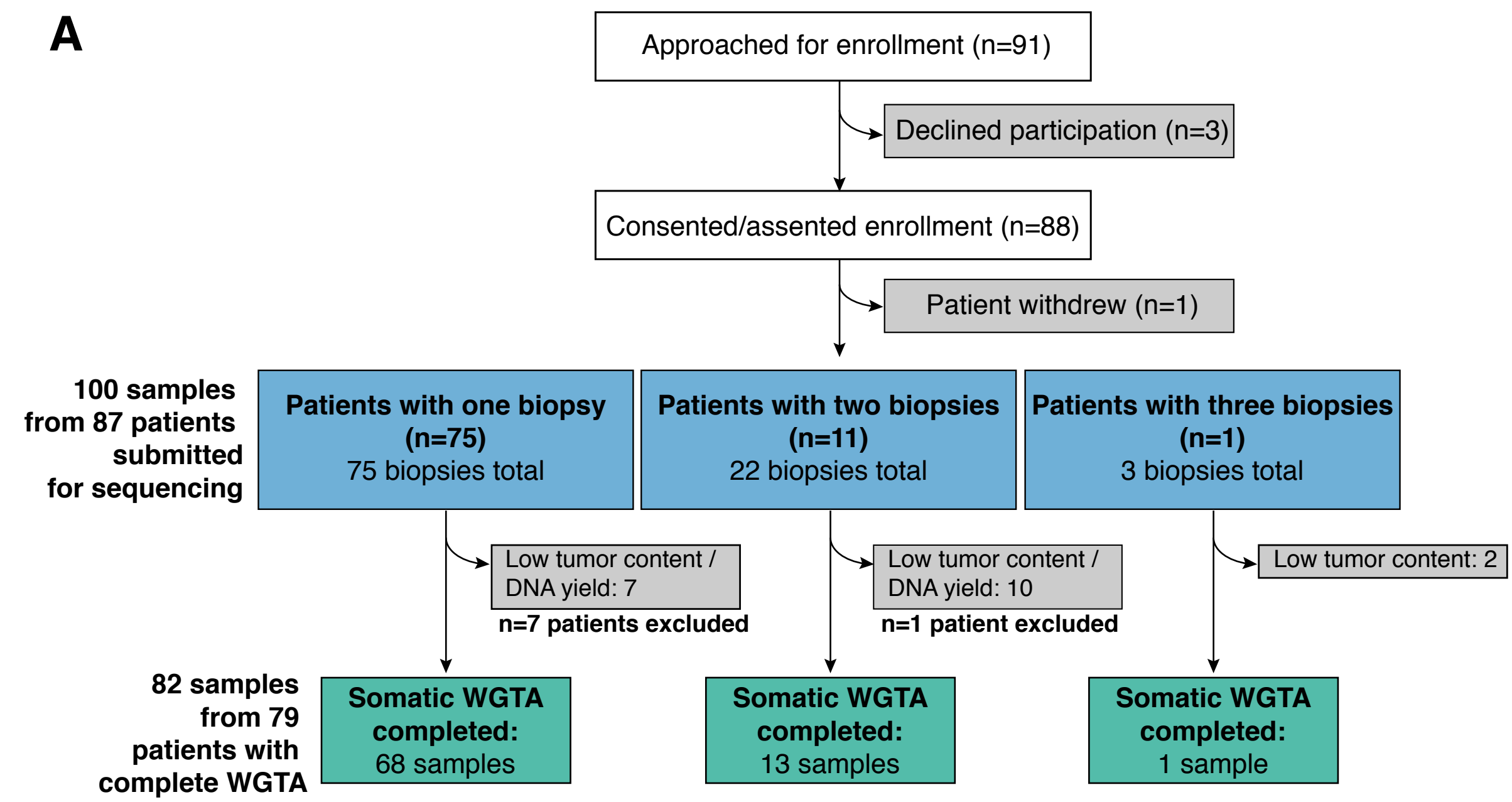
**make it easy to compare**

align assiduously

**A**





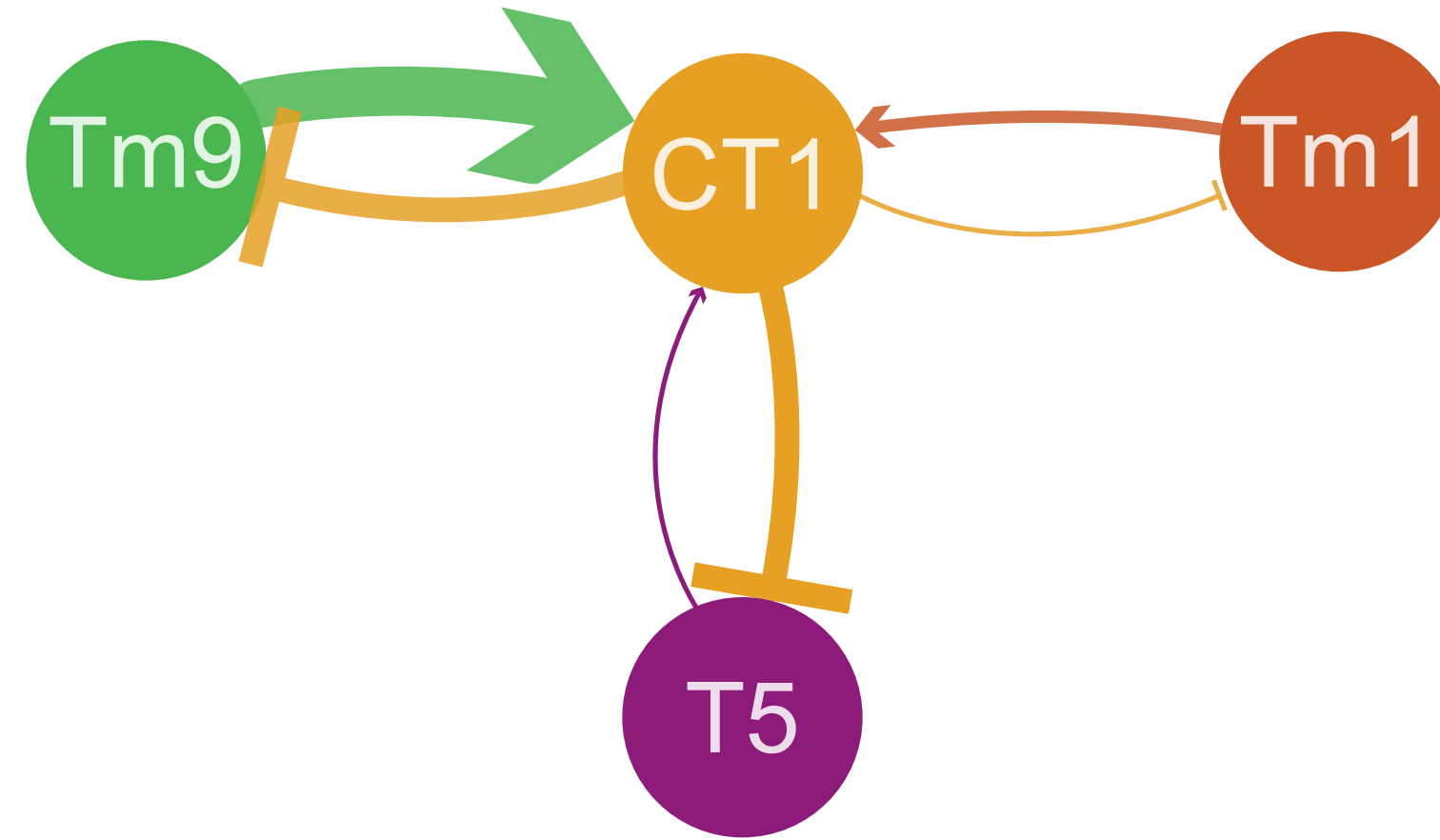




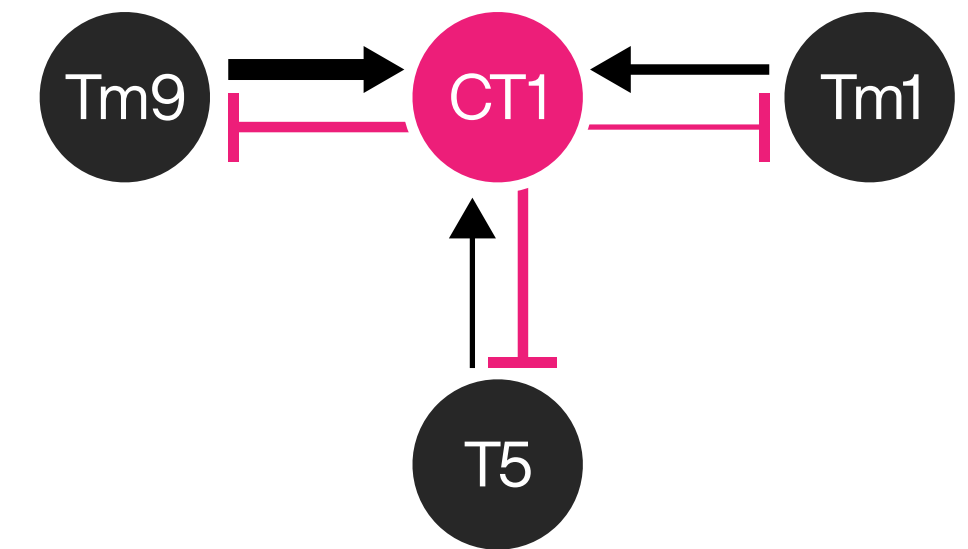
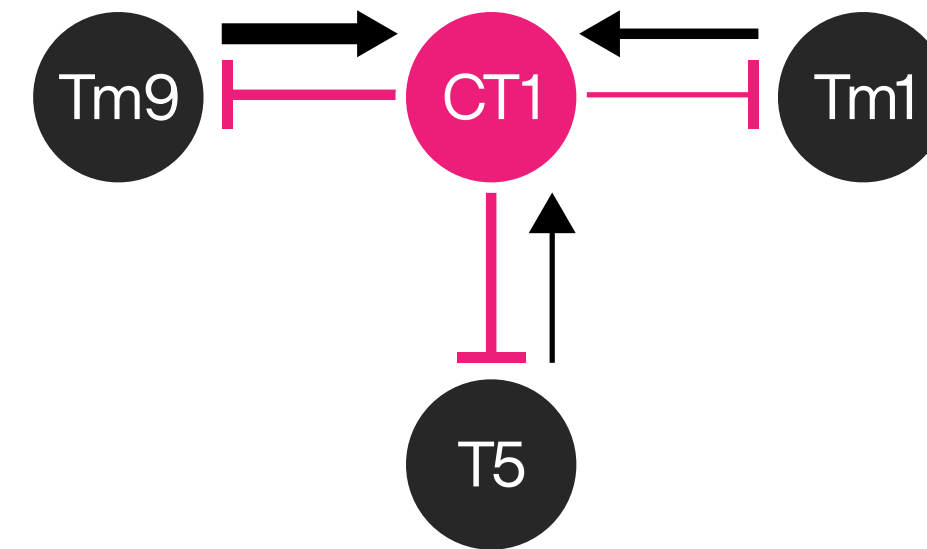
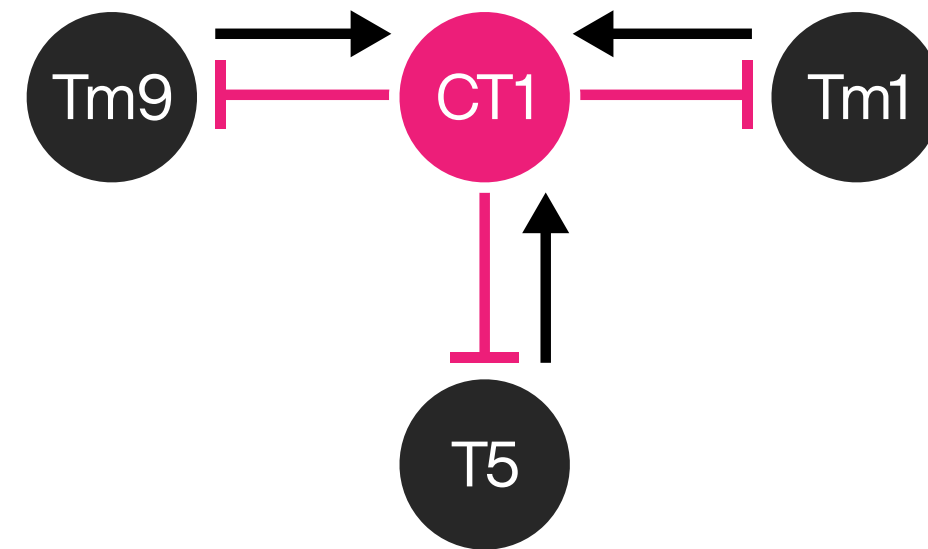
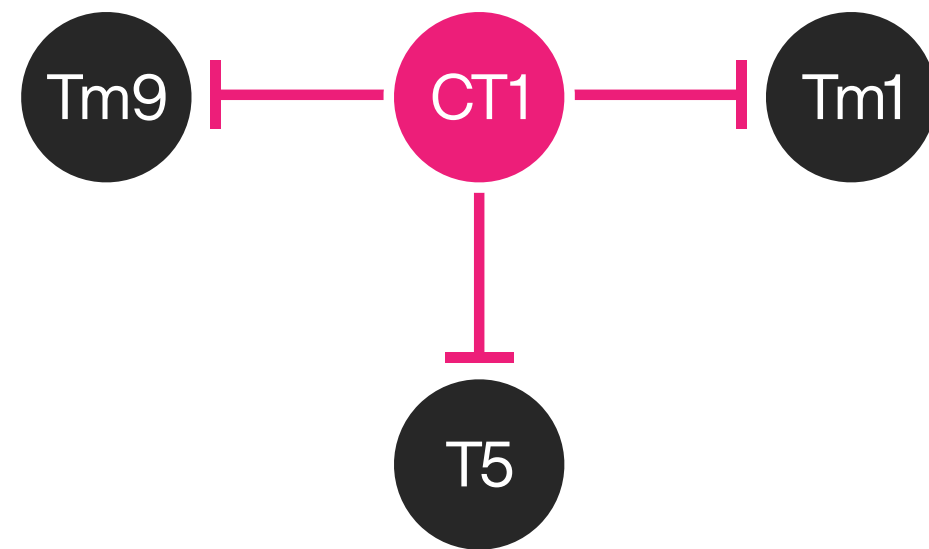
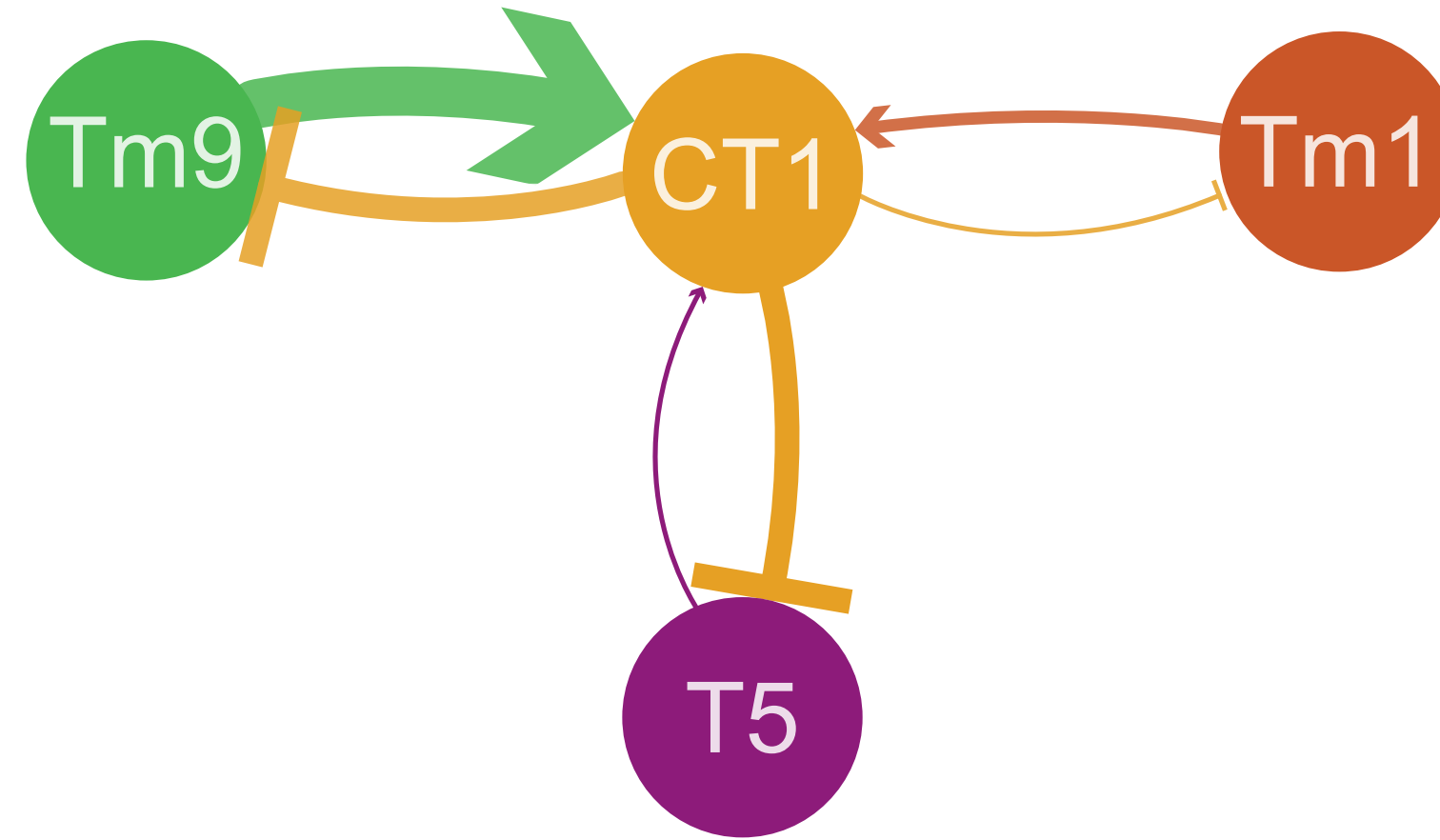
**make it easy to compare**

data structure vs encoding

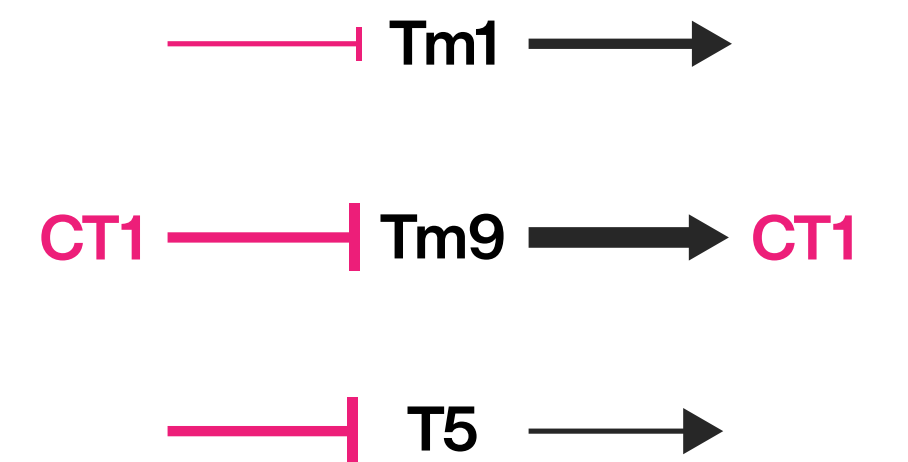
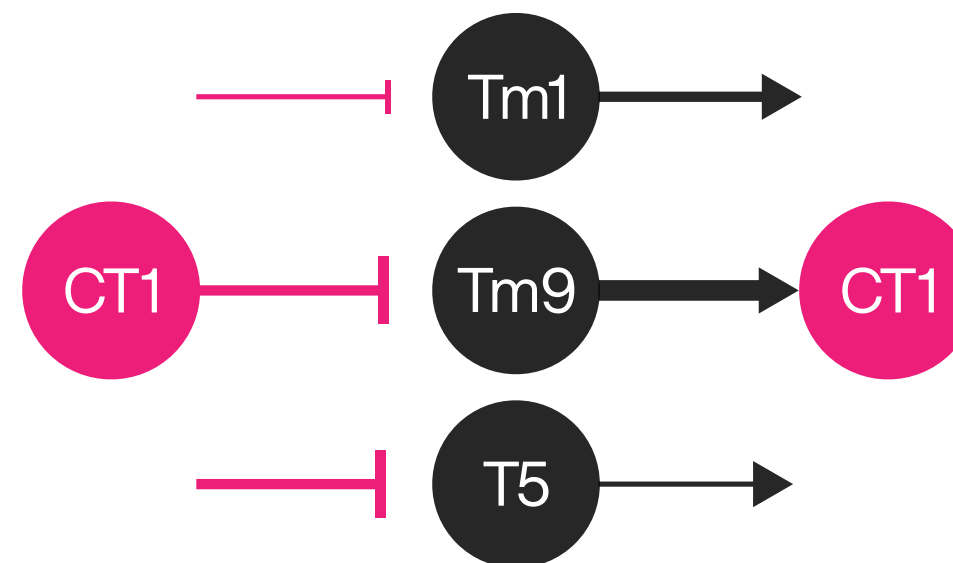
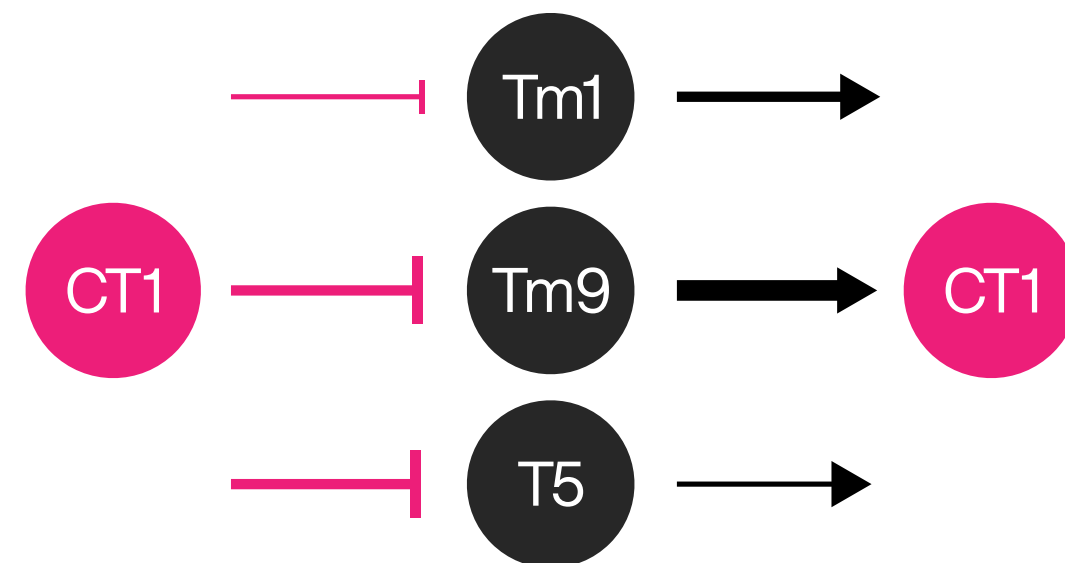
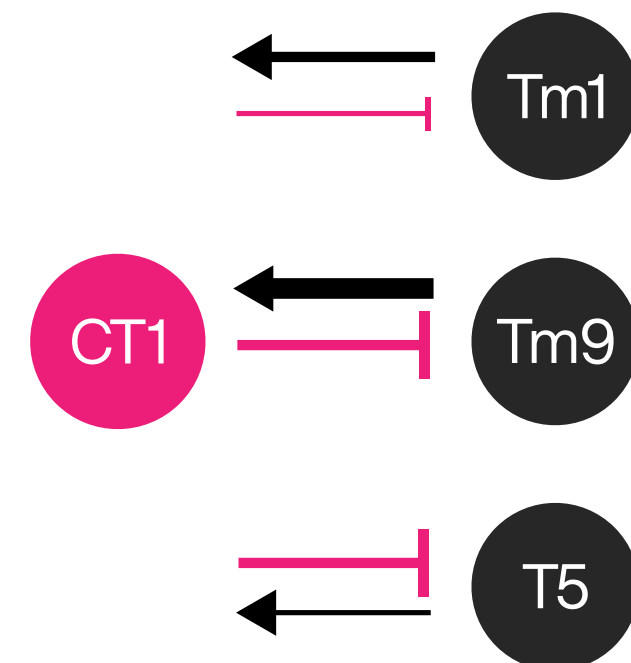
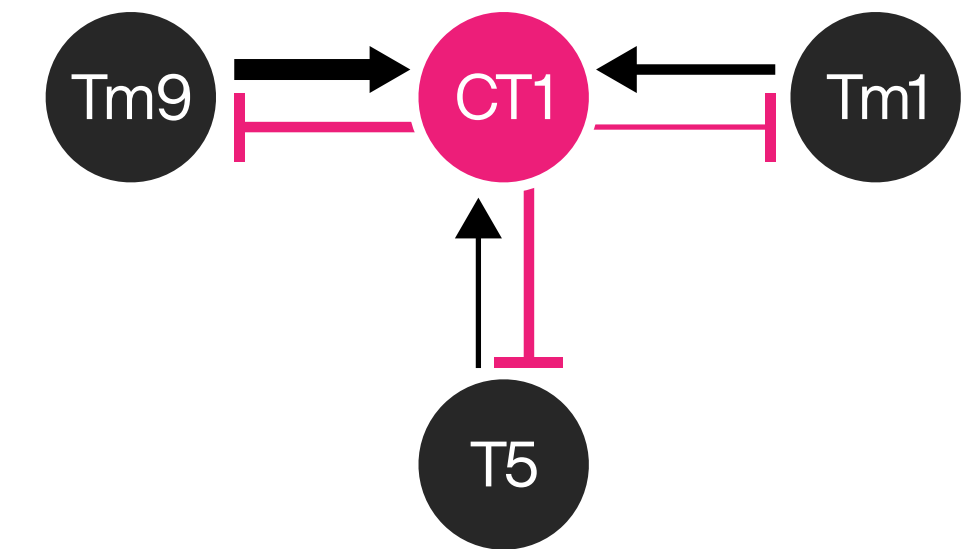
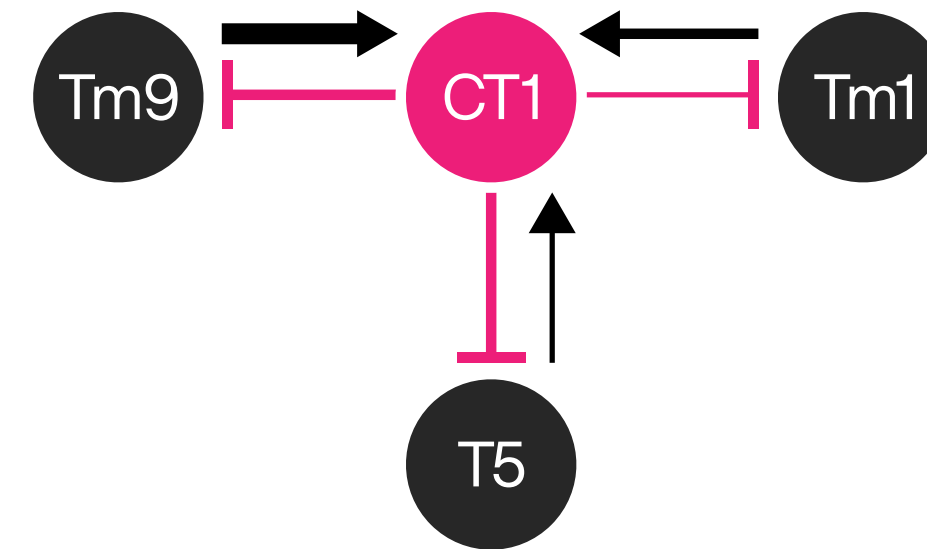
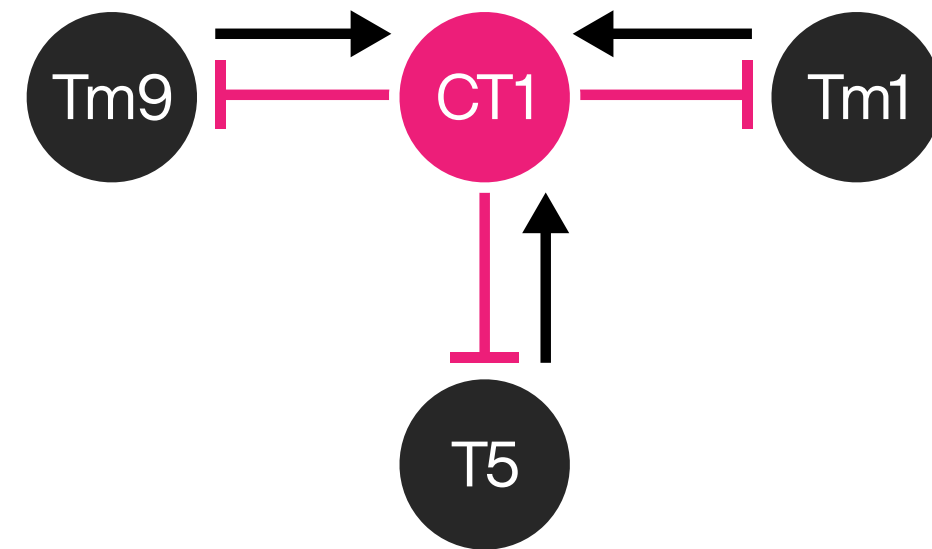
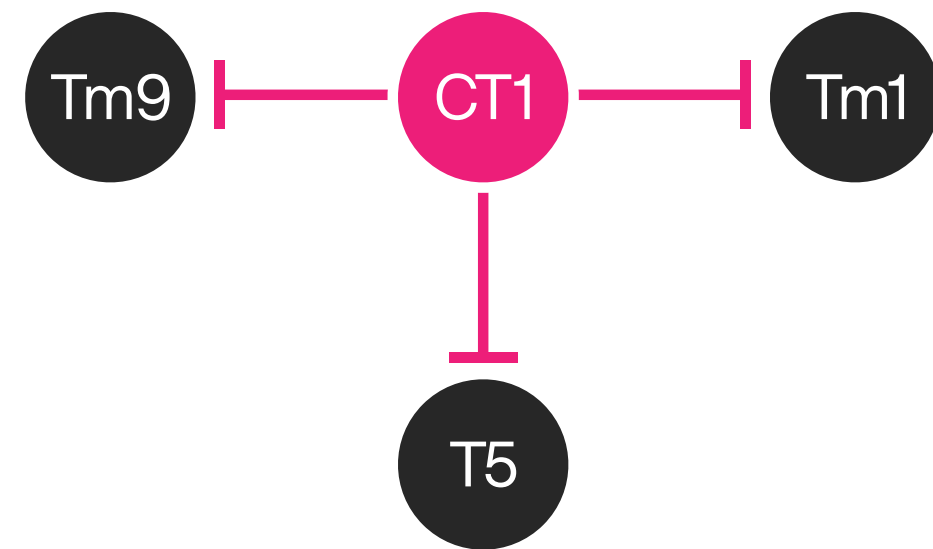
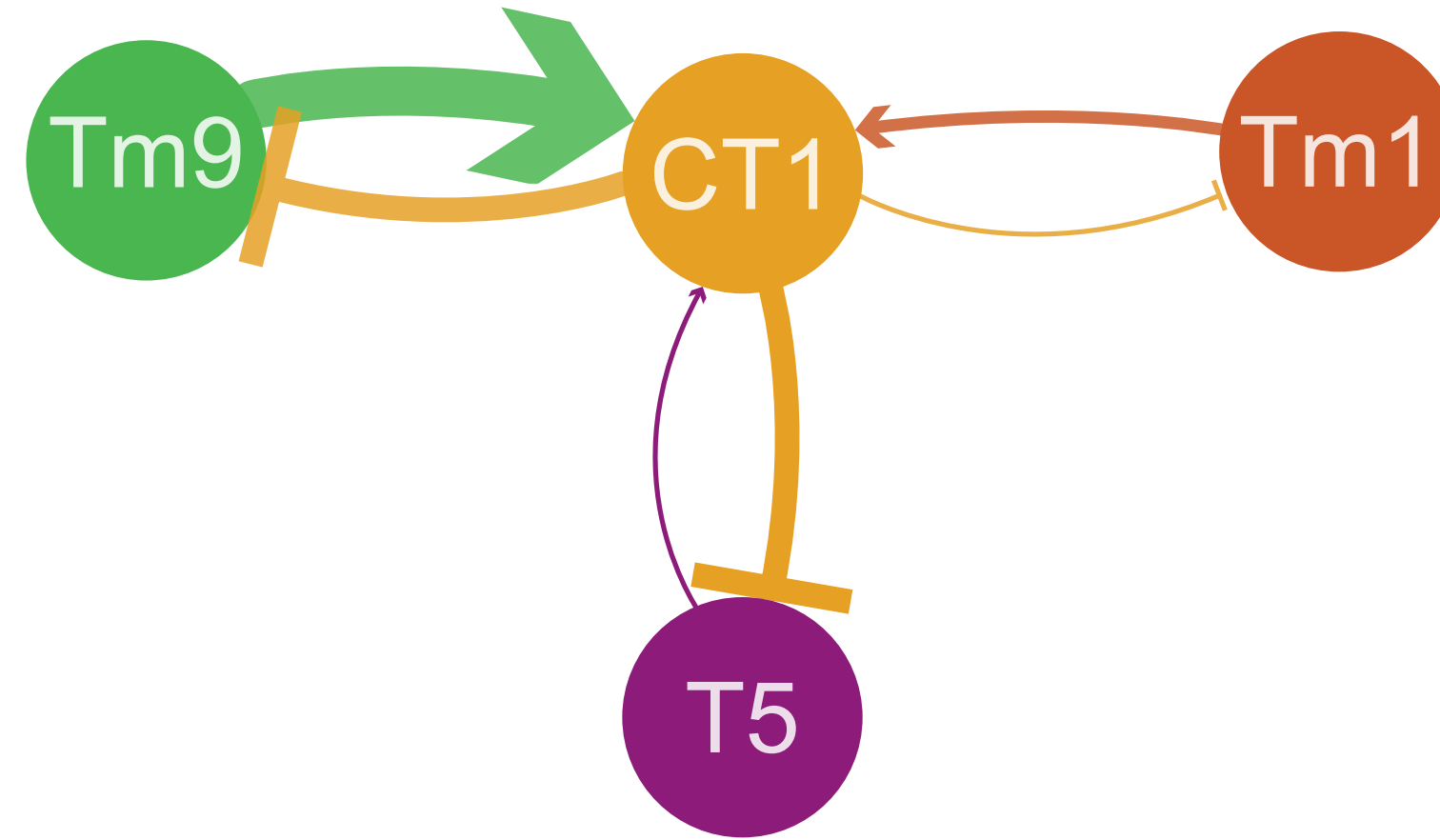
Microcircuit  
within each column



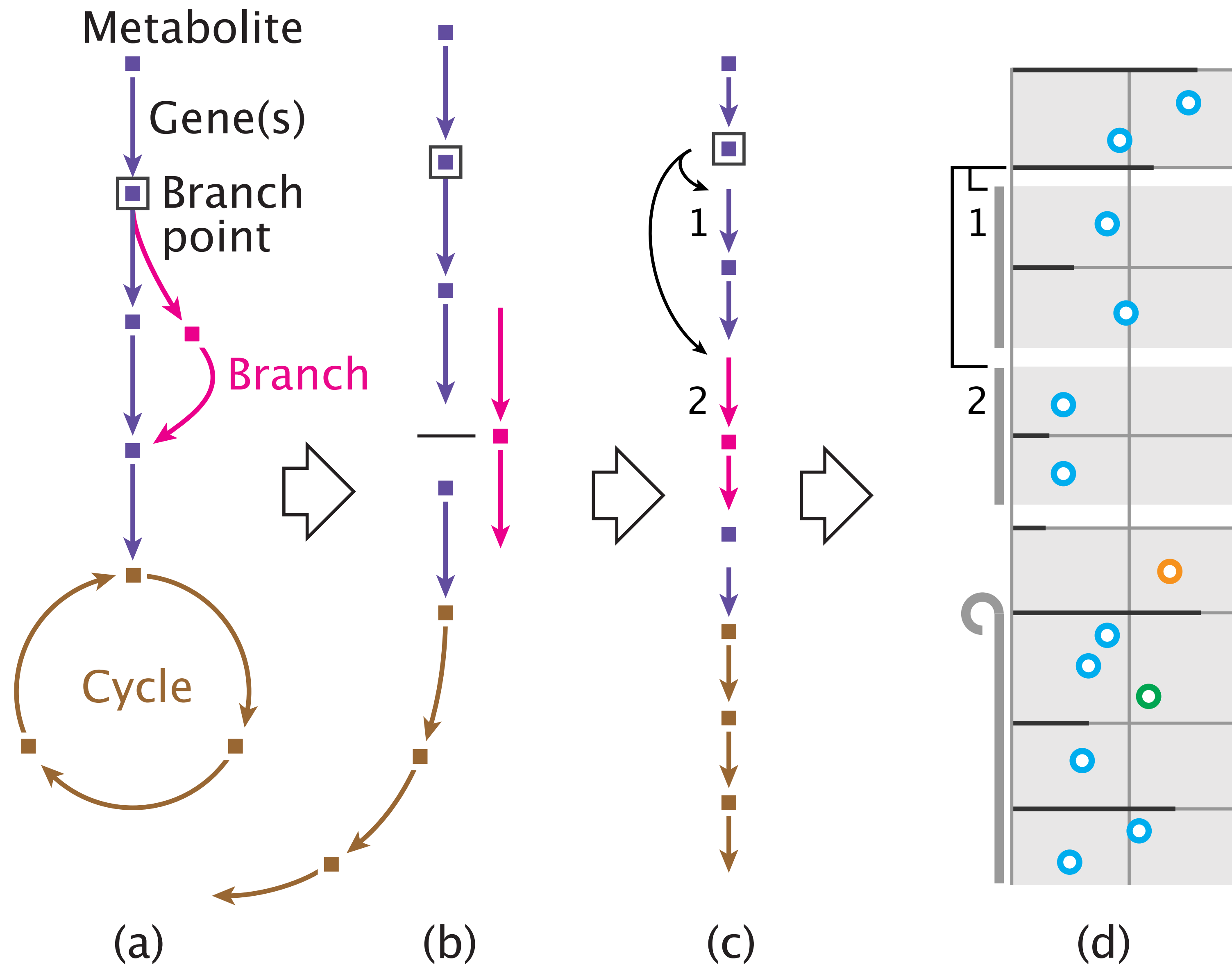
# Microcircuit within each column



# Microcircuit within each column



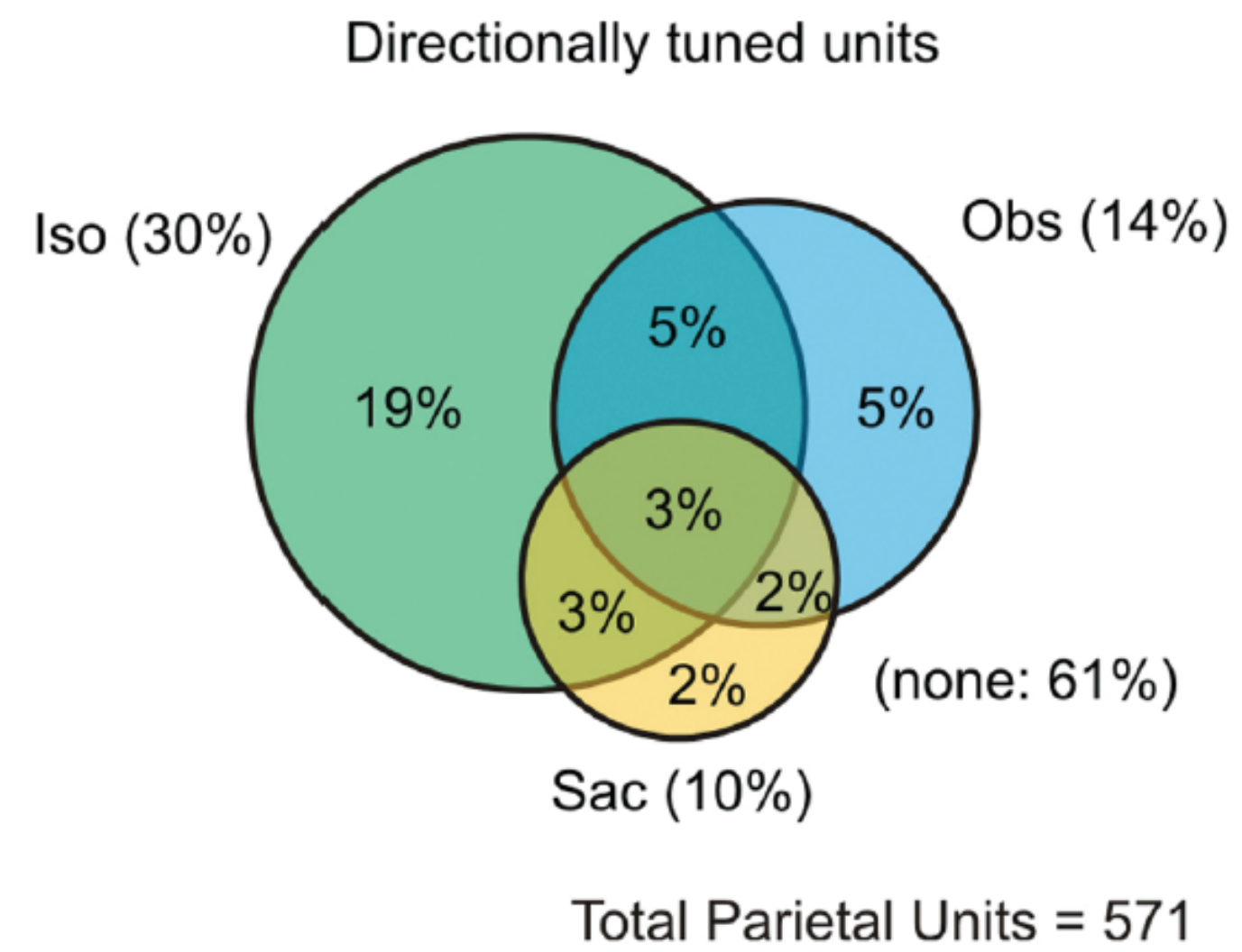
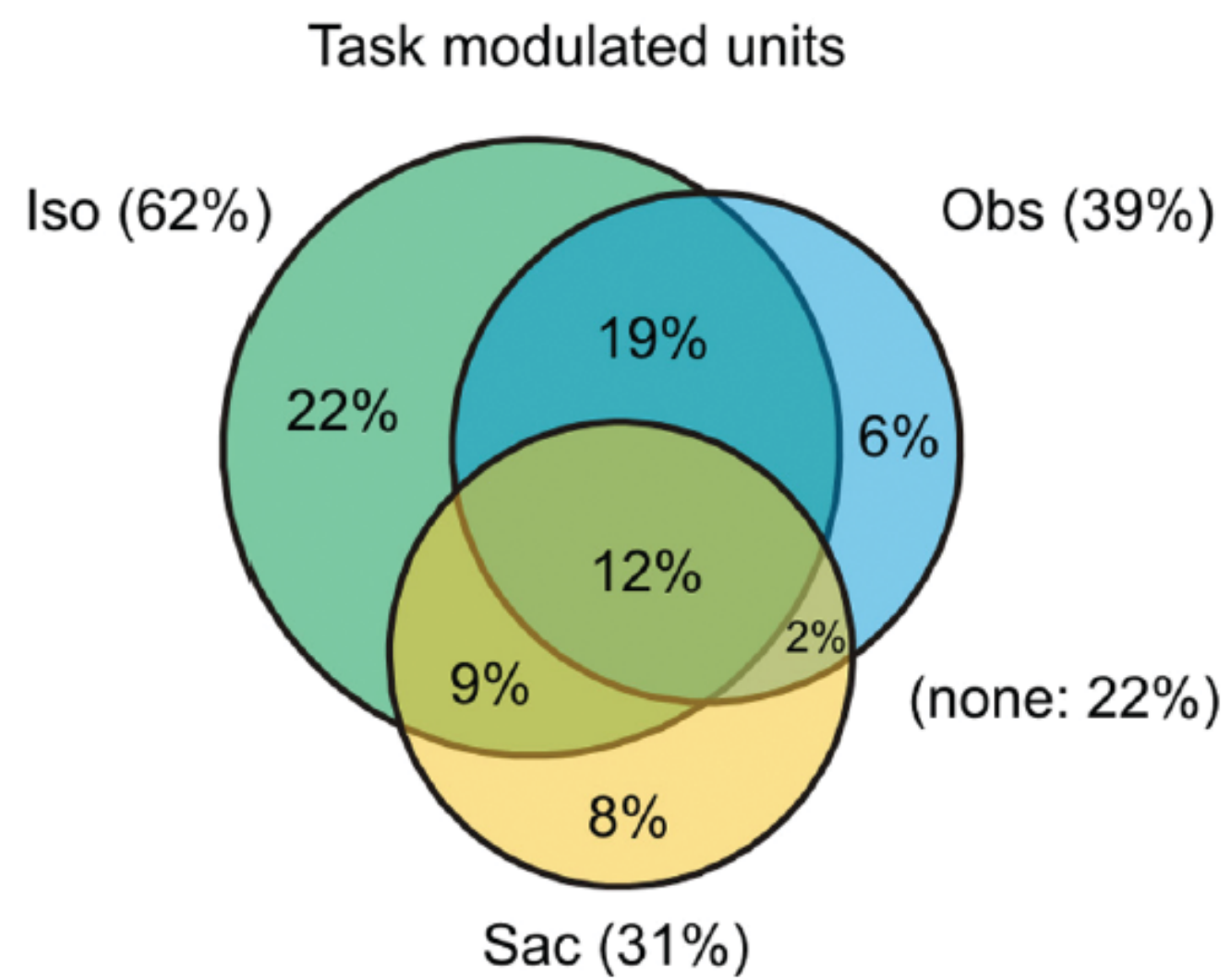


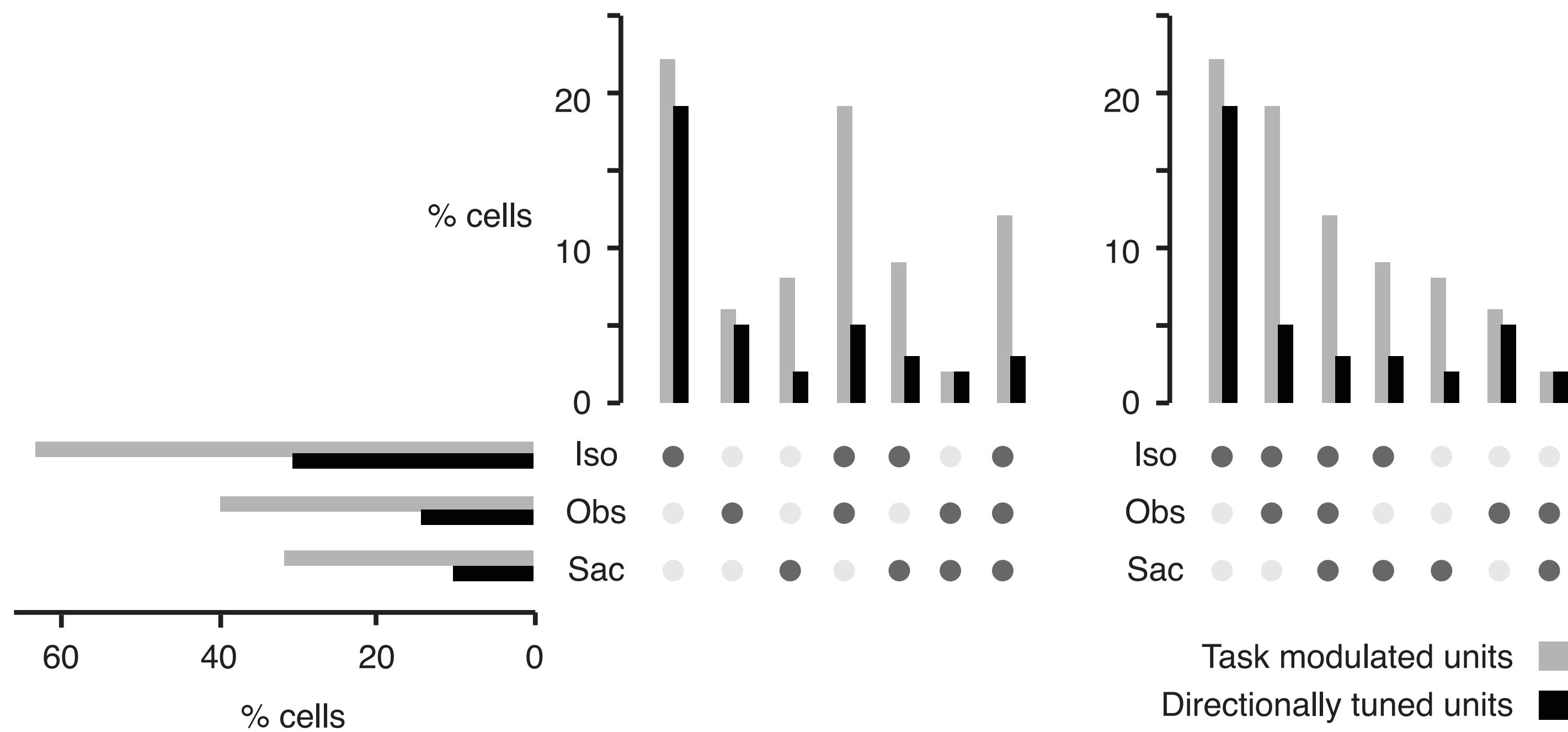
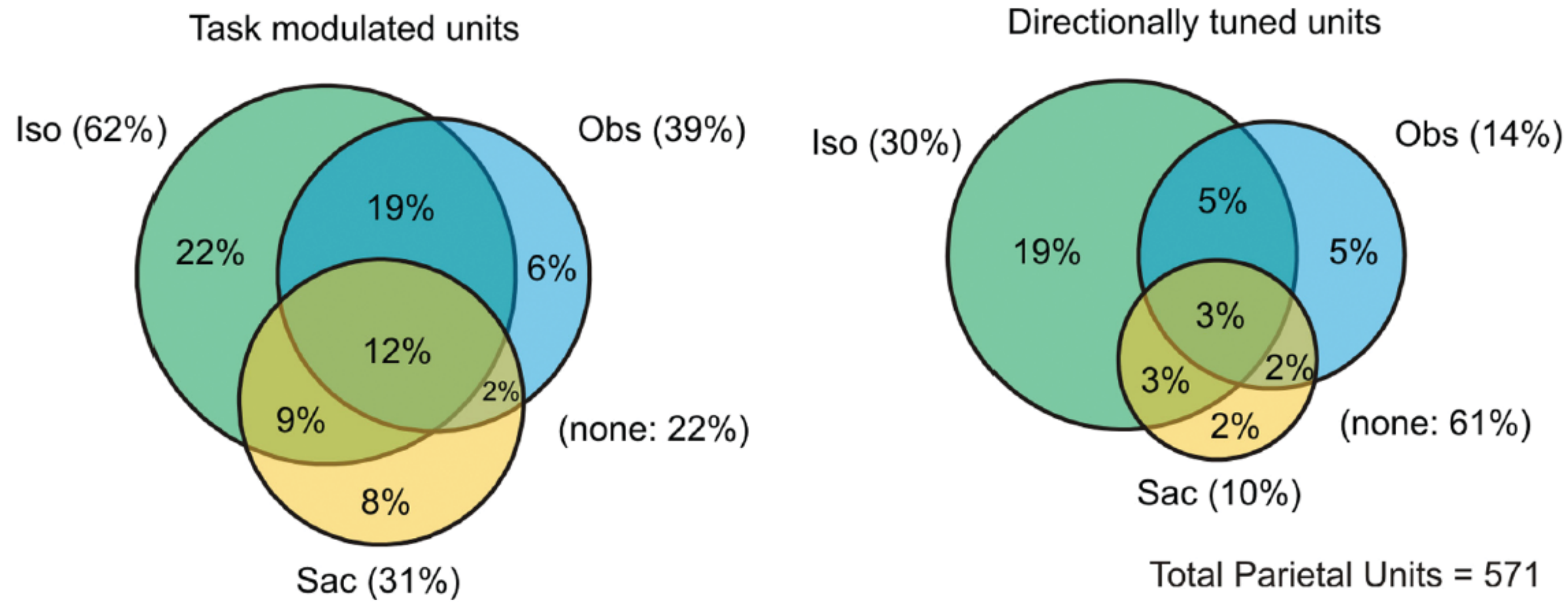


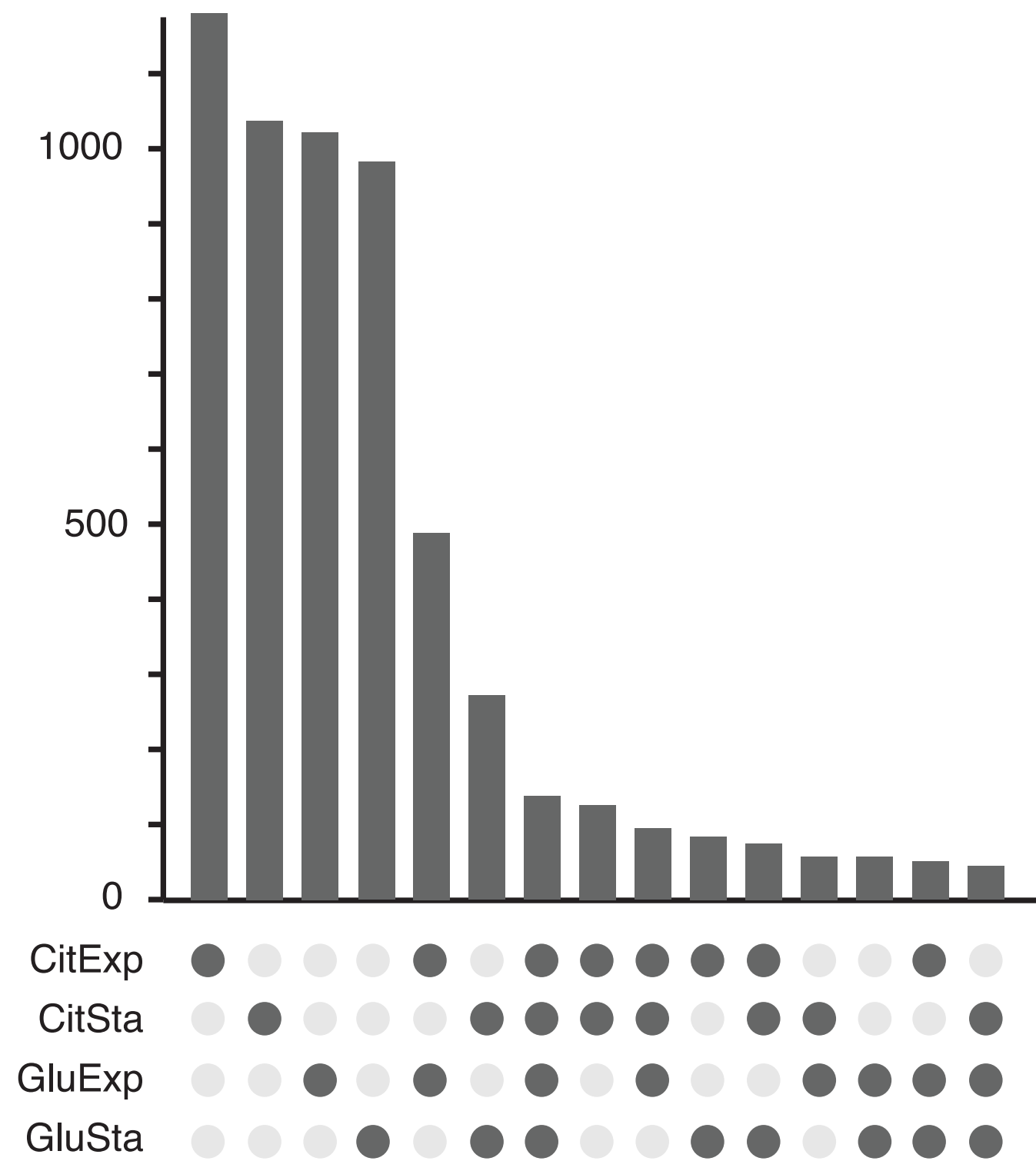
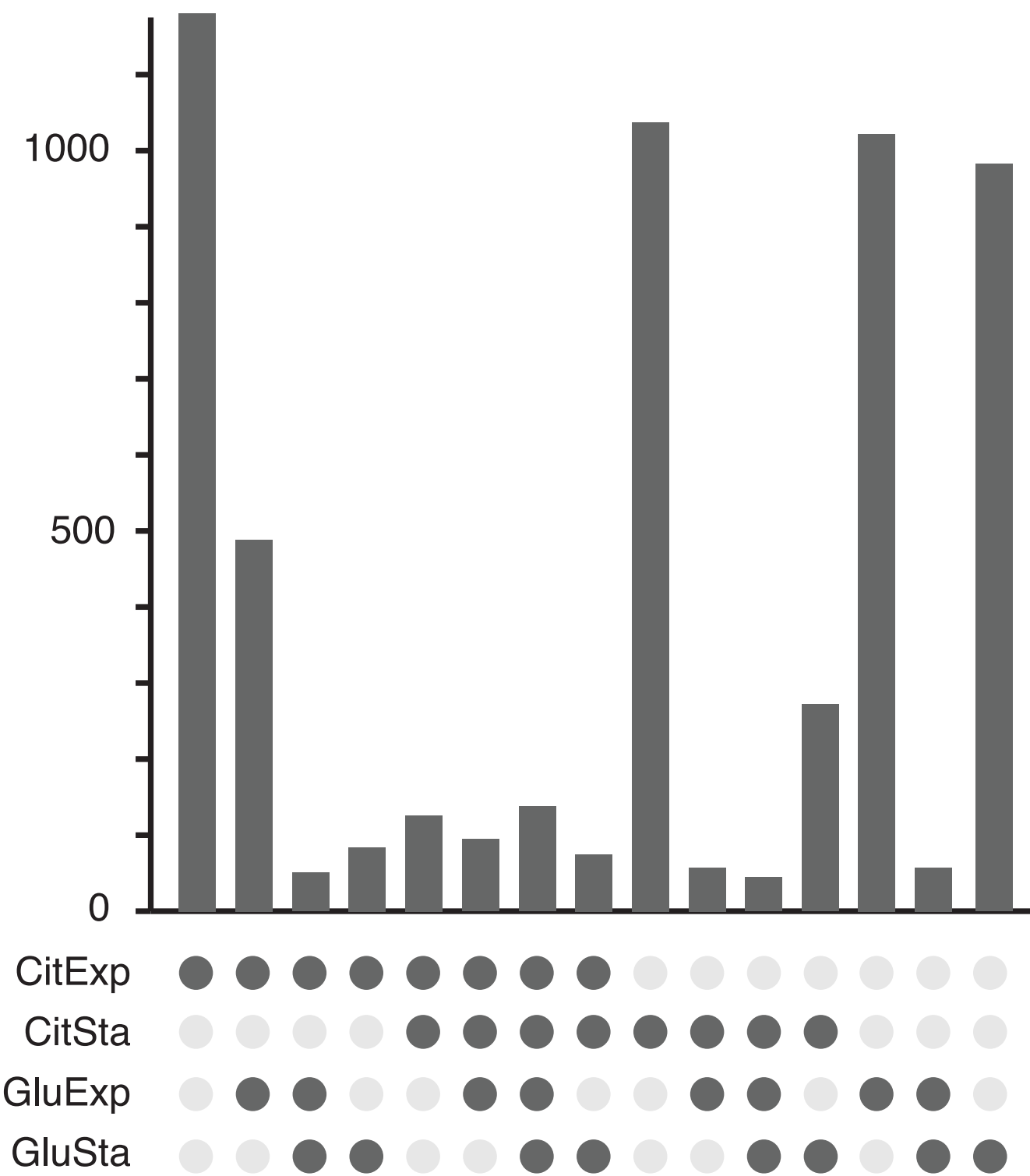
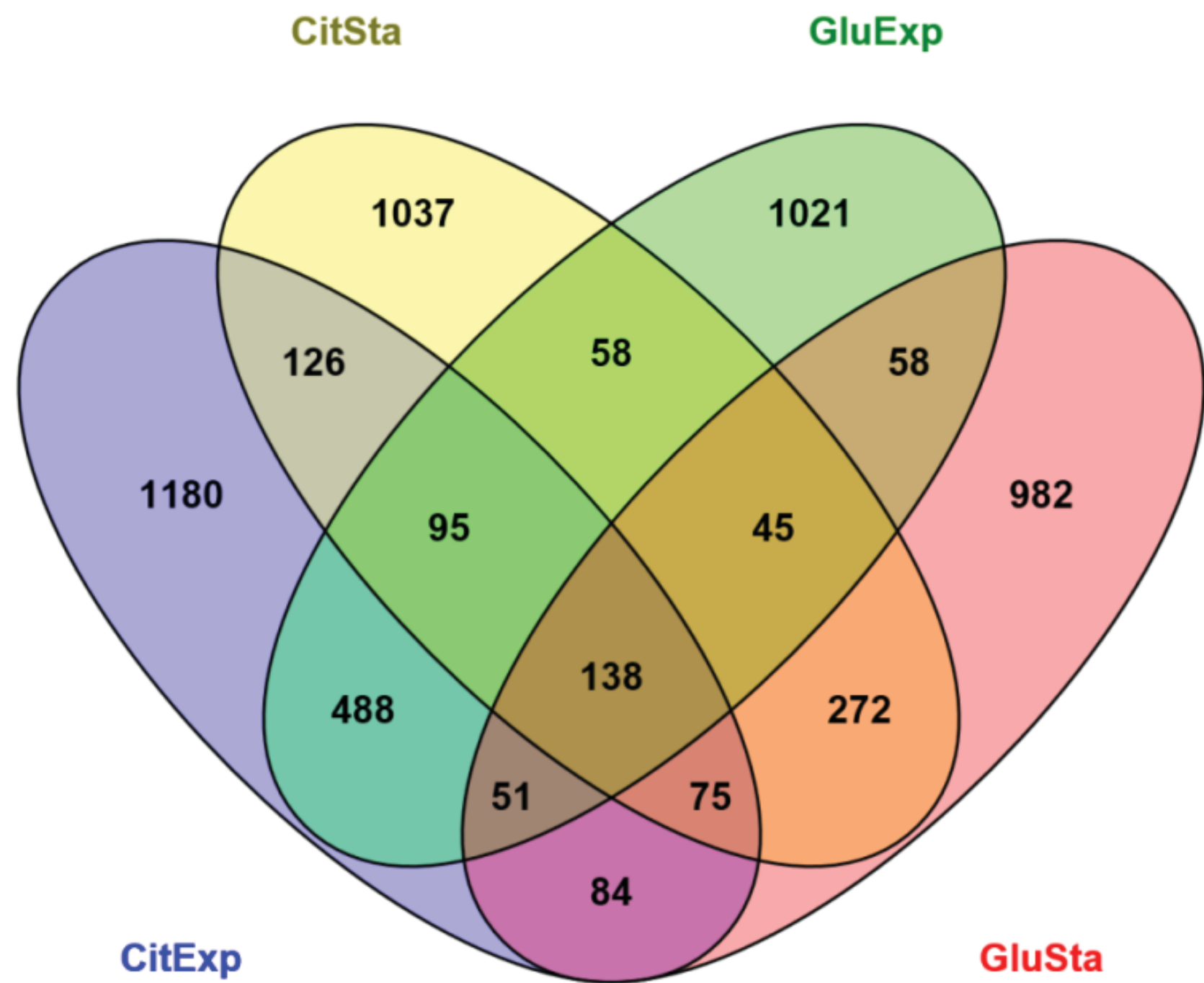


**make it easy to compare**

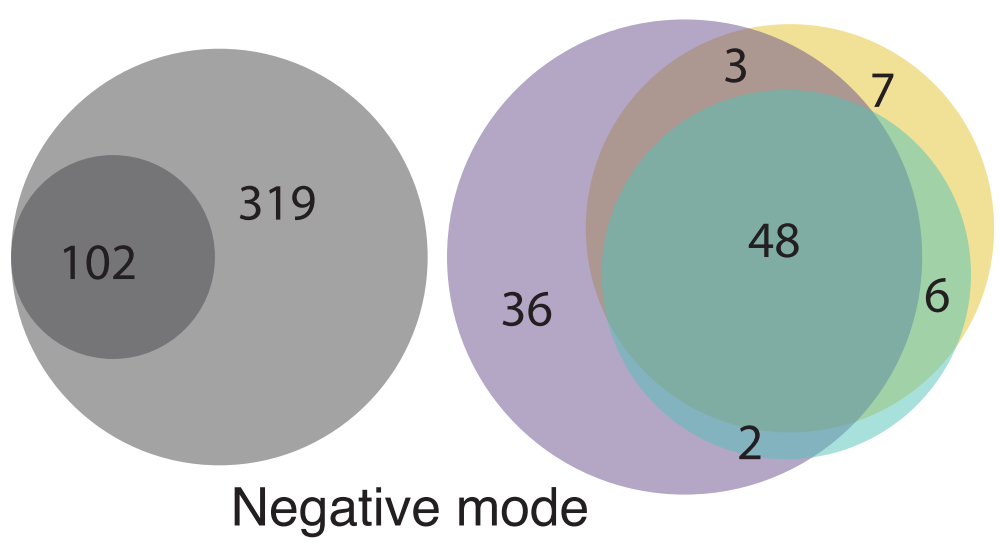
familiar, but useful?



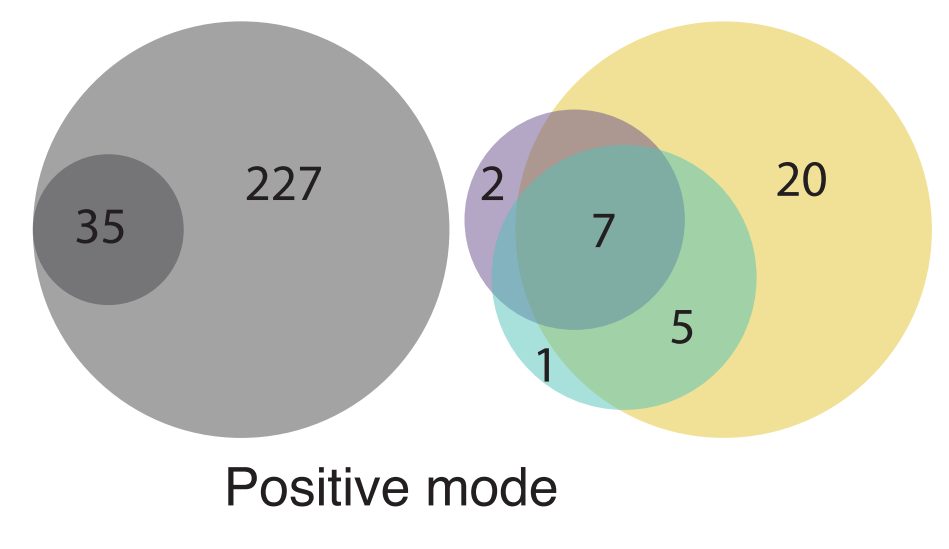


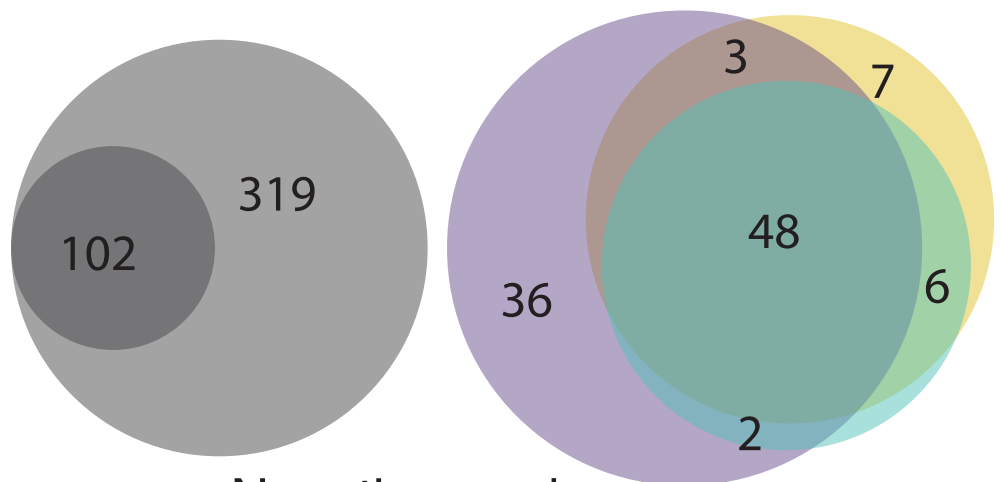




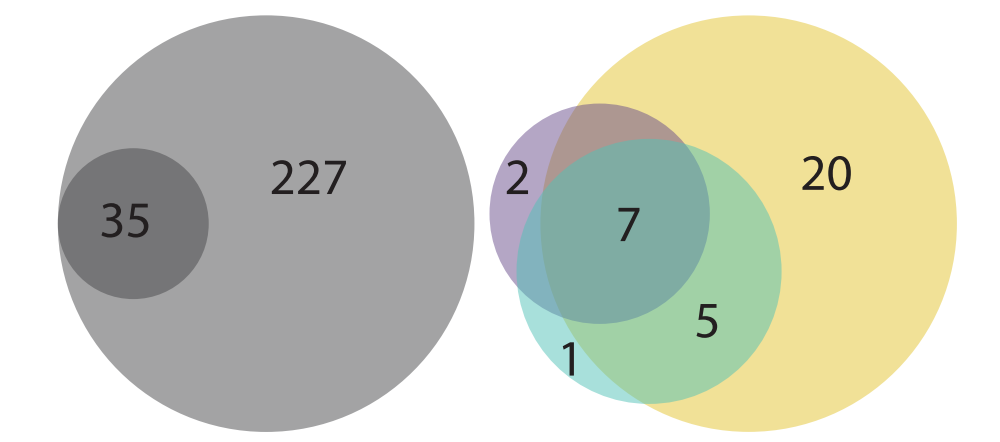


- total features
- features with MassList or MS2 match
- MassList match
- Spectral match (in house)
- Spectral match (mzCloud)





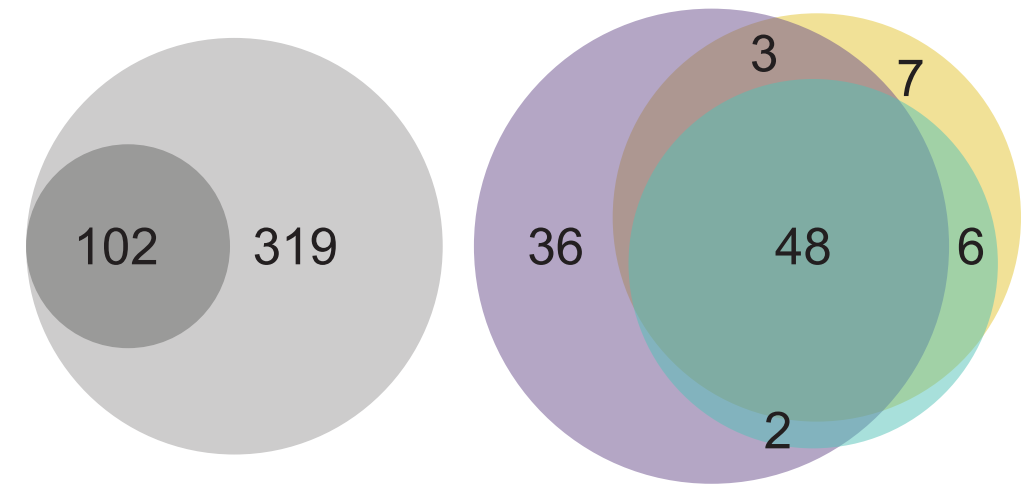
Negative mode



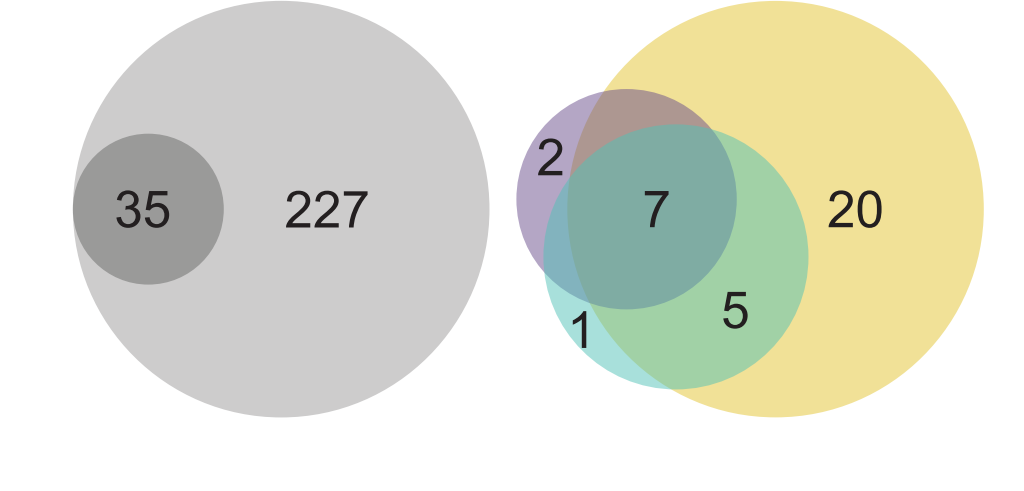
Positive mode

- total features
- features with MassList or MS2 match
- MassList match
- Spectral match (in house)
- Spectral match (mzCloud)

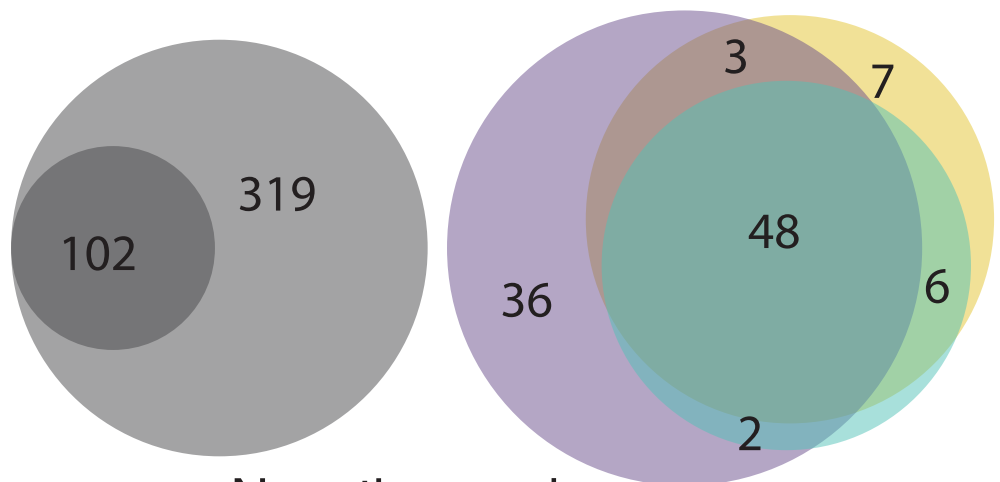
Negative mode



Positive mode

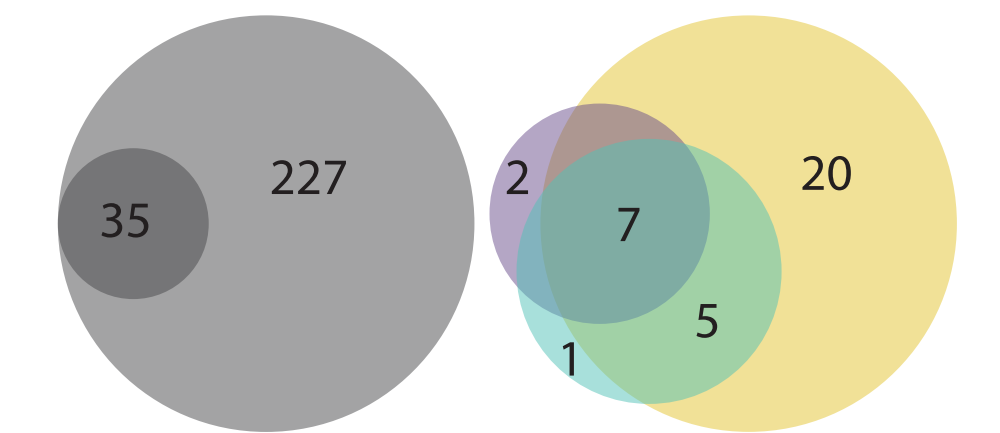


- total features
  - features with MassList or MS2 match
- MassList match
  - Spectral match (in house)
  - Spectral match (mzCloud)



Negative mode

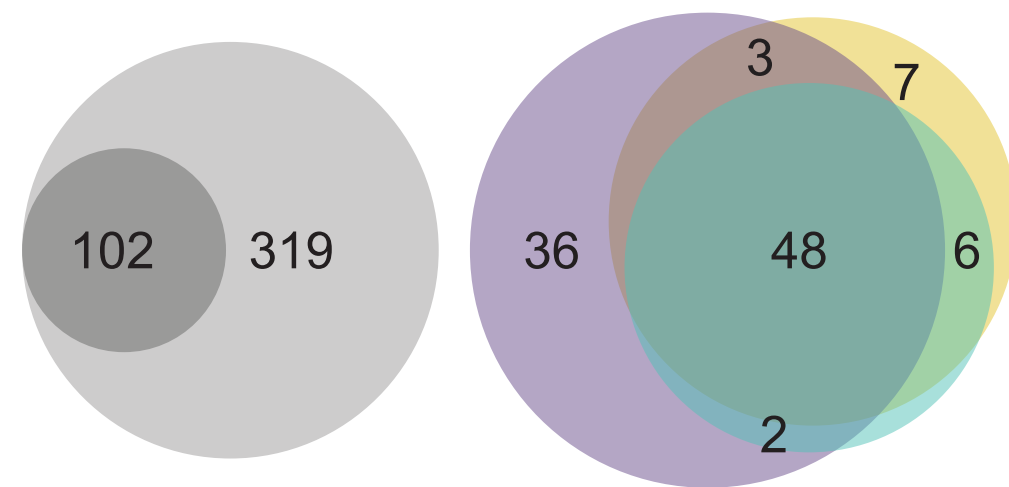
- total features
- features with MassList or MS2 match
- MassList match
- Spectral match (in house)
- Spectral match (mzCloud)



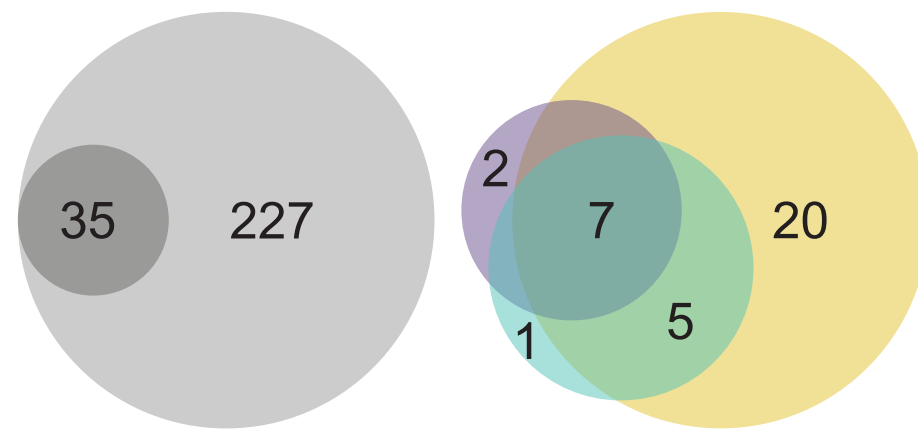
Positive mode

- total features ●
- features with MassList or MS2 match ●
- all other features ●
- MassList match
- Spectral match (in house)
- Spectral match (mzCloud)

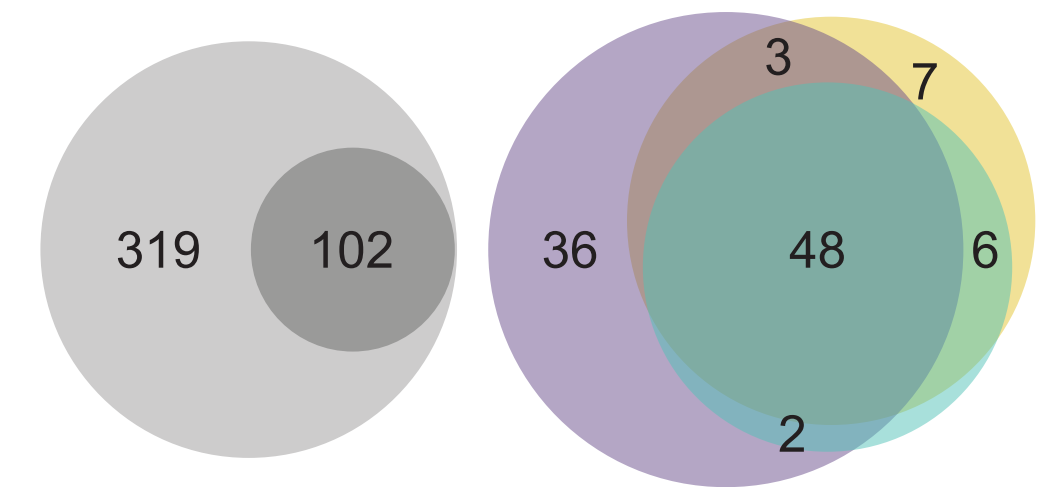
Negative mode



Positive mode



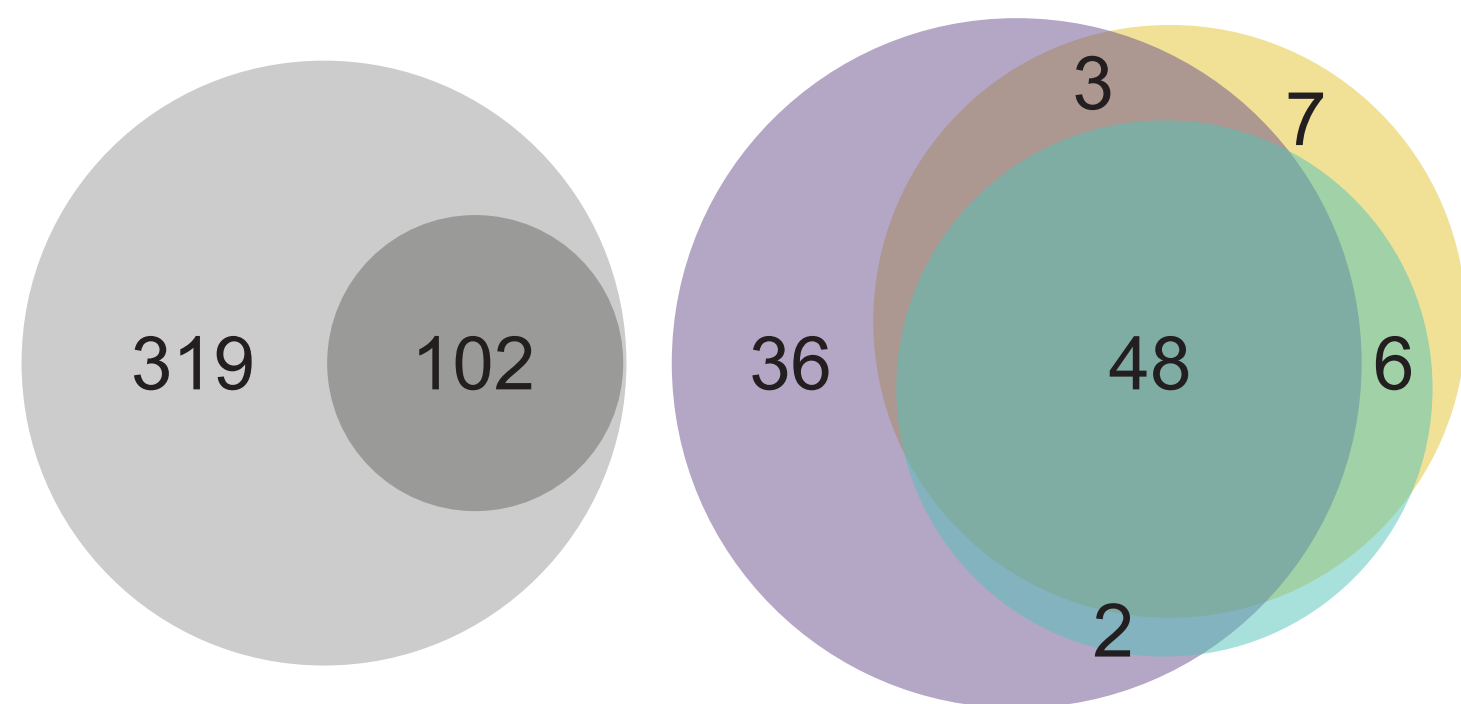
Negative mode



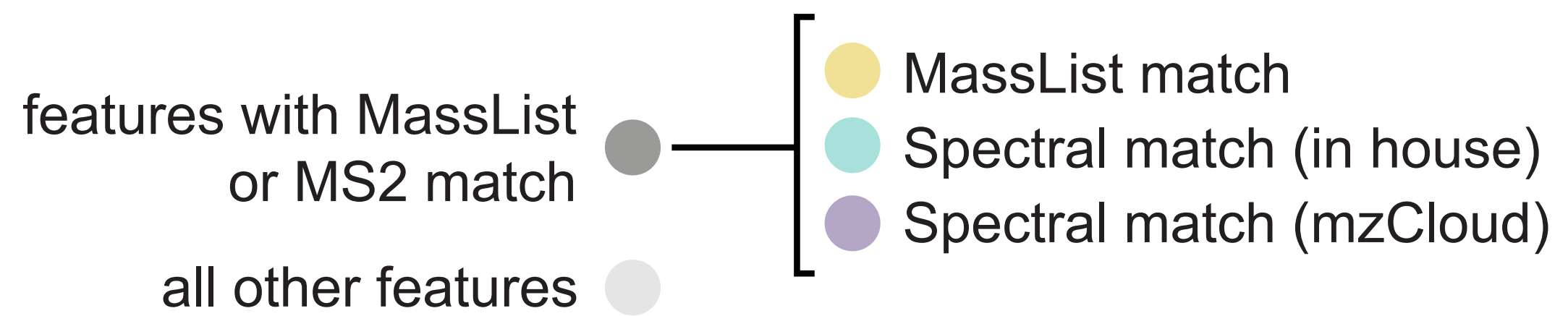
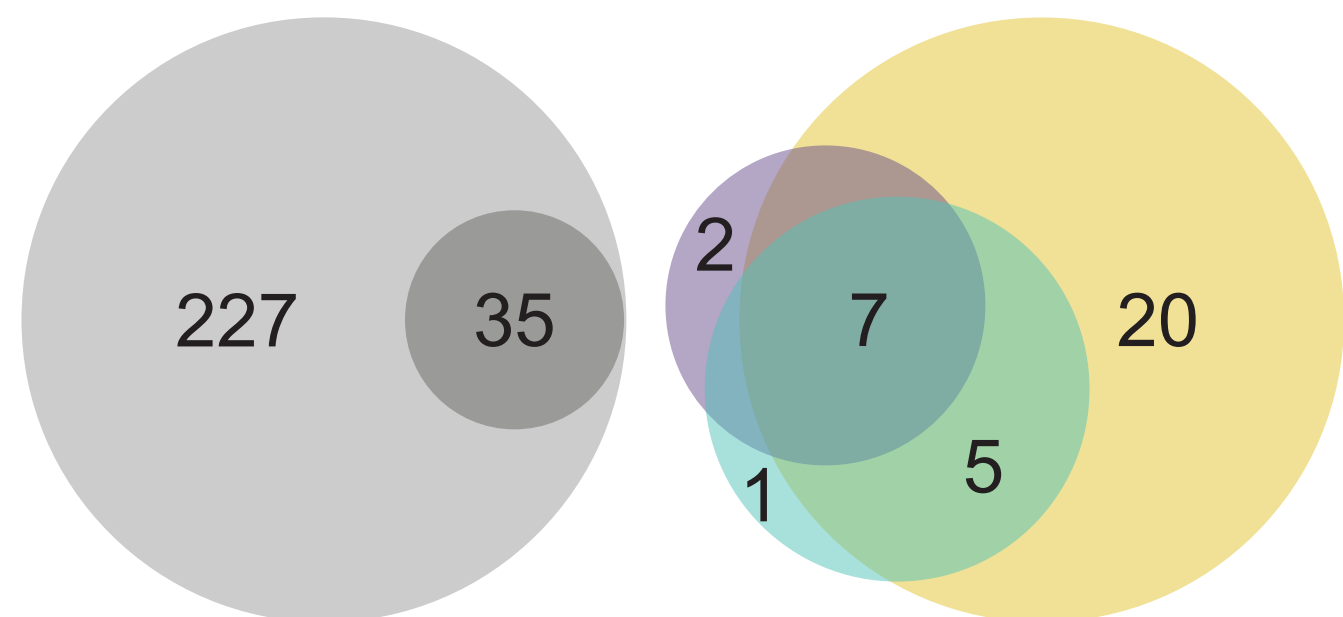
Positive mode

- features with MassList or MS2 match ●
- all other features ●
- MassList match
- Spectral match (in house)
- Spectral match (mzCloud)

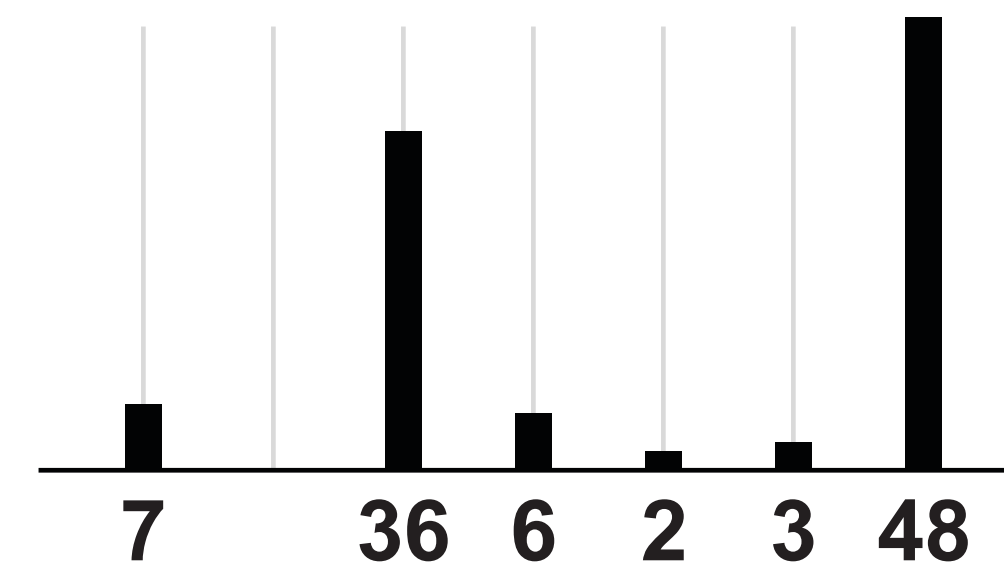
Negative mode



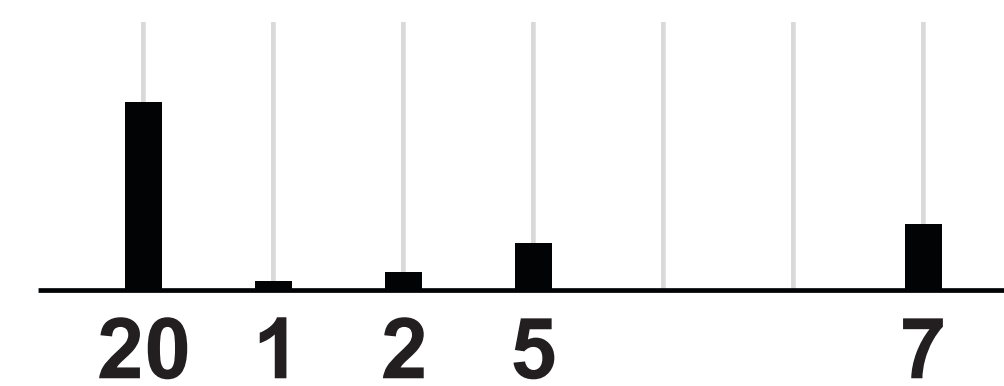
Positive mode



**NEGATIVE MODE 102/319**  
matched/other



**POSITIVE MODE 35/227**



match	MassList	●		●		●	●
	Spectral		●	●	●		●
	in house mzCloud			●		●	●



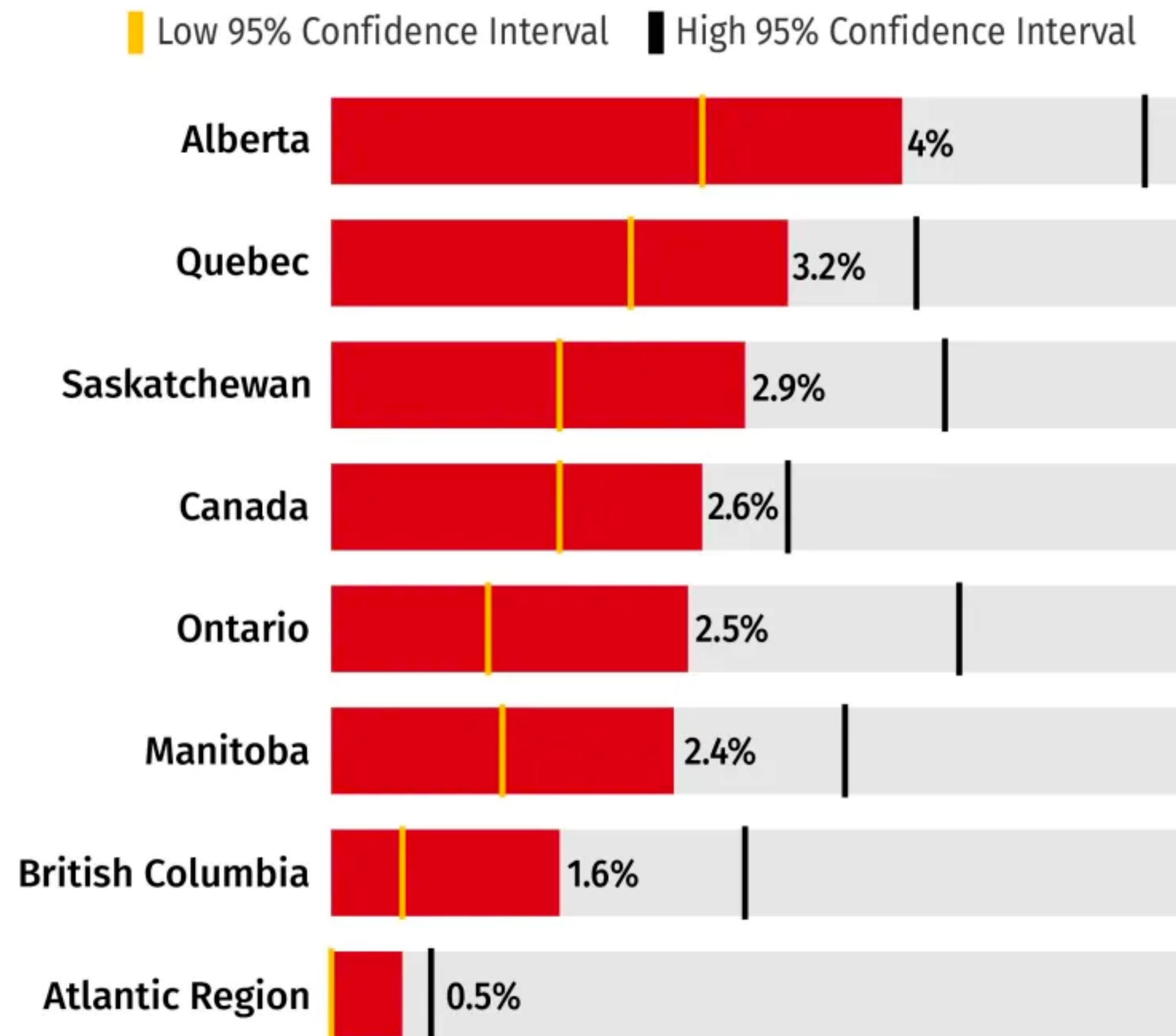
**make it easy to compare**

encode intuitively



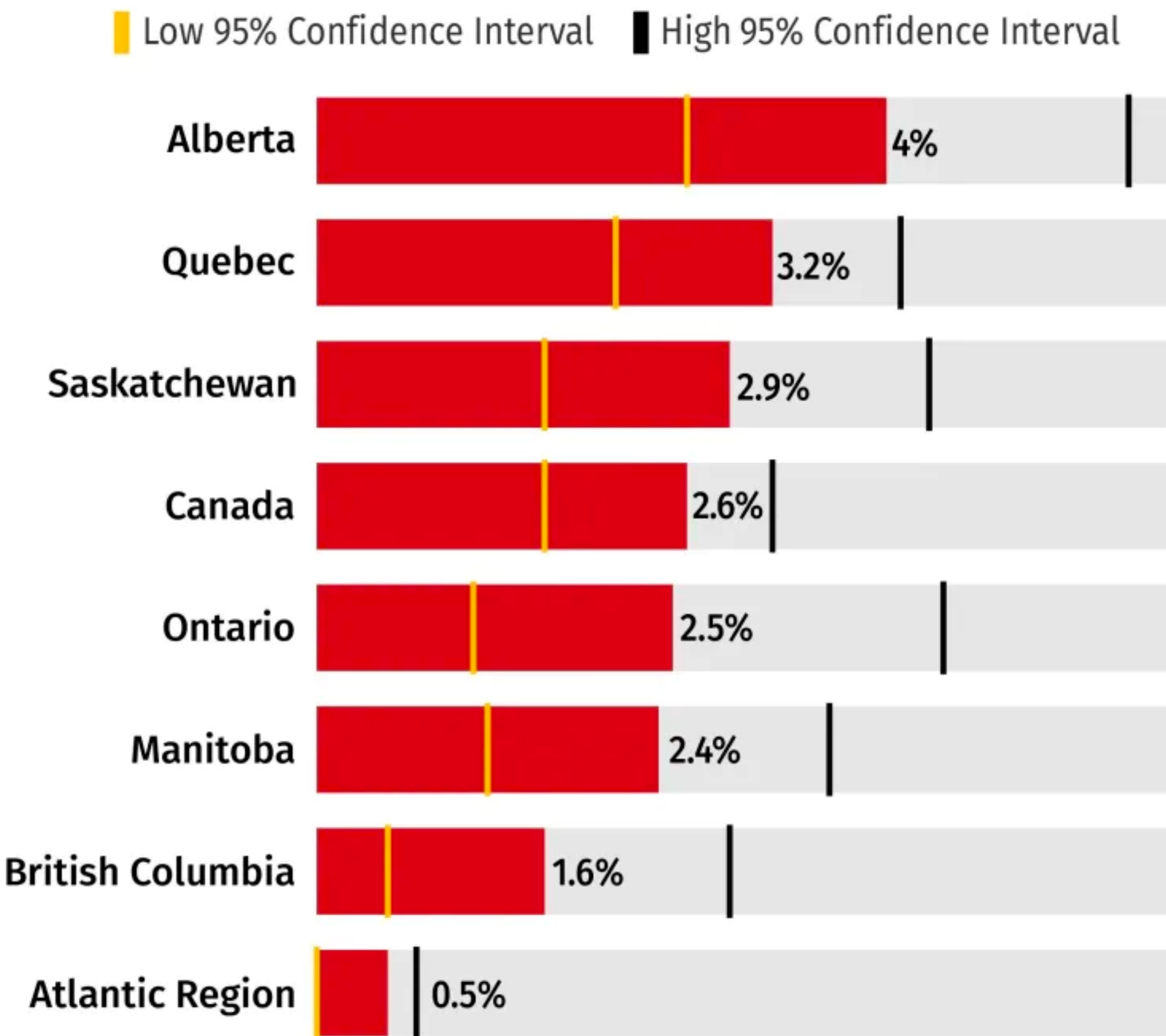
# Estimates of COVID-19 infection based on blood antibodies

Bars show the **estimated** percentage of people who had been infected with COVID-19 in each jurisdiction, based on antibodies being detected in blood samples gathered from November 2020 to April 2021. **The bulk of the blood samples were collected in January and February 2021.**

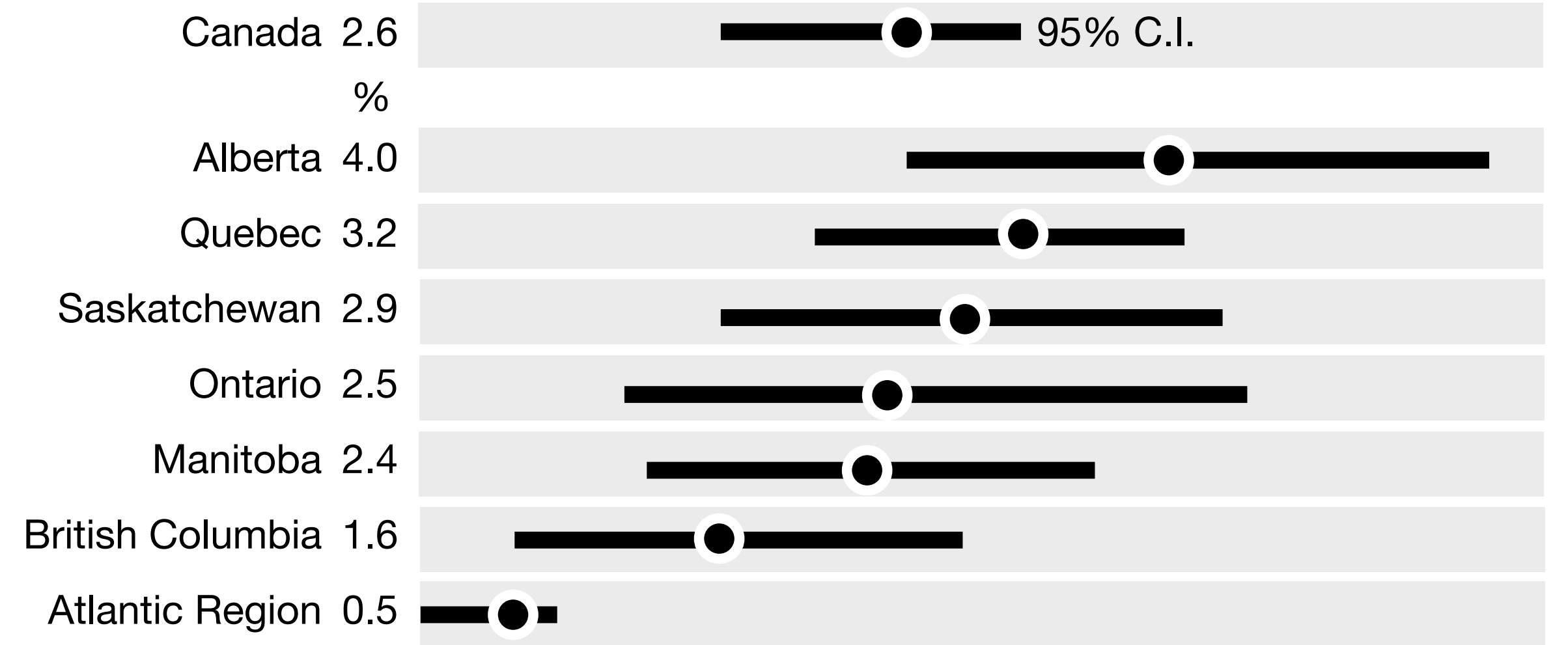


# Estimates of COVID-19 infection based on blood antibodies

Bars show the **estimated** percentage of people who had been infected with COVID-19 in each jurisdiction, based on antibodies being detected in blood samples gathered from November 2020 to April 2021. **The bulk of the blood samples were collected in January and February 2021.**



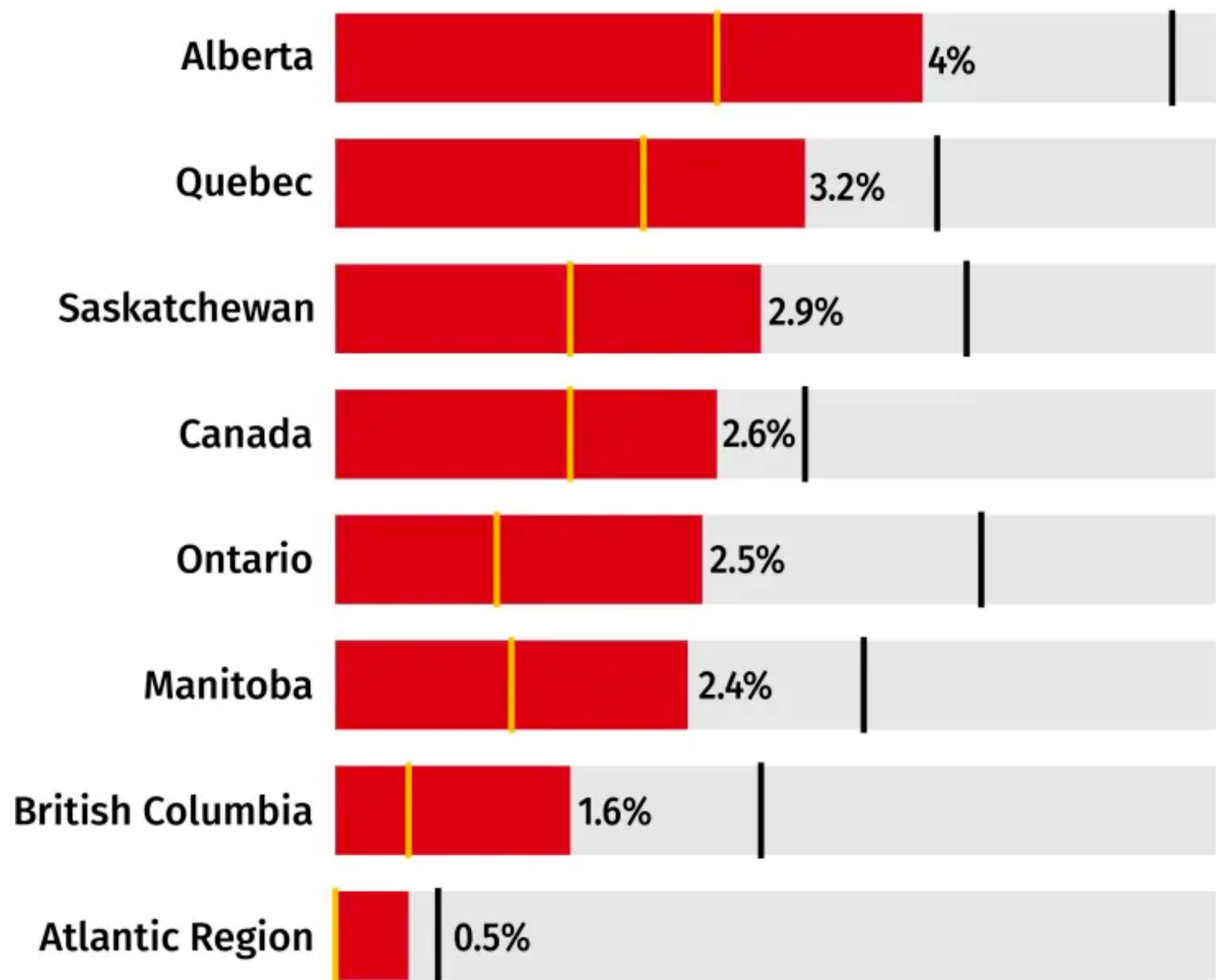
# Estimate of COVID-19 infection based on blood antibodies



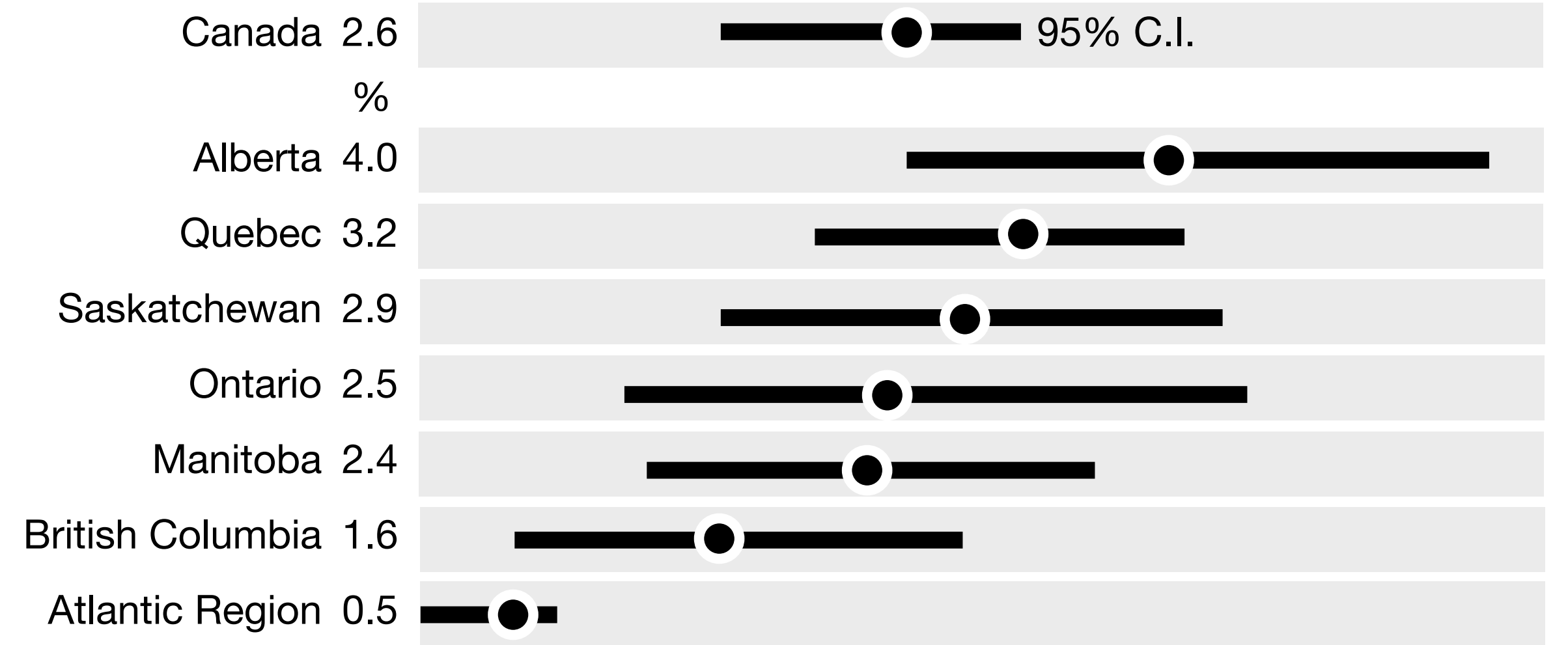
# Estimates of COVID-19 infection based on blood antibodies

Bars show the **estimated** percentage of people who had been infected with COVID-19 in each jurisdiction, based on antibodies being detected in blood samples gathered from November 2020 to April 2021. **The bulk of the blood samples were collected in January and February 2021.**

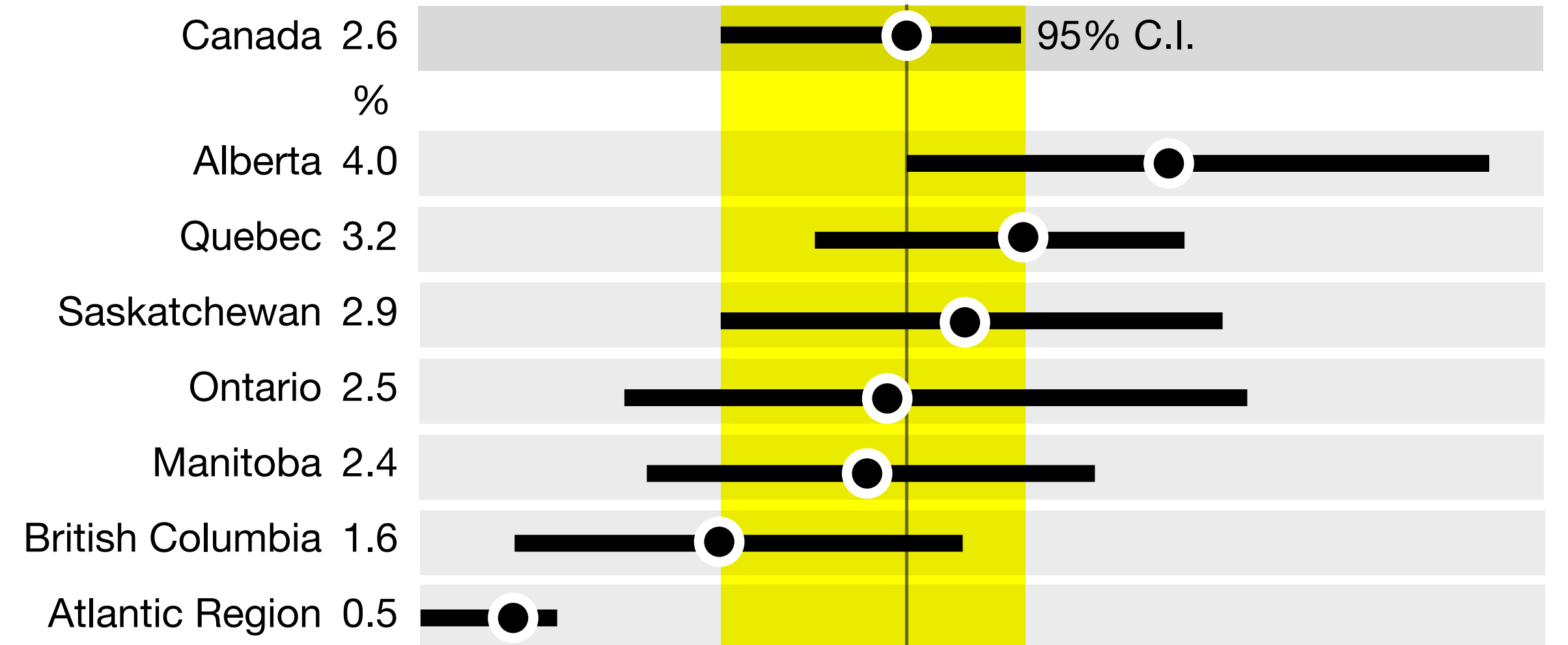
█ Low 95% Confidence Interval   
 █ High 95% Confidence Interval



# Estimate of COVID-19 infection based on blood antibodies



# Estimate of COVID-19 infection based on blood antibodies

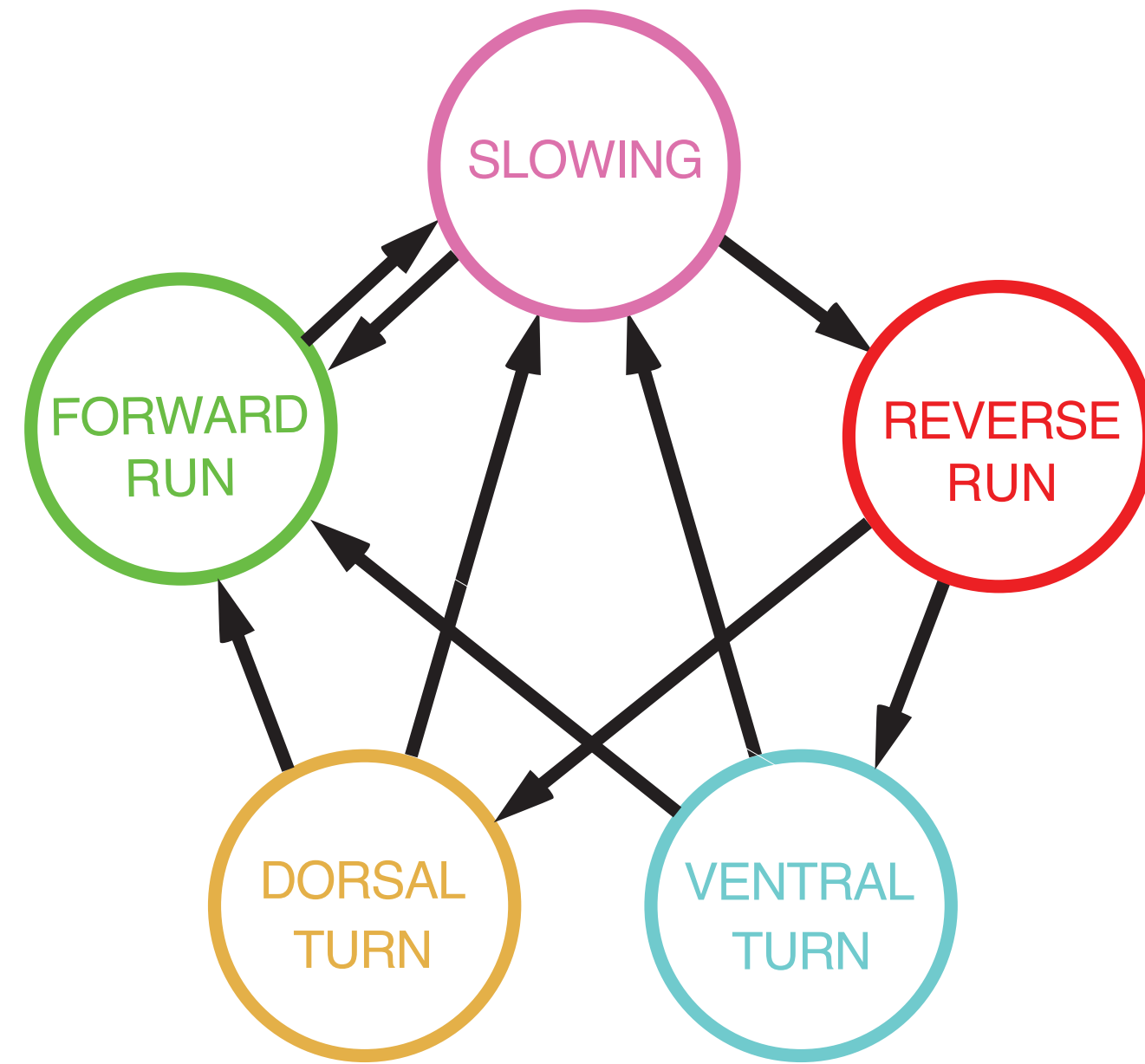




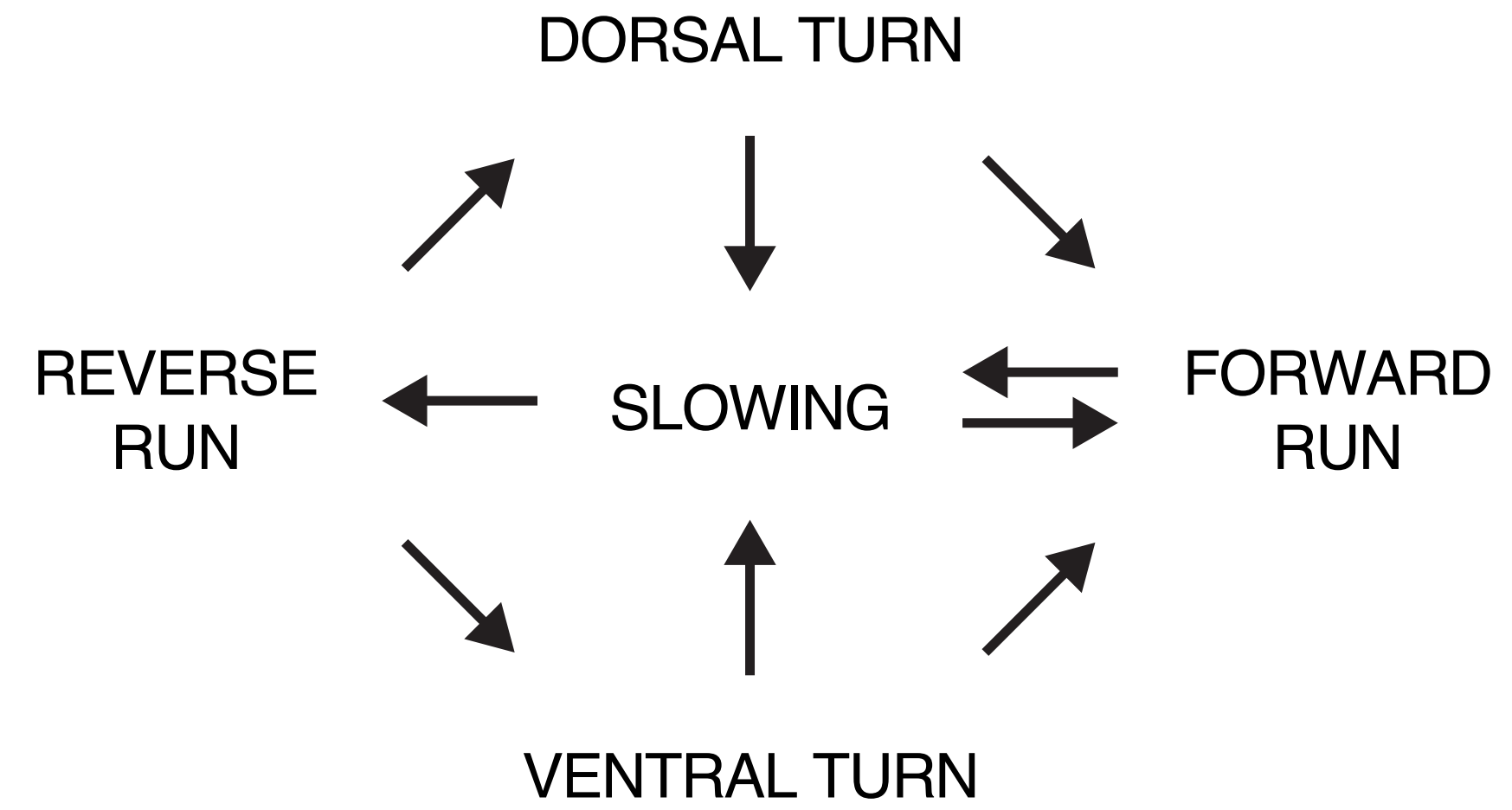
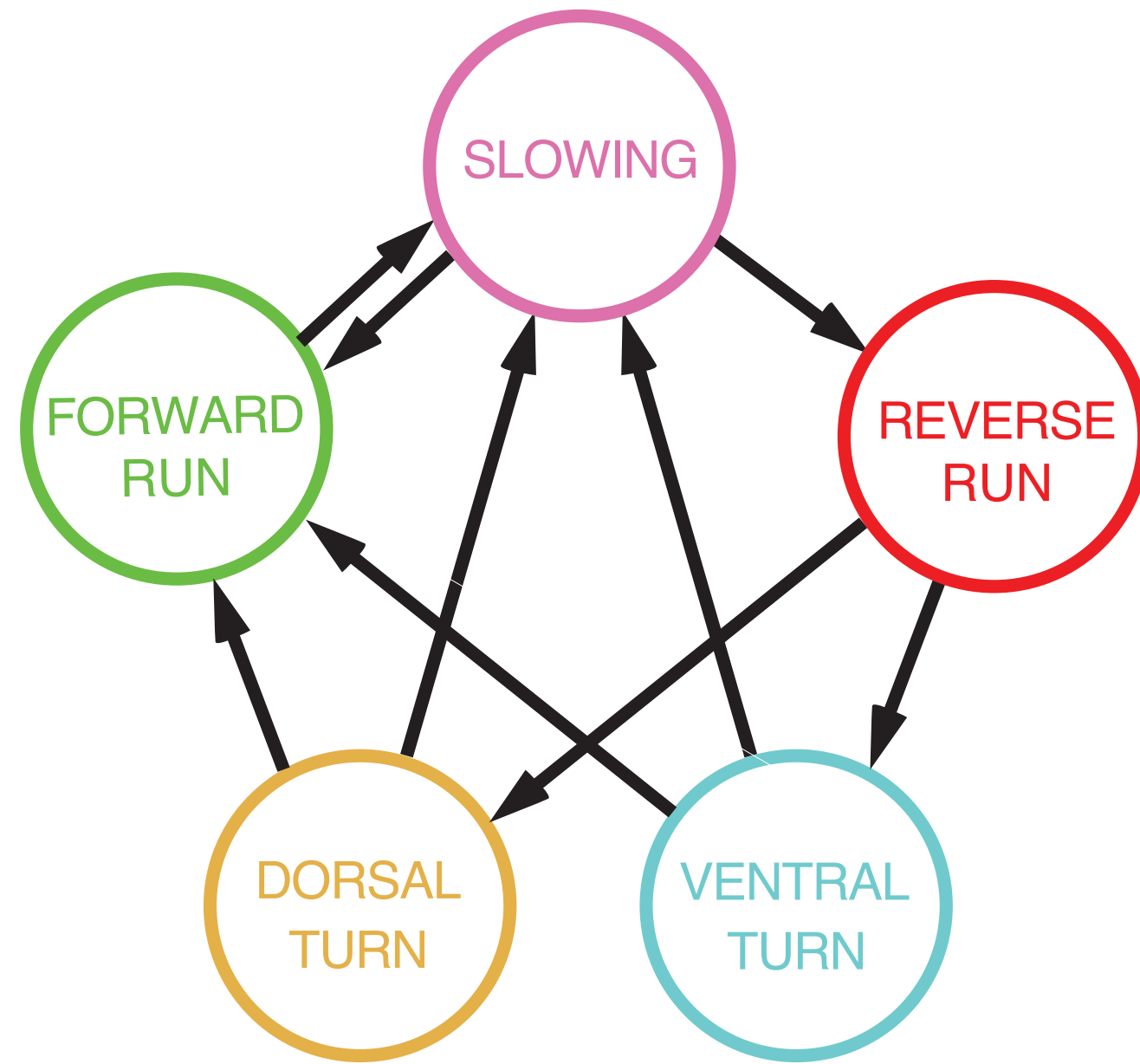


**make it easy to compare**

sense from order







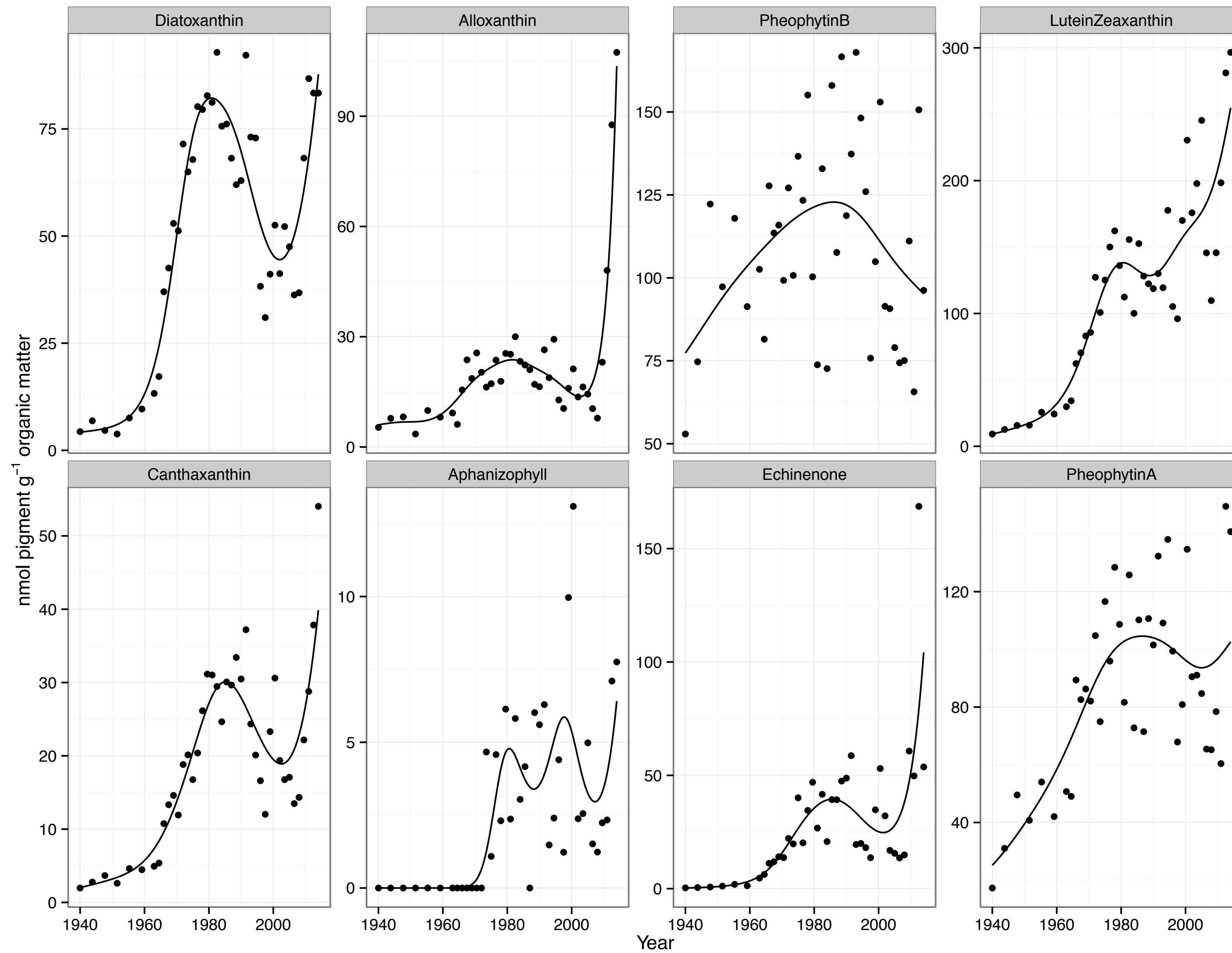


Figure 4. Concentrations of select fossil pigments throughout time in sediments from Pelican Lake. Pigment concentration was determined by HPLC analysis.



Alloxanthin



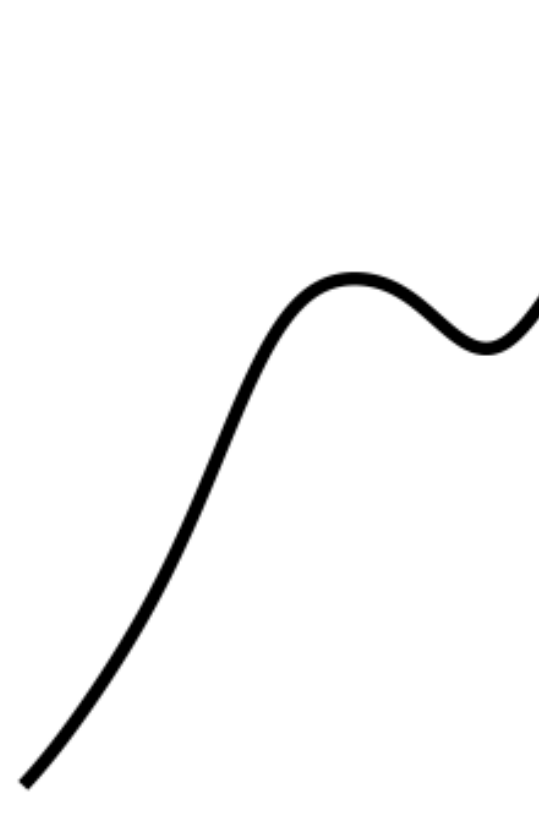
Echinenone



LuteinZeaxanthin



Canthaxanthin



PheophytinA



Diatoxanthin

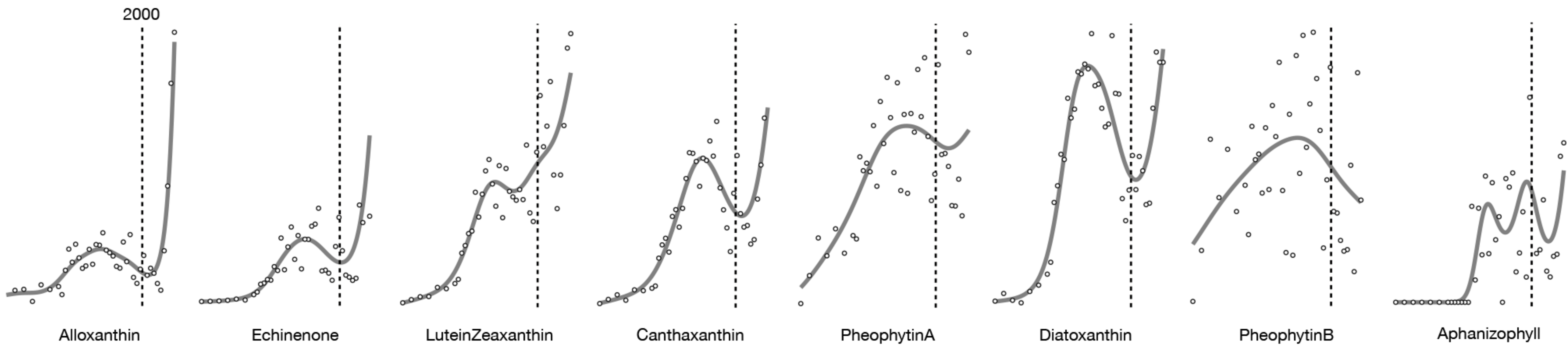
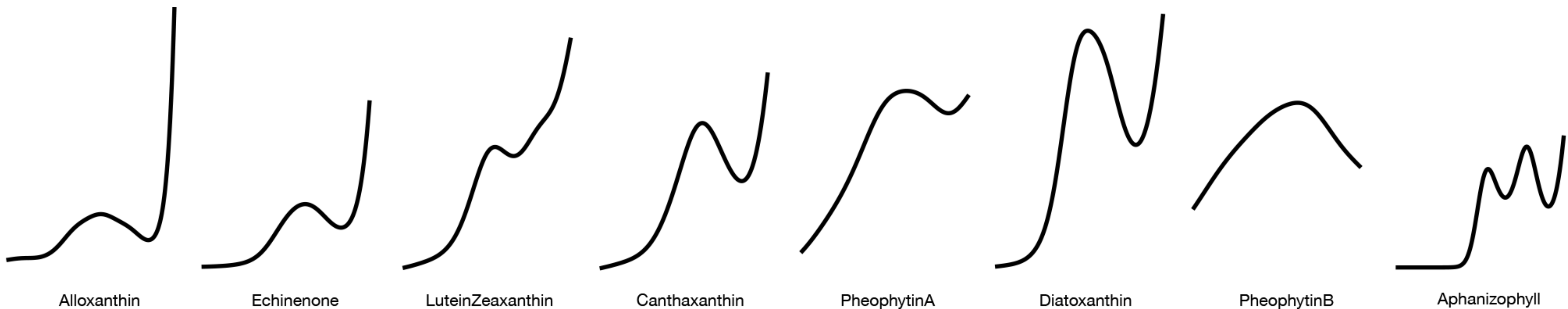


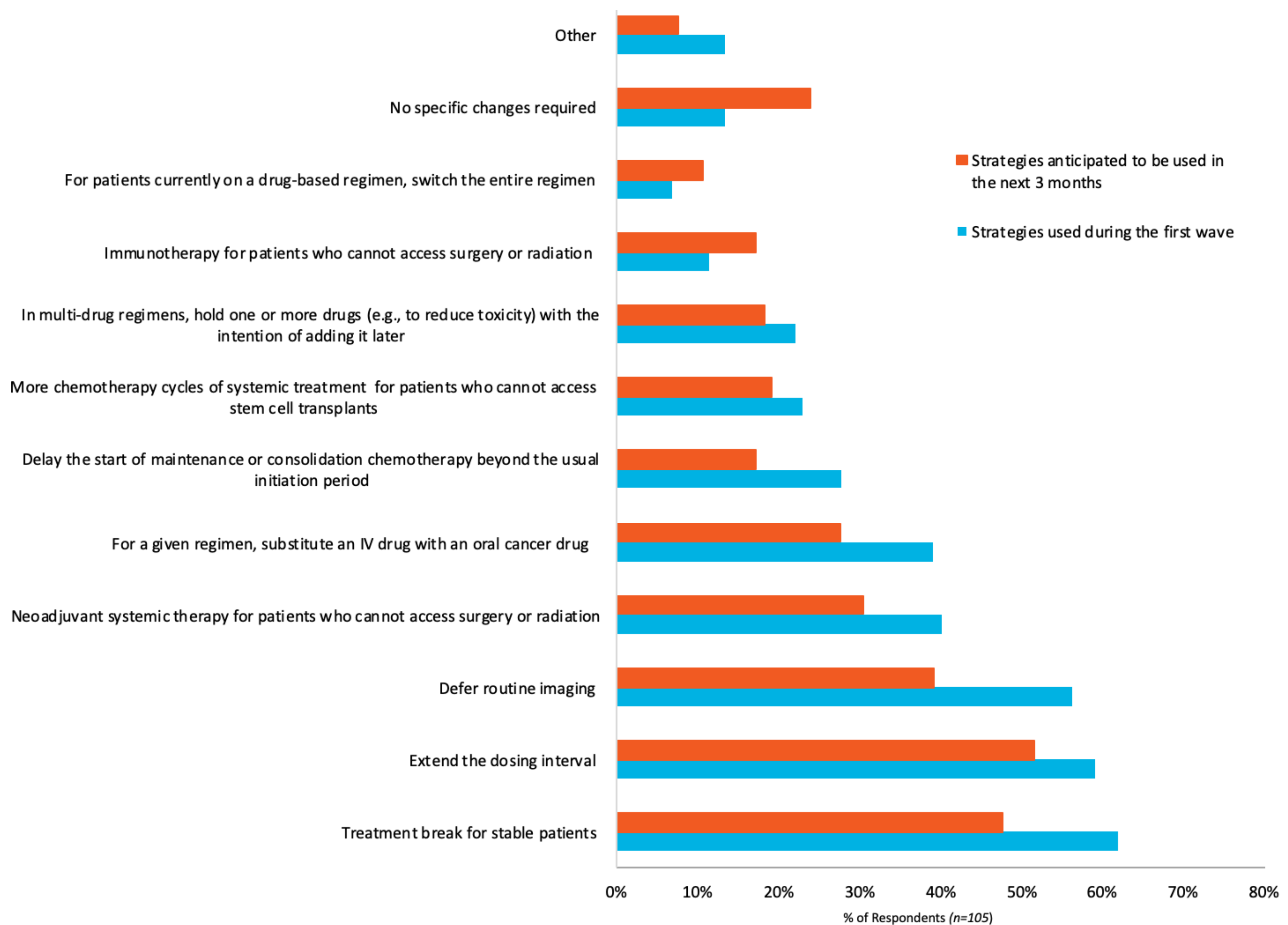
PheophytinB



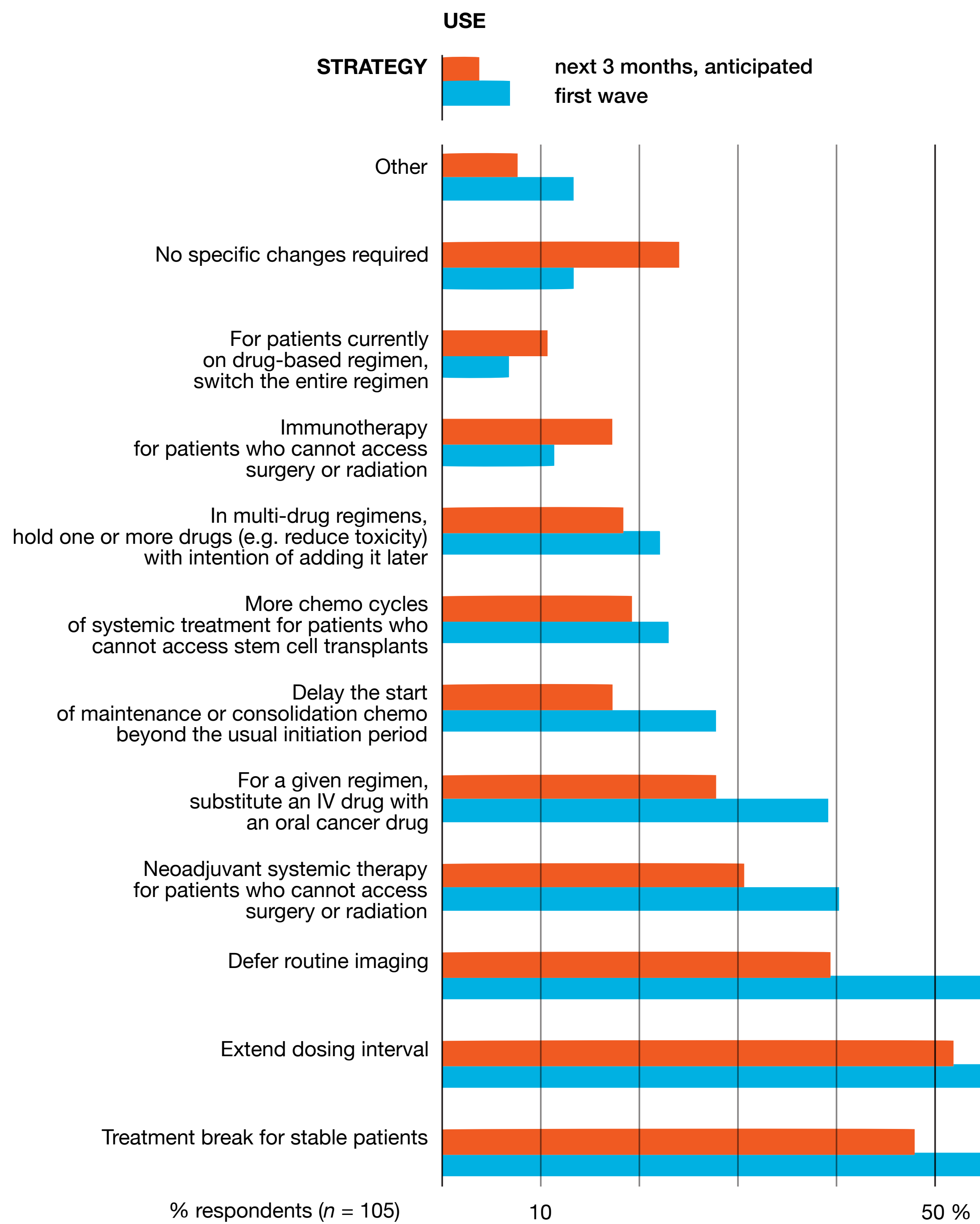
Aphanizophyll

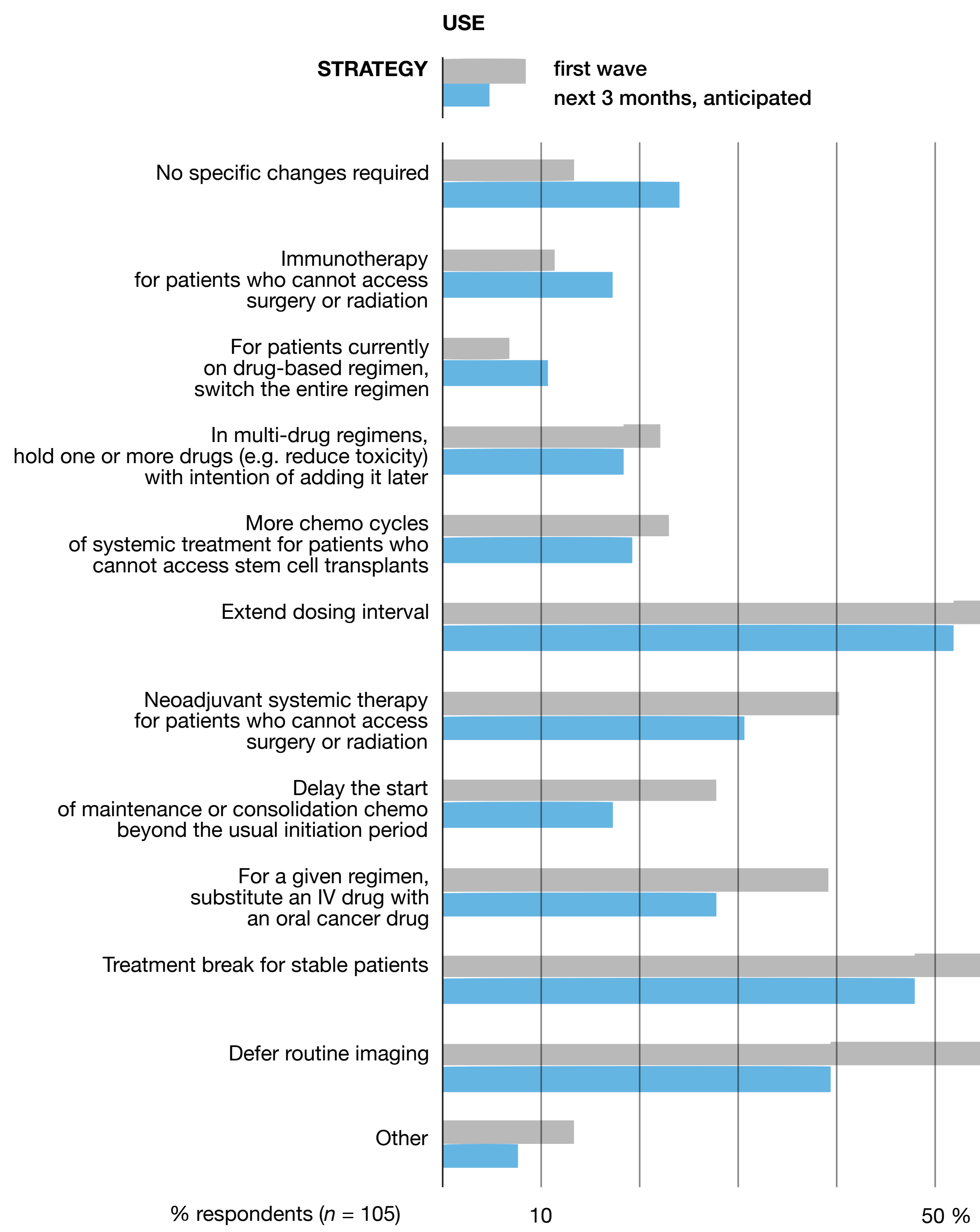
-----

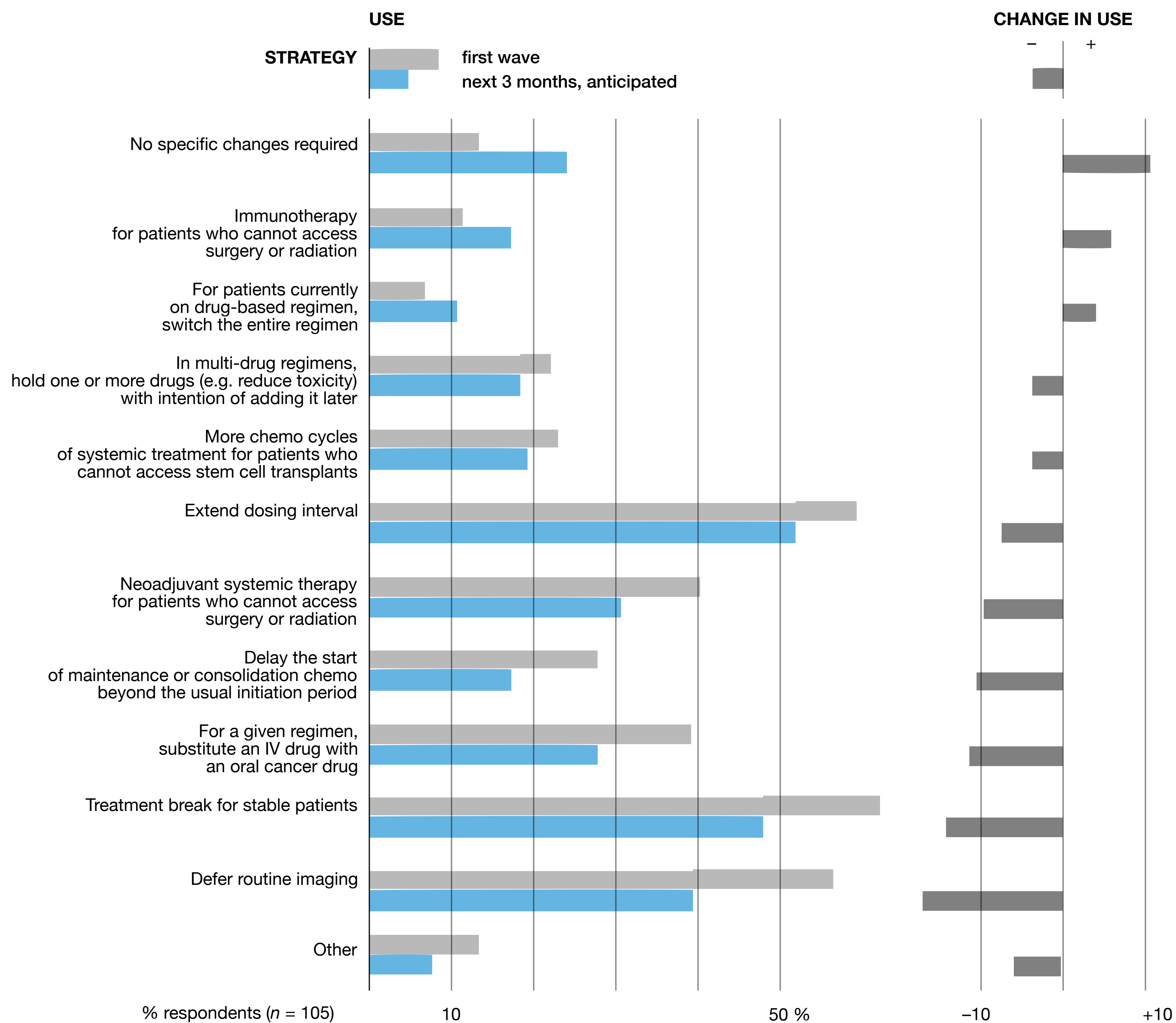








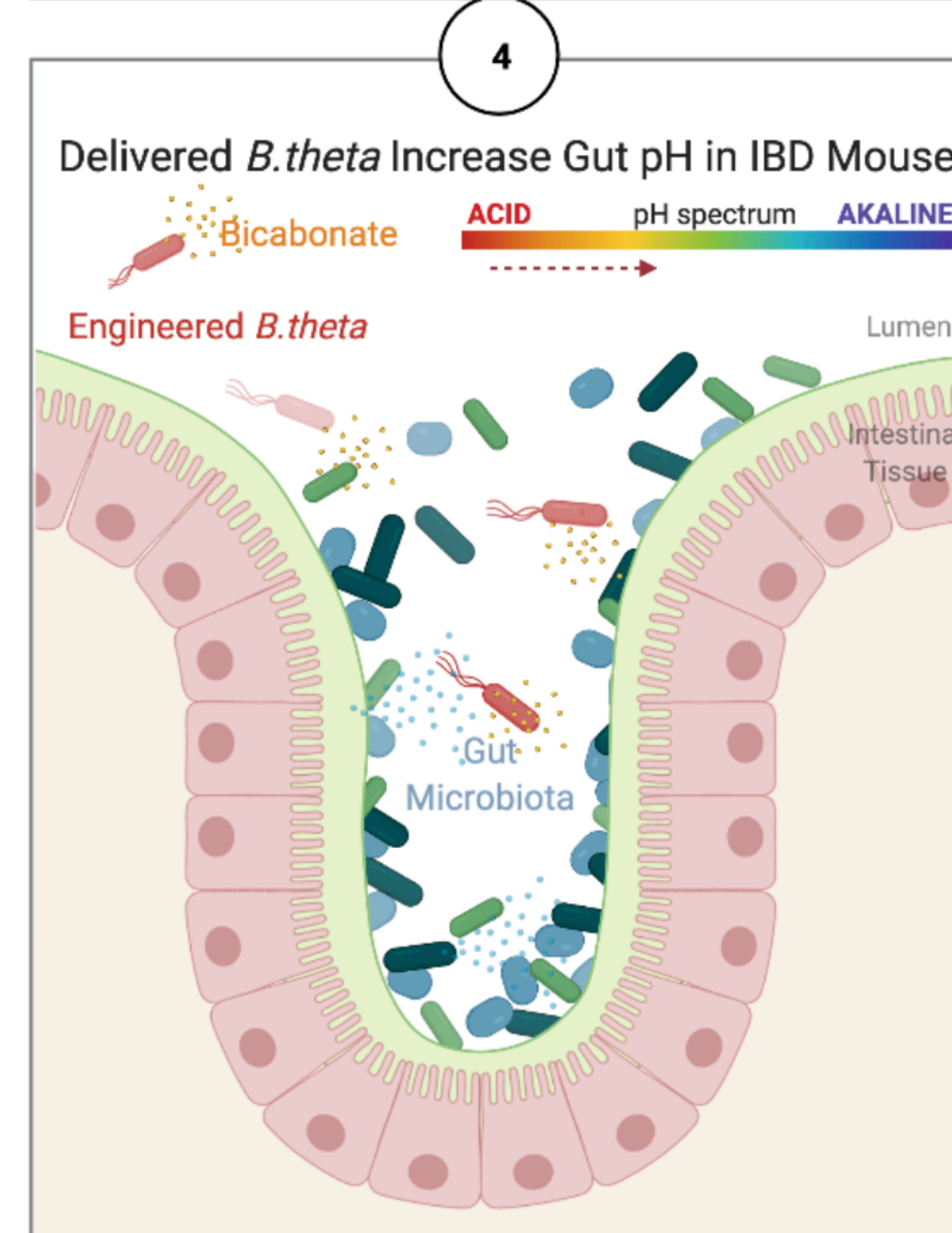
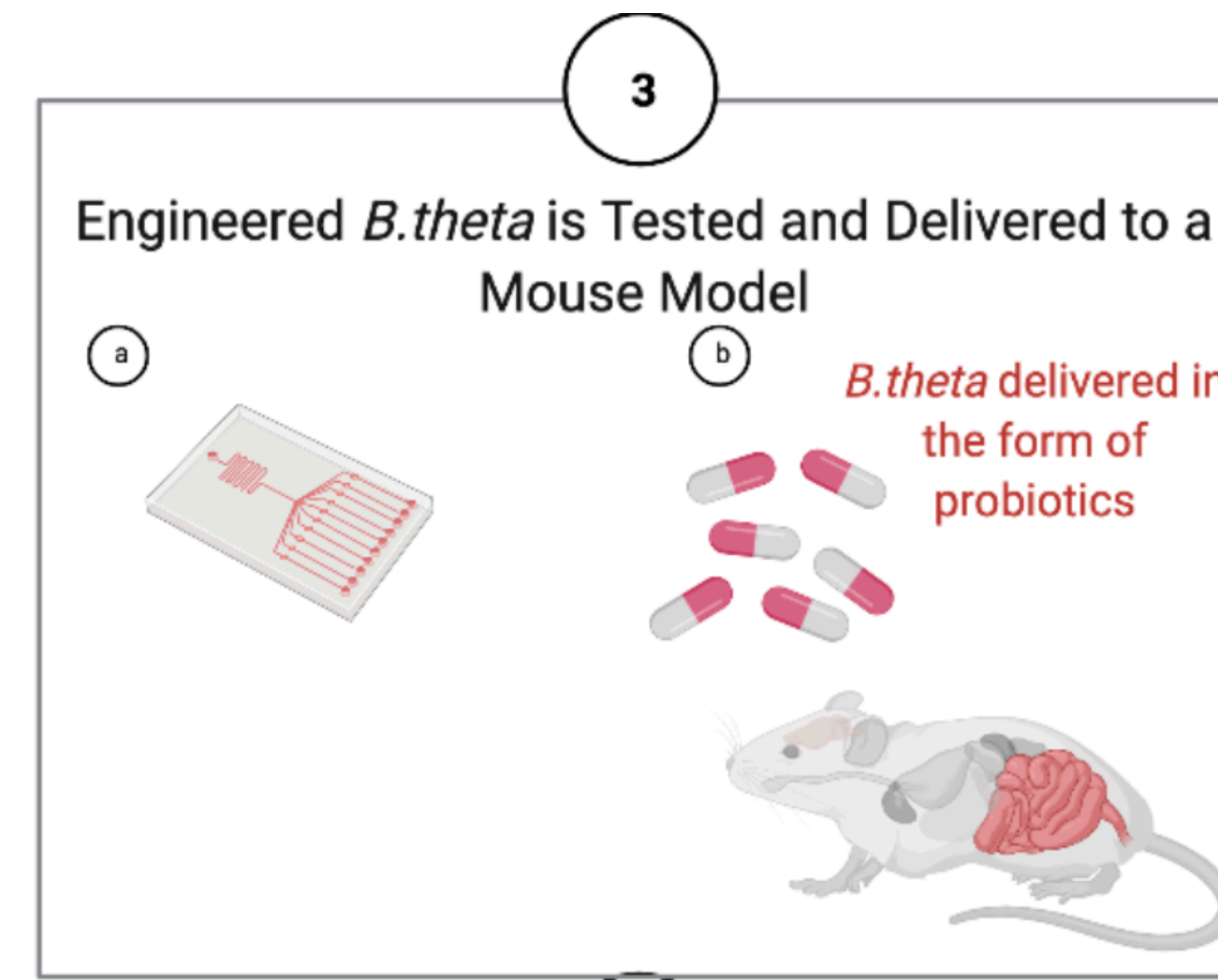
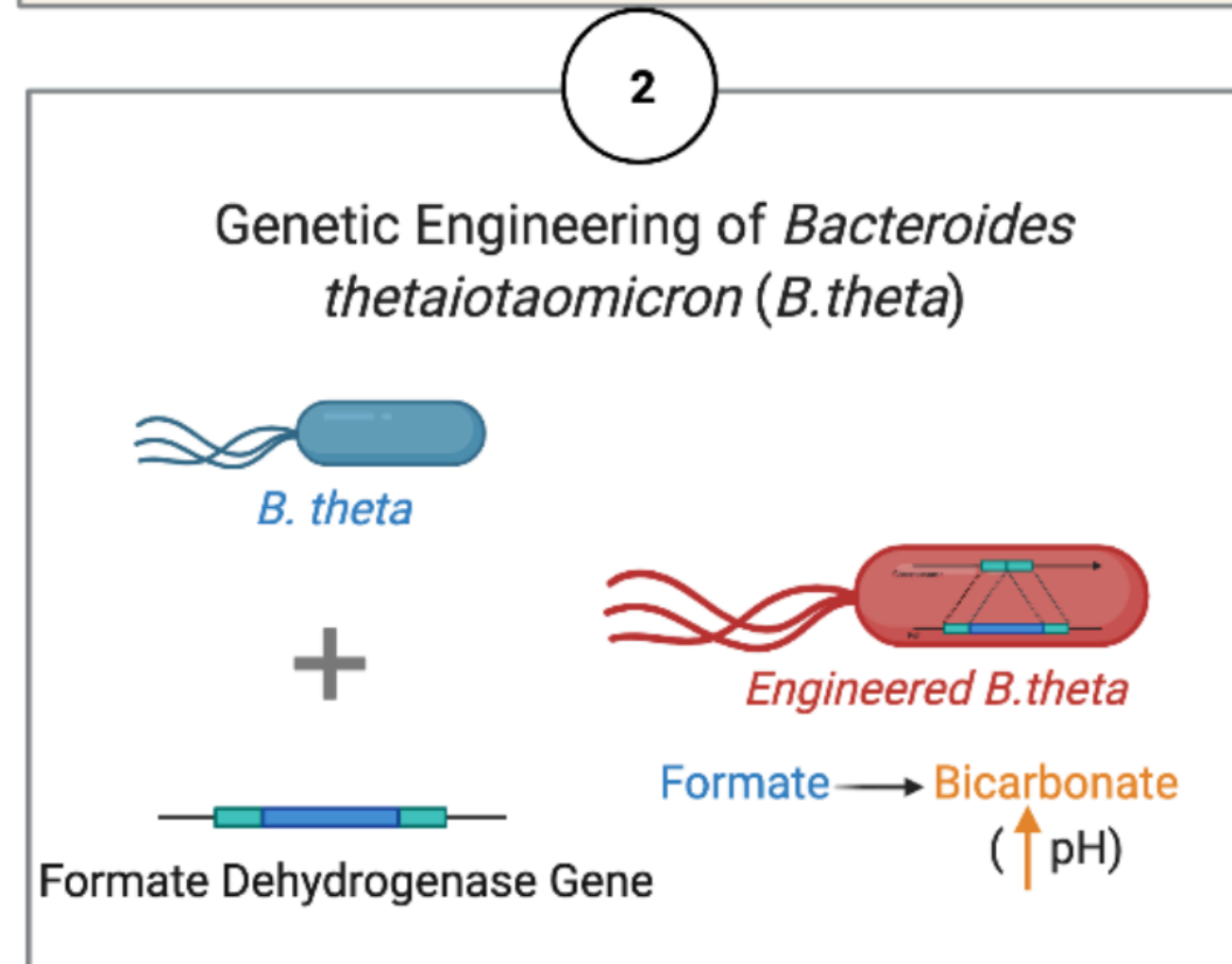
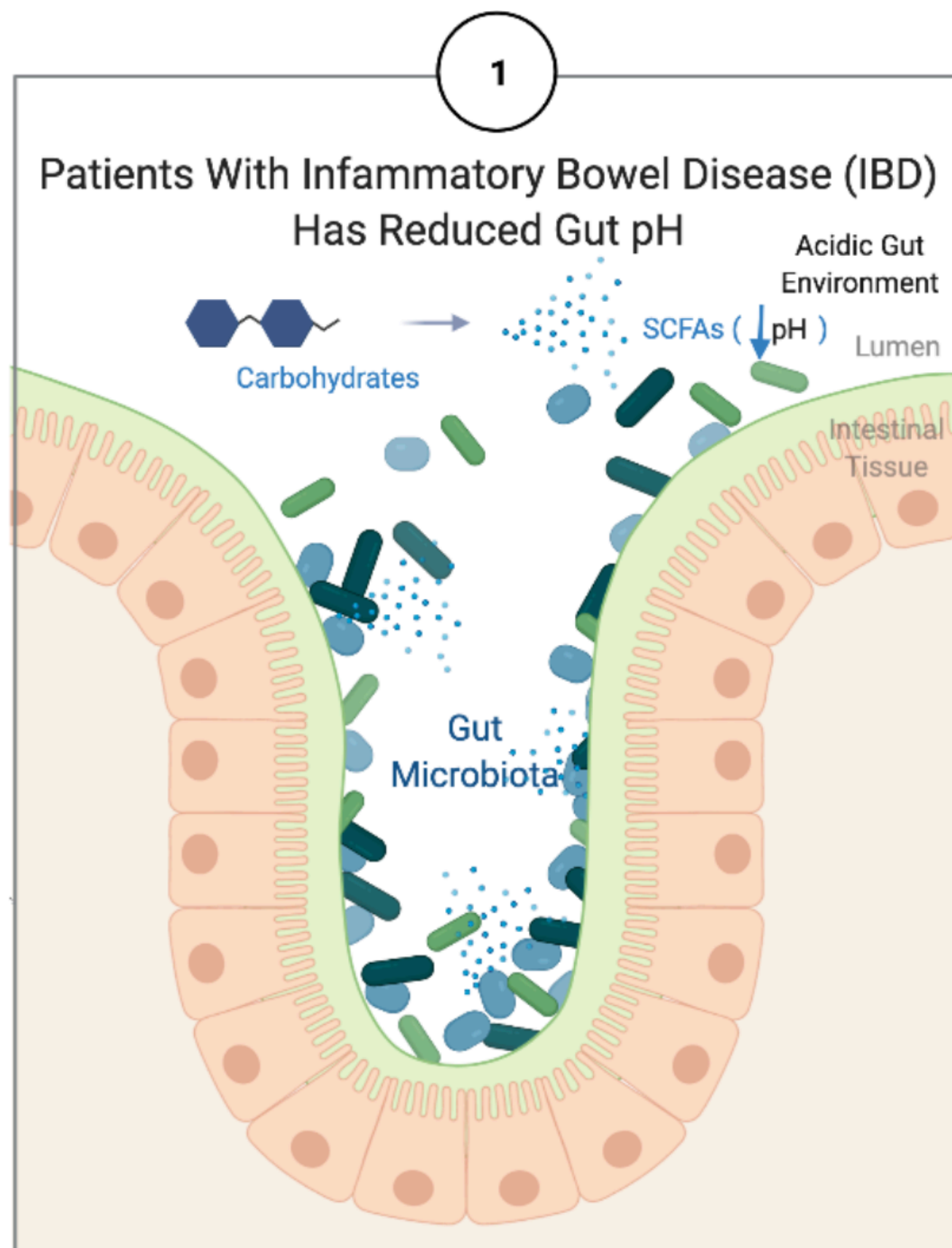




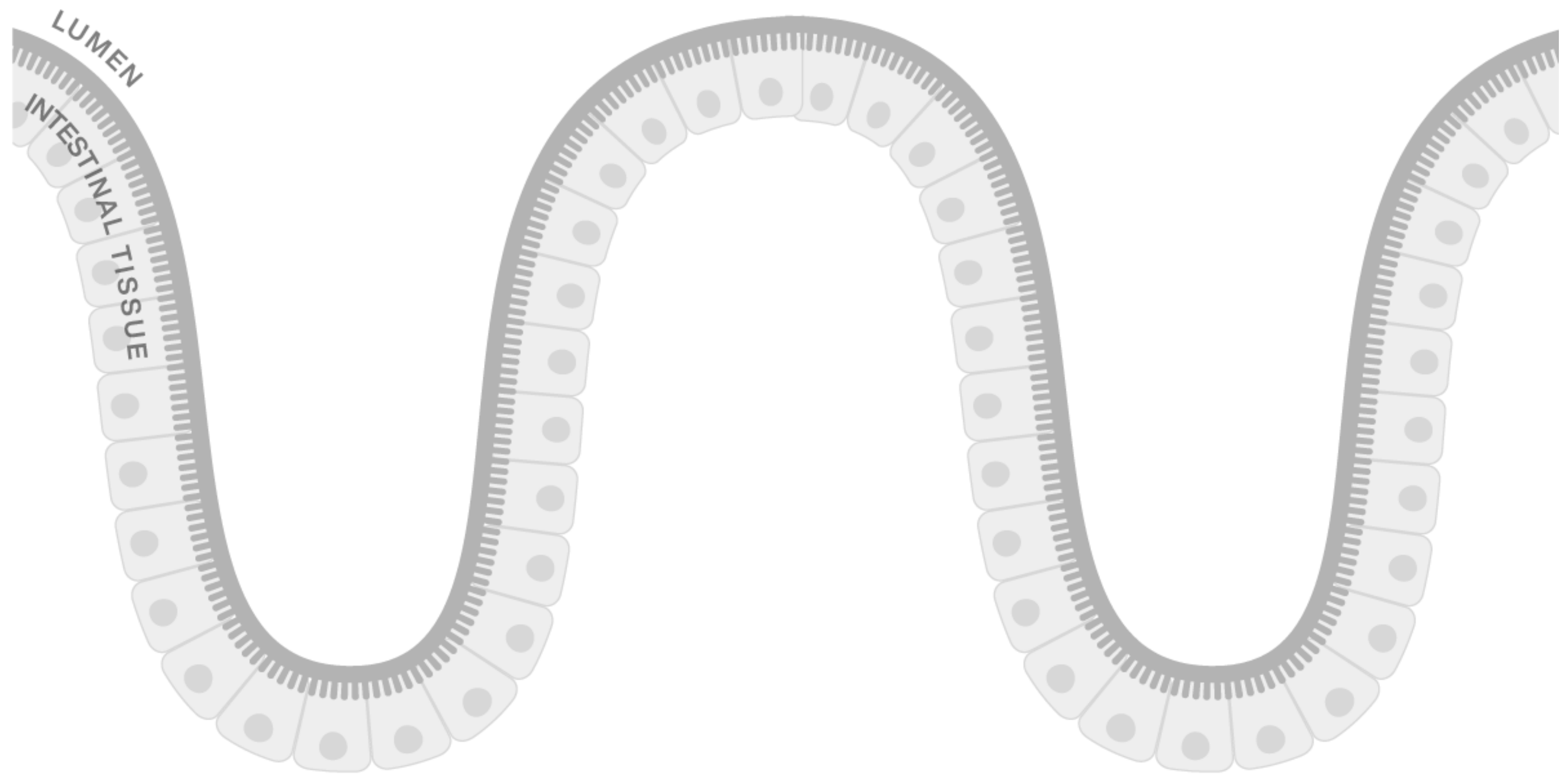


# **side-by-side**

draw the eye to differences

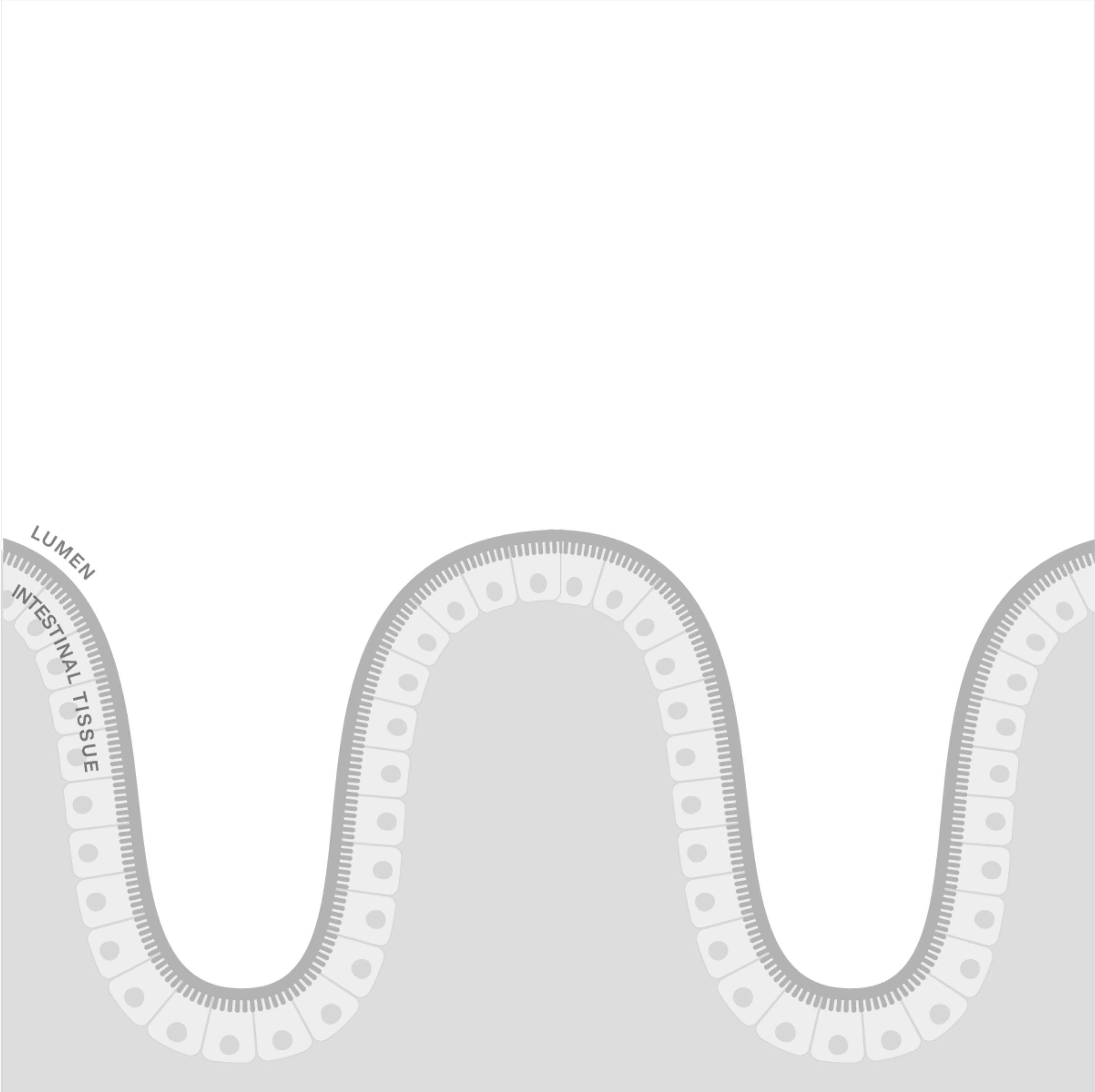


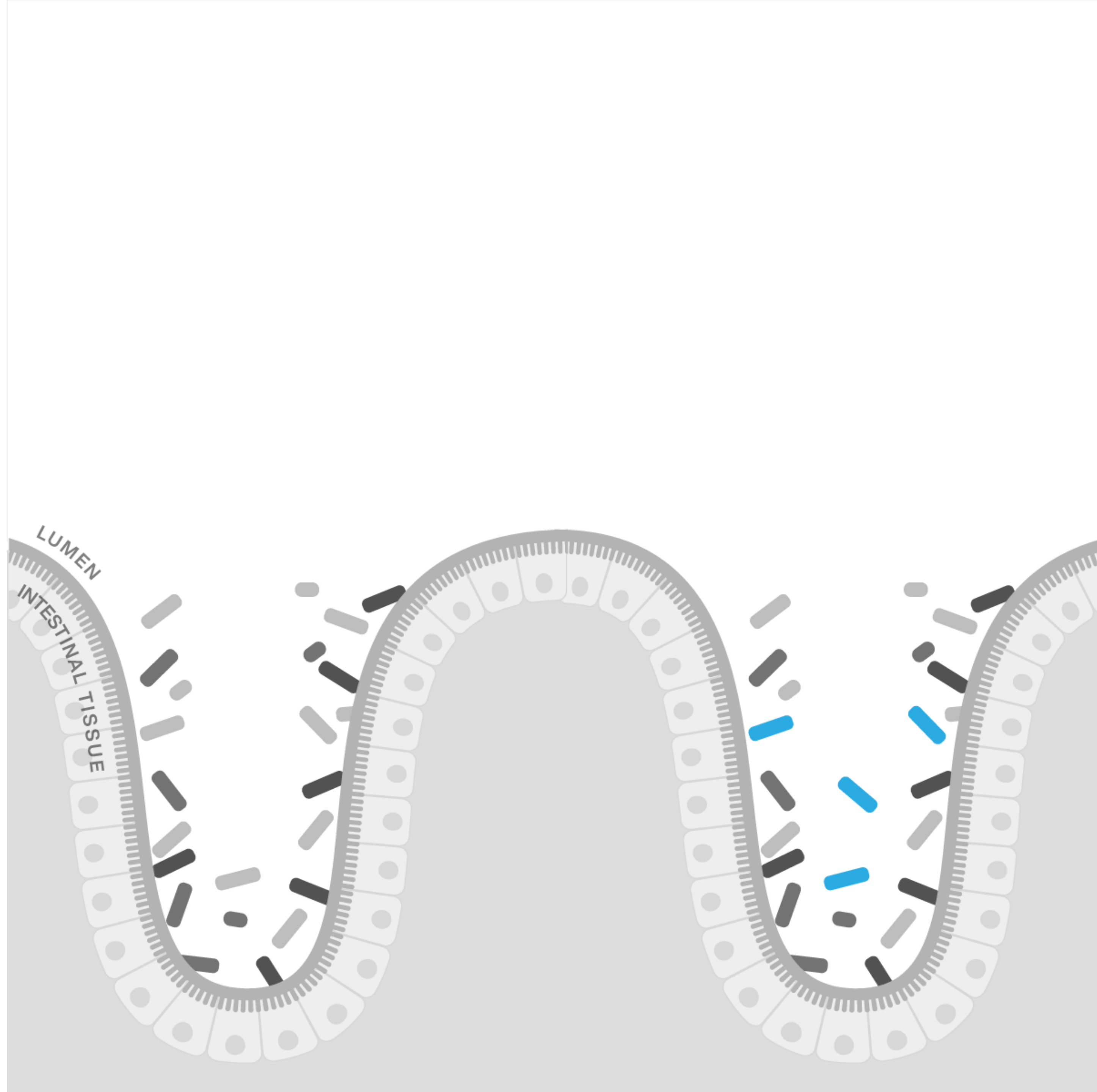


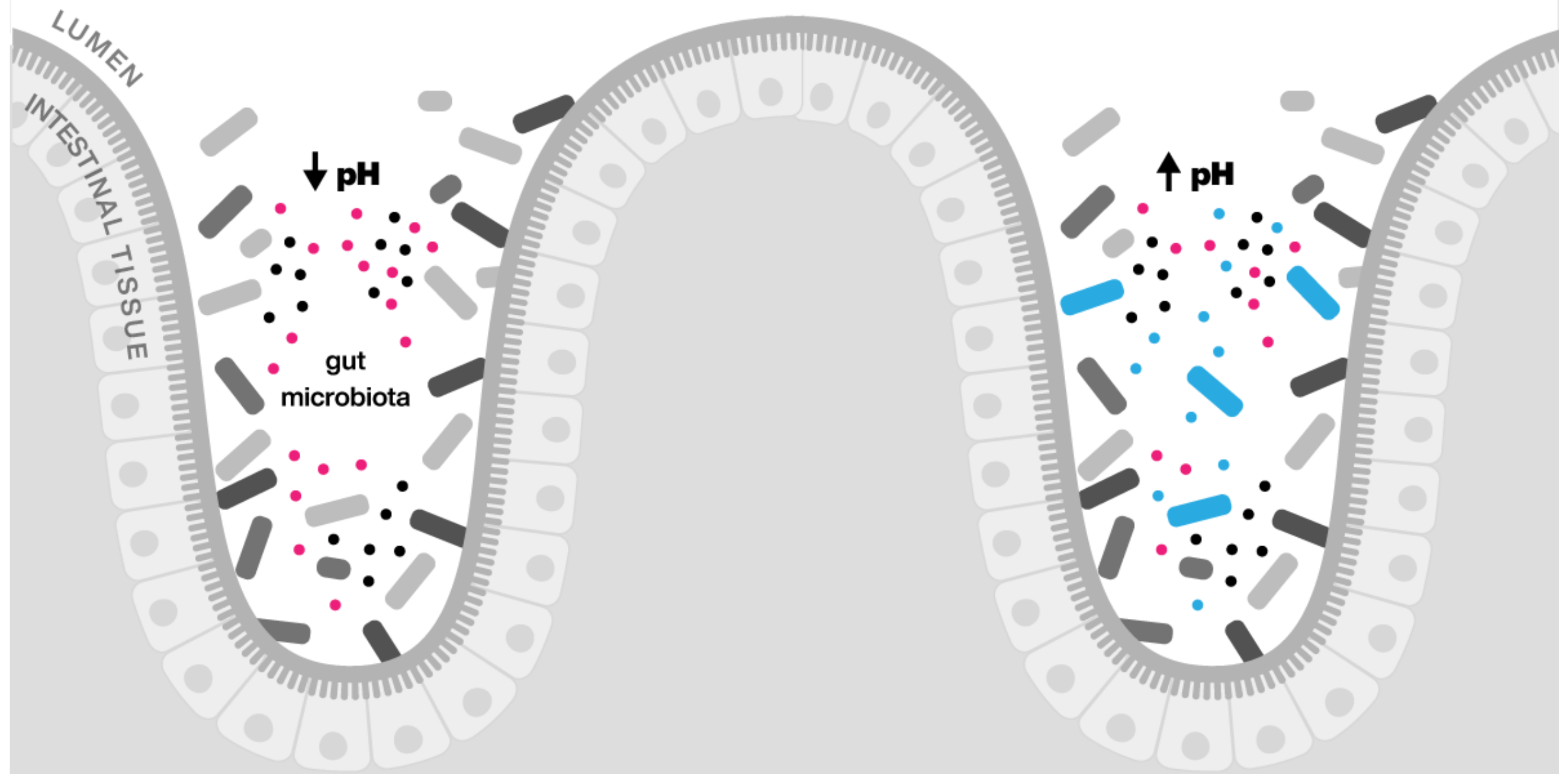


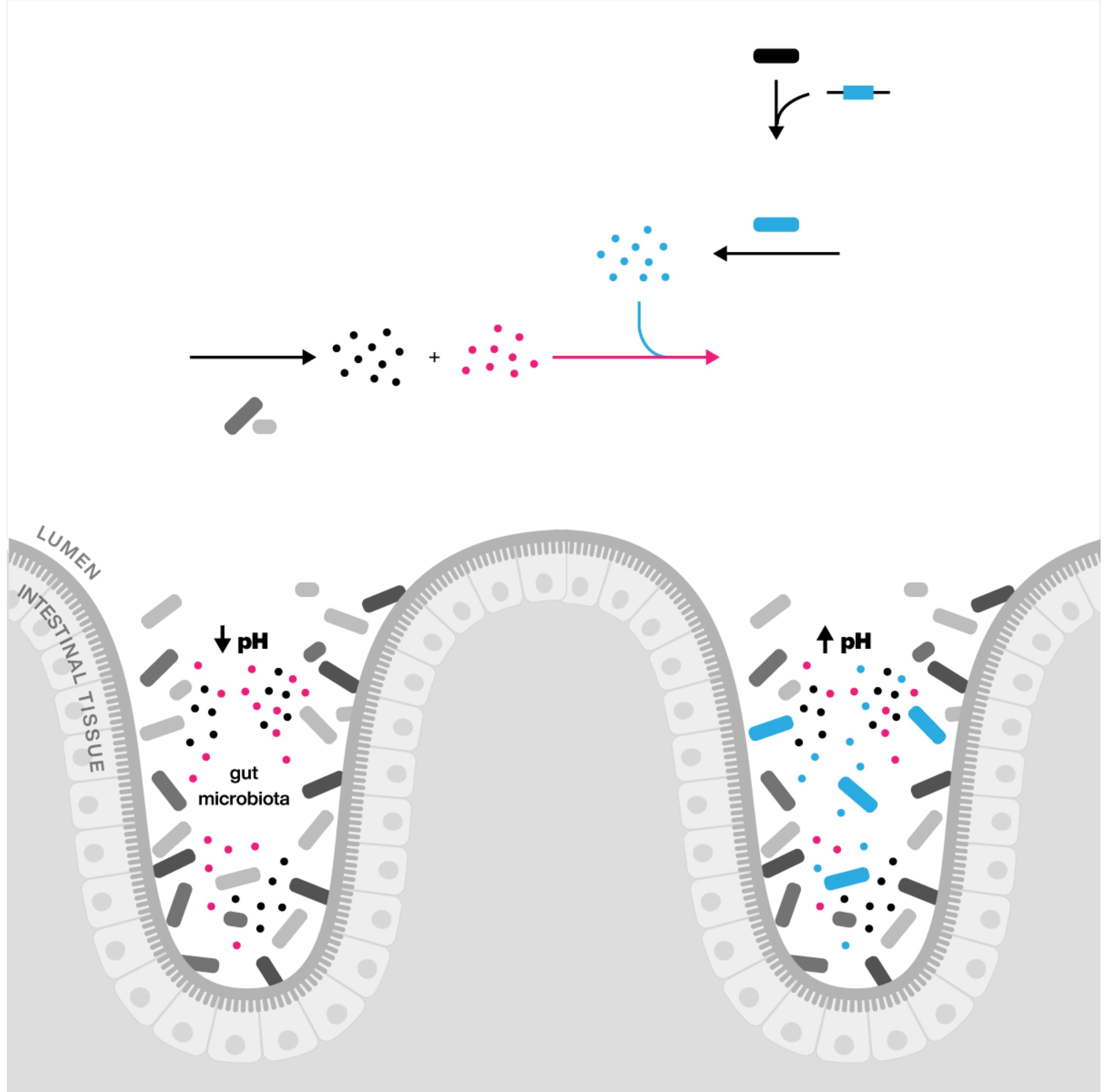
LUMEN

INTESTINAL TISSUE



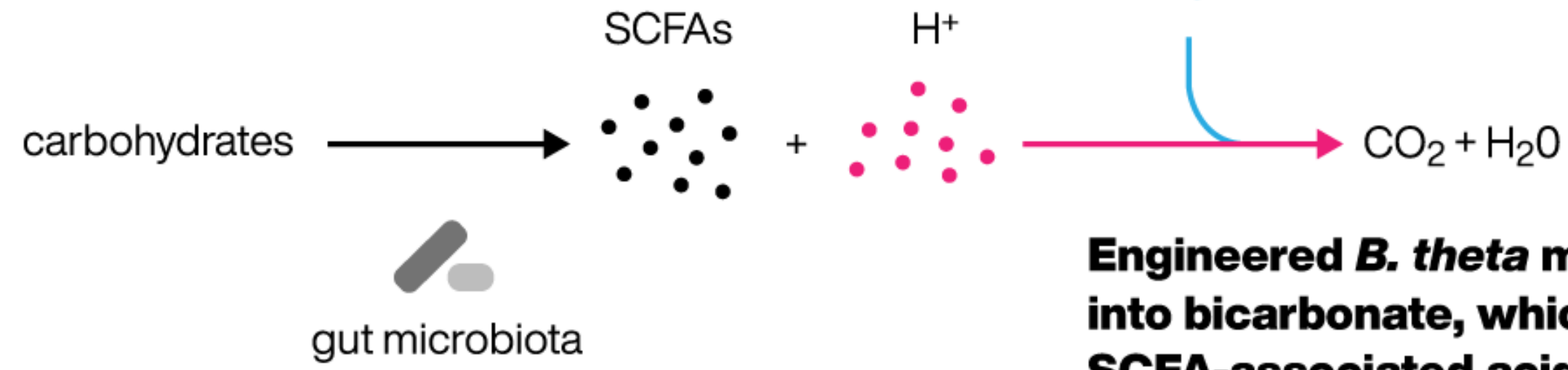




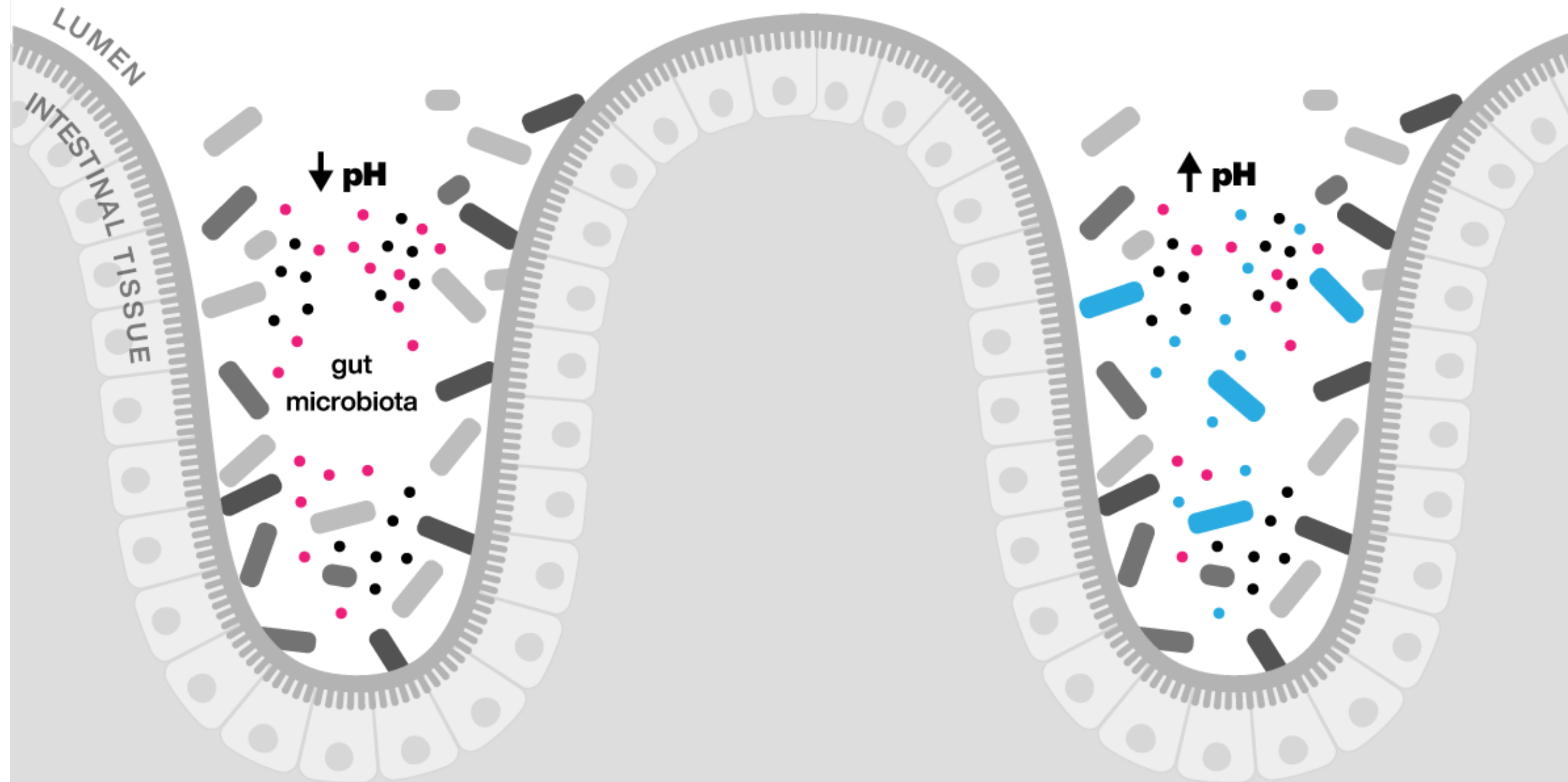




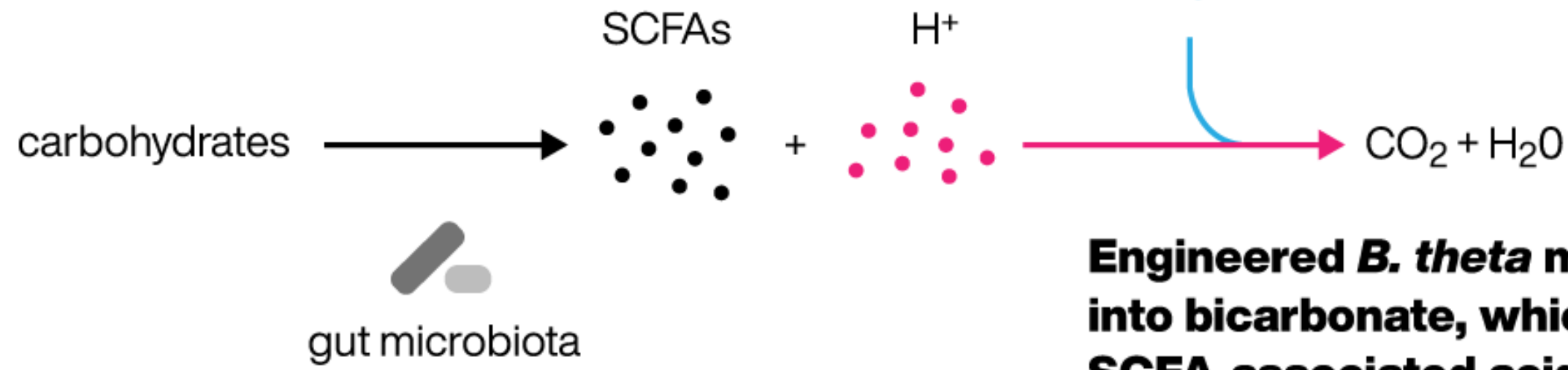
**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**



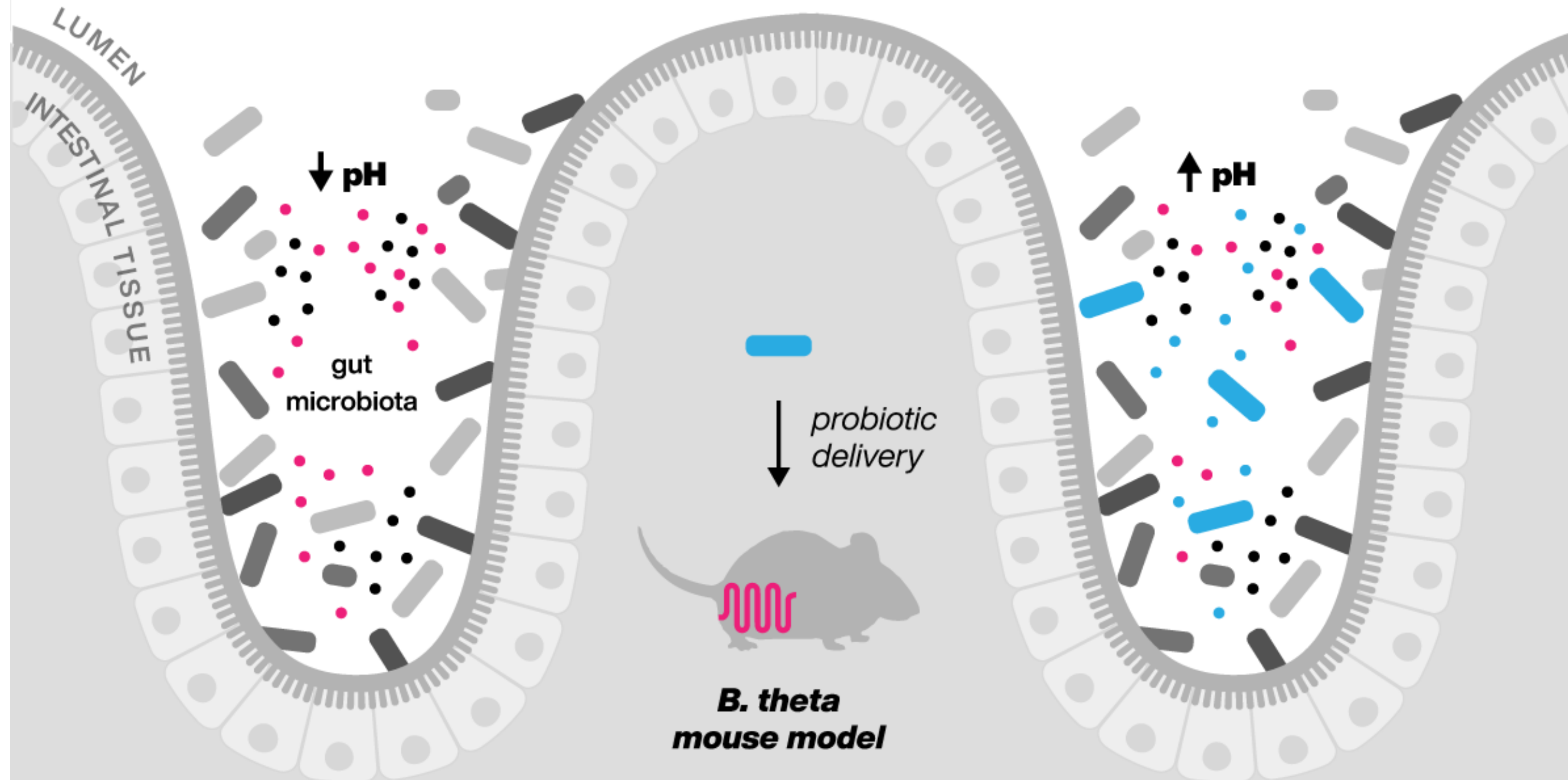
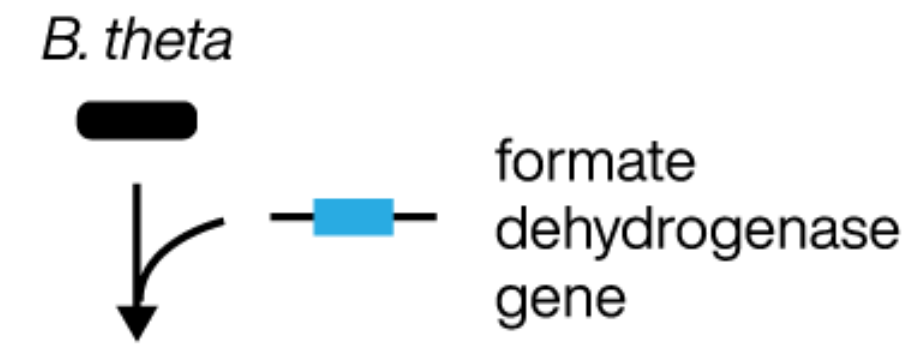
**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**



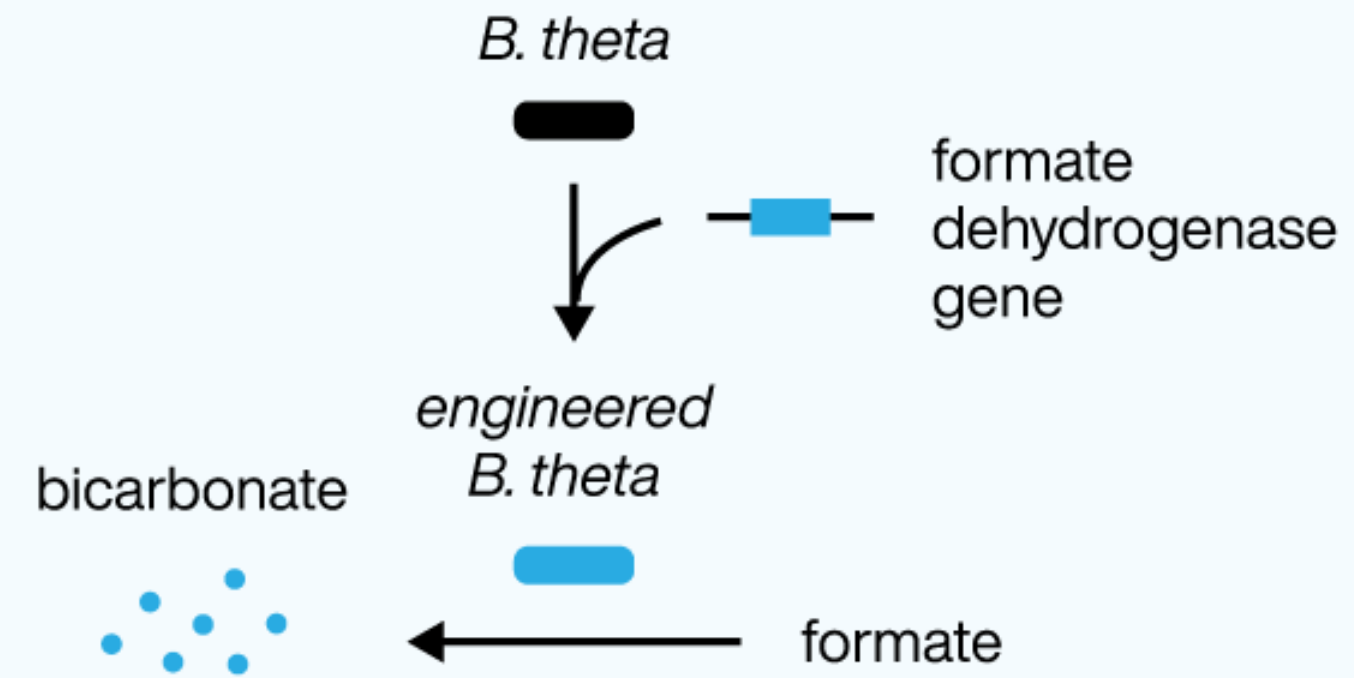
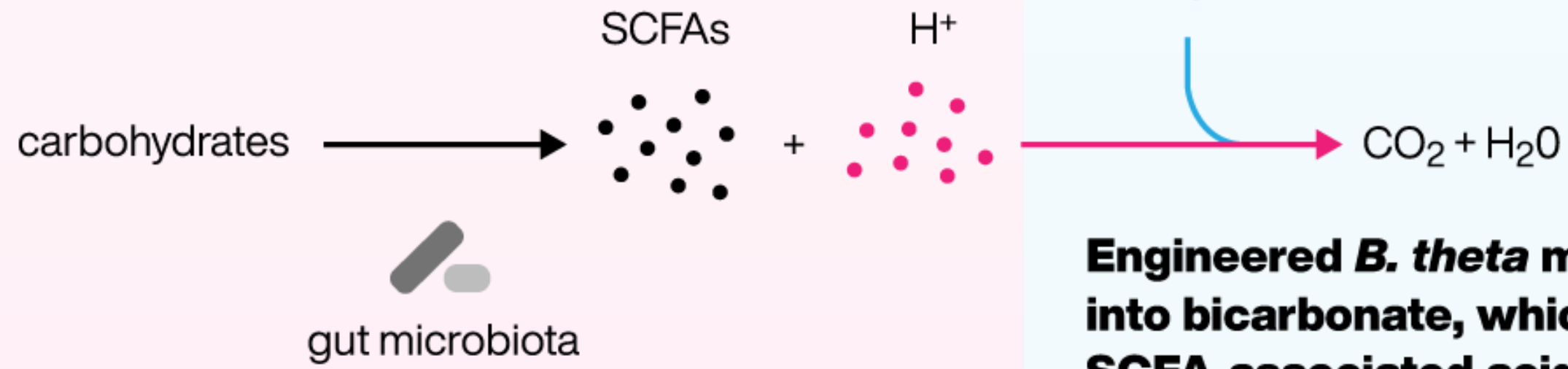
**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**



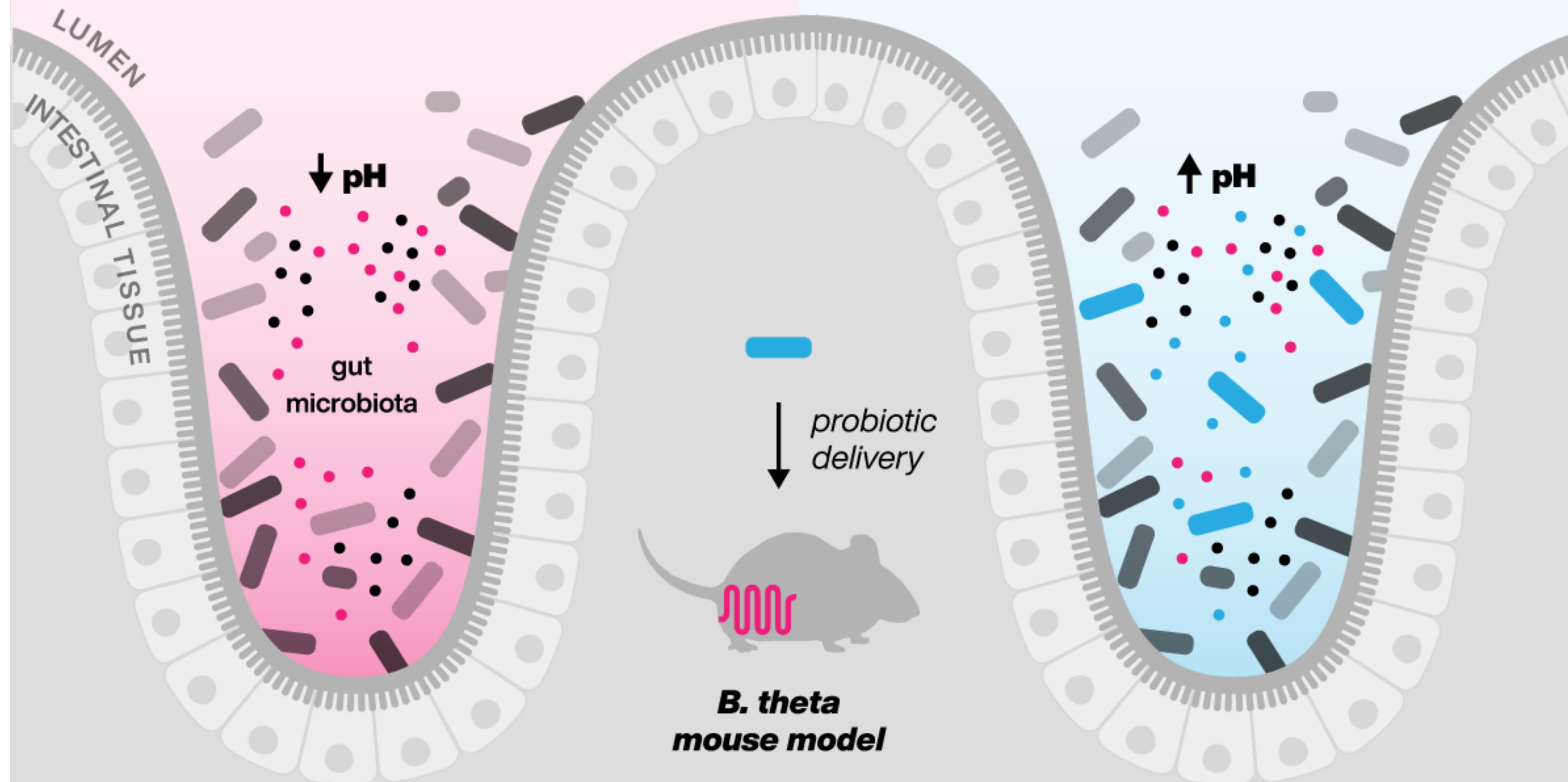
**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**



**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**

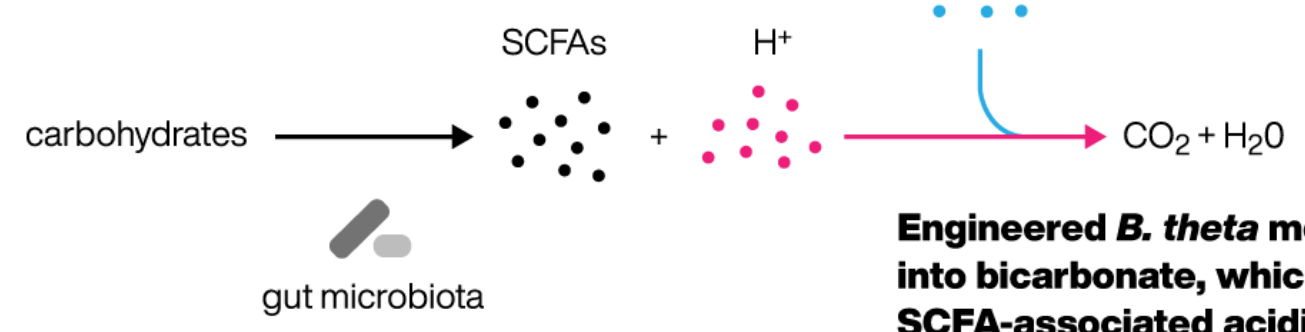


**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**

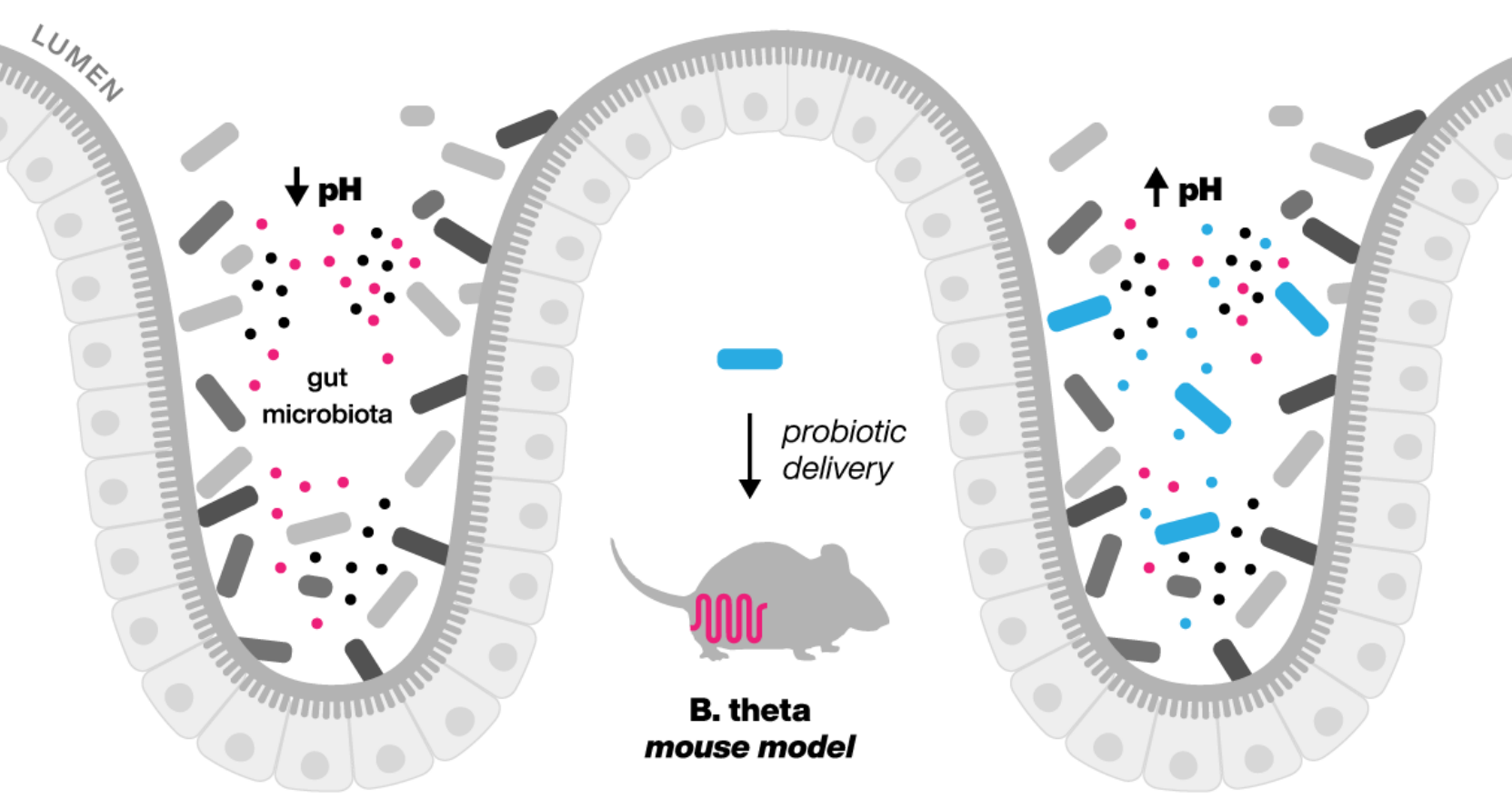




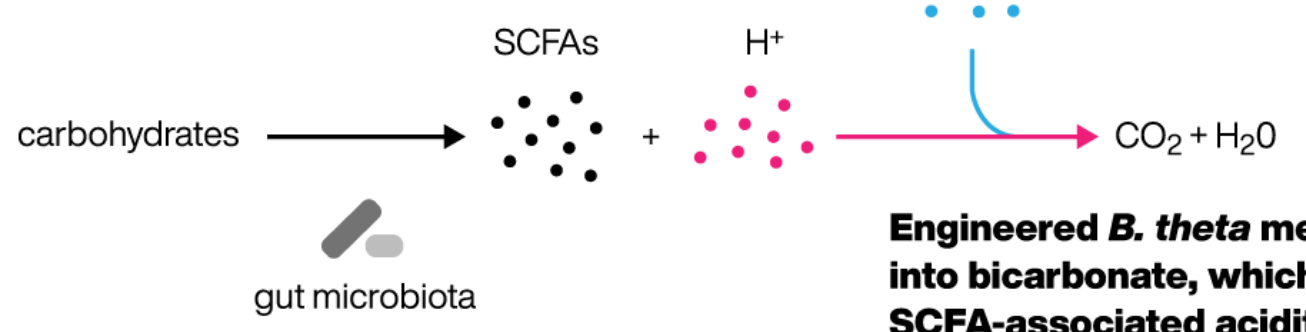
**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**



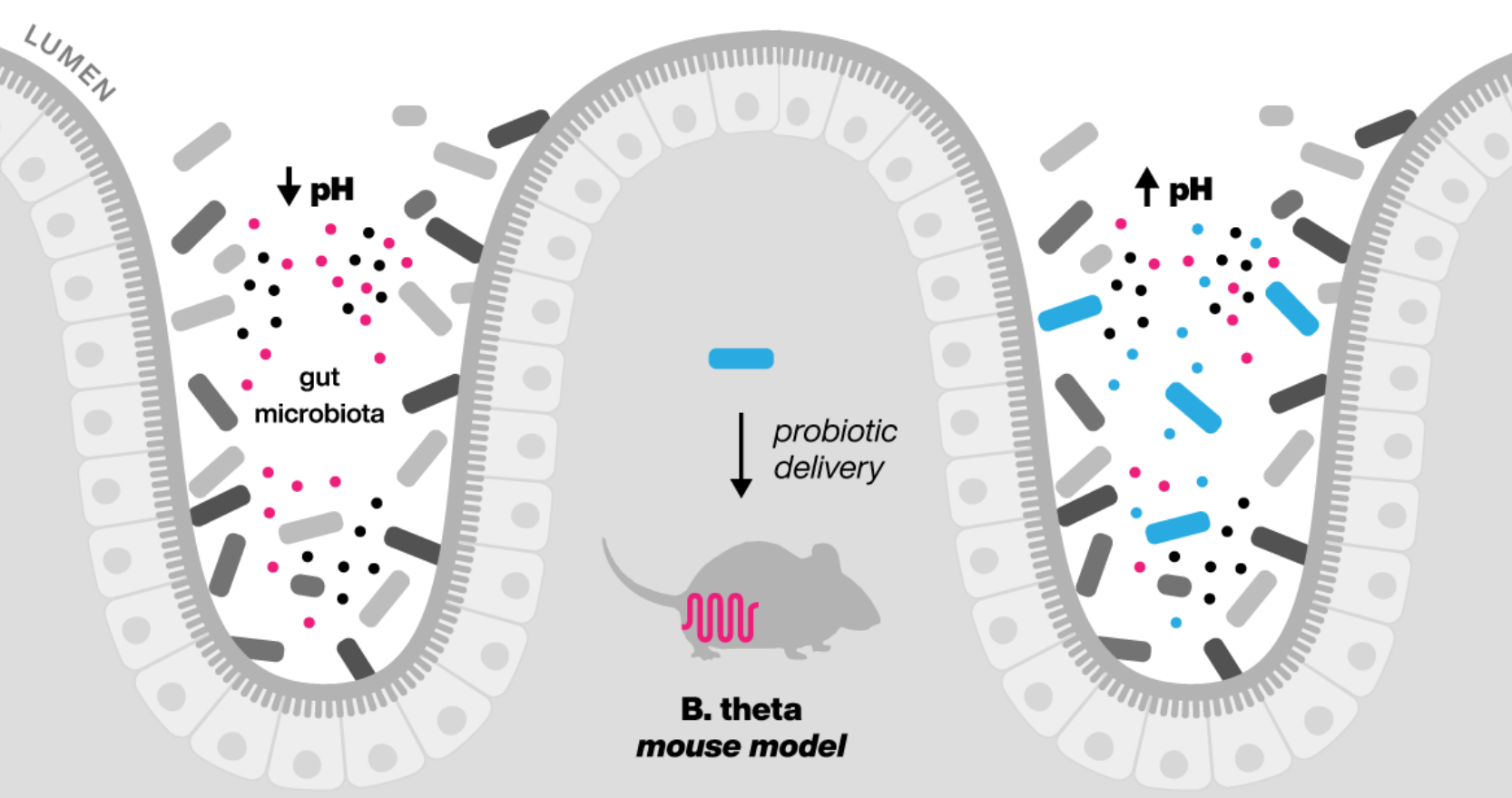
**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**



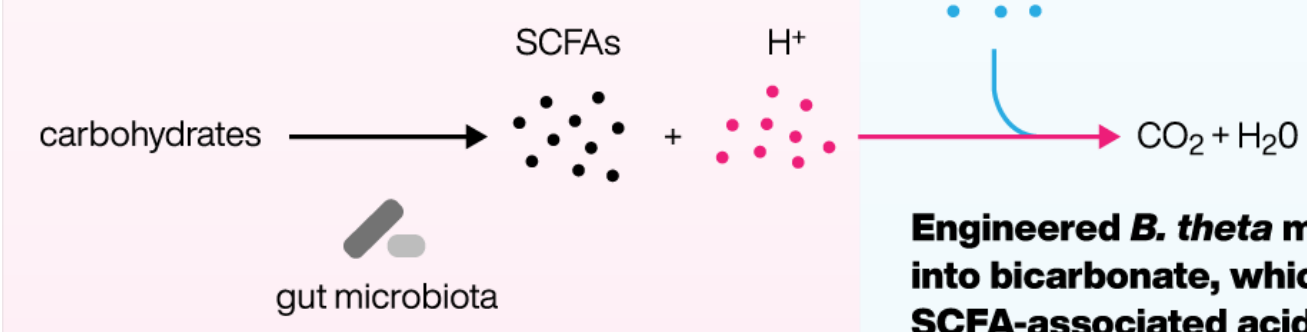
**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**



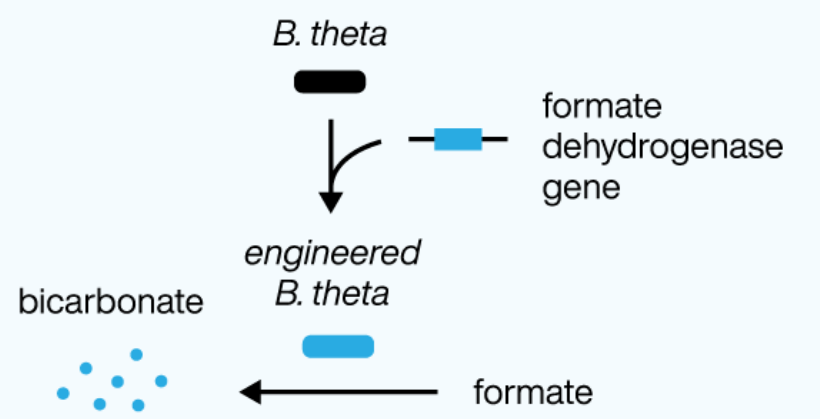
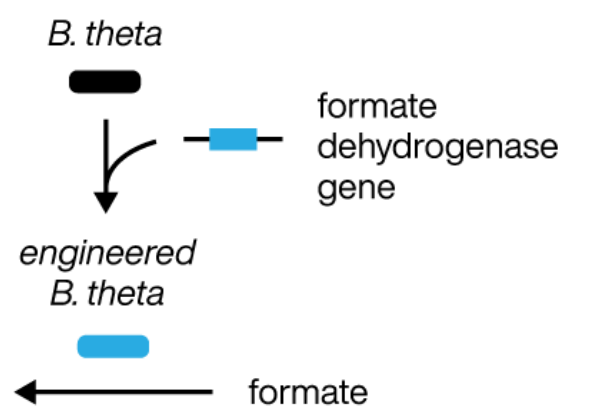
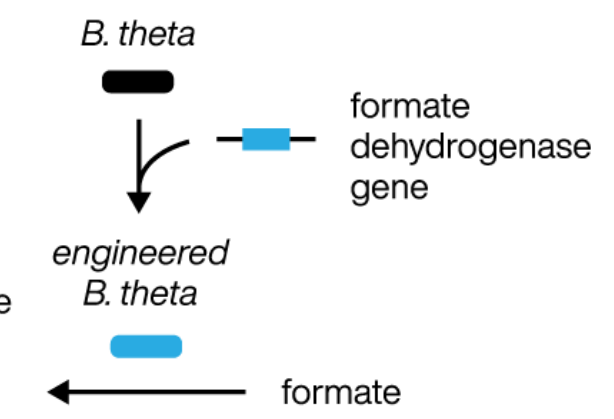
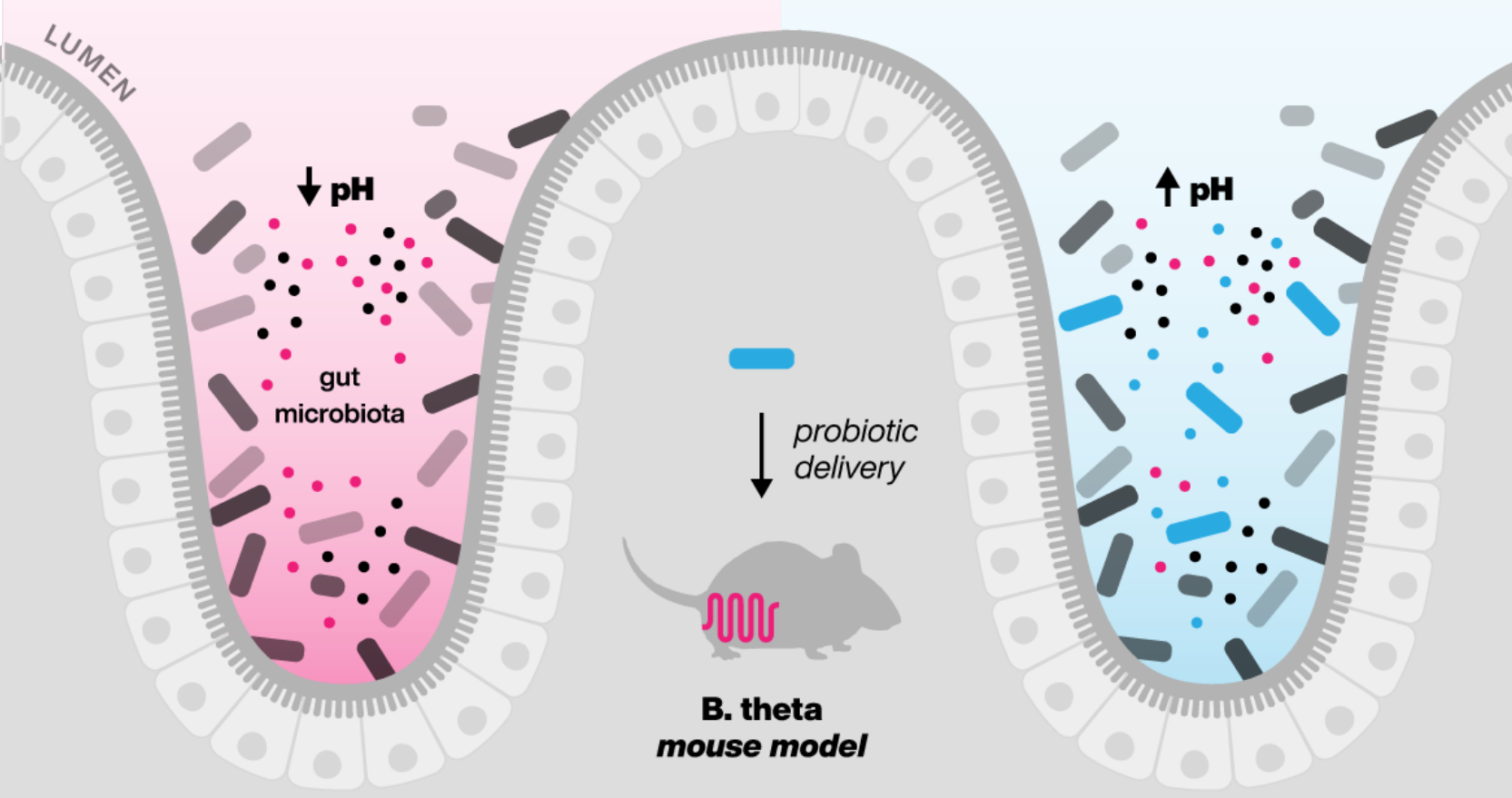
**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**



**Patients with inflammatory bowel disease have reduced gut pH due to short fatty acid produced by gut microbes in carbohydrate metabolism.**



**Engineered *B. theta* metabolizes formate into bicarbonate, which neutralizes SCFA-associated acidity and restores pH.**



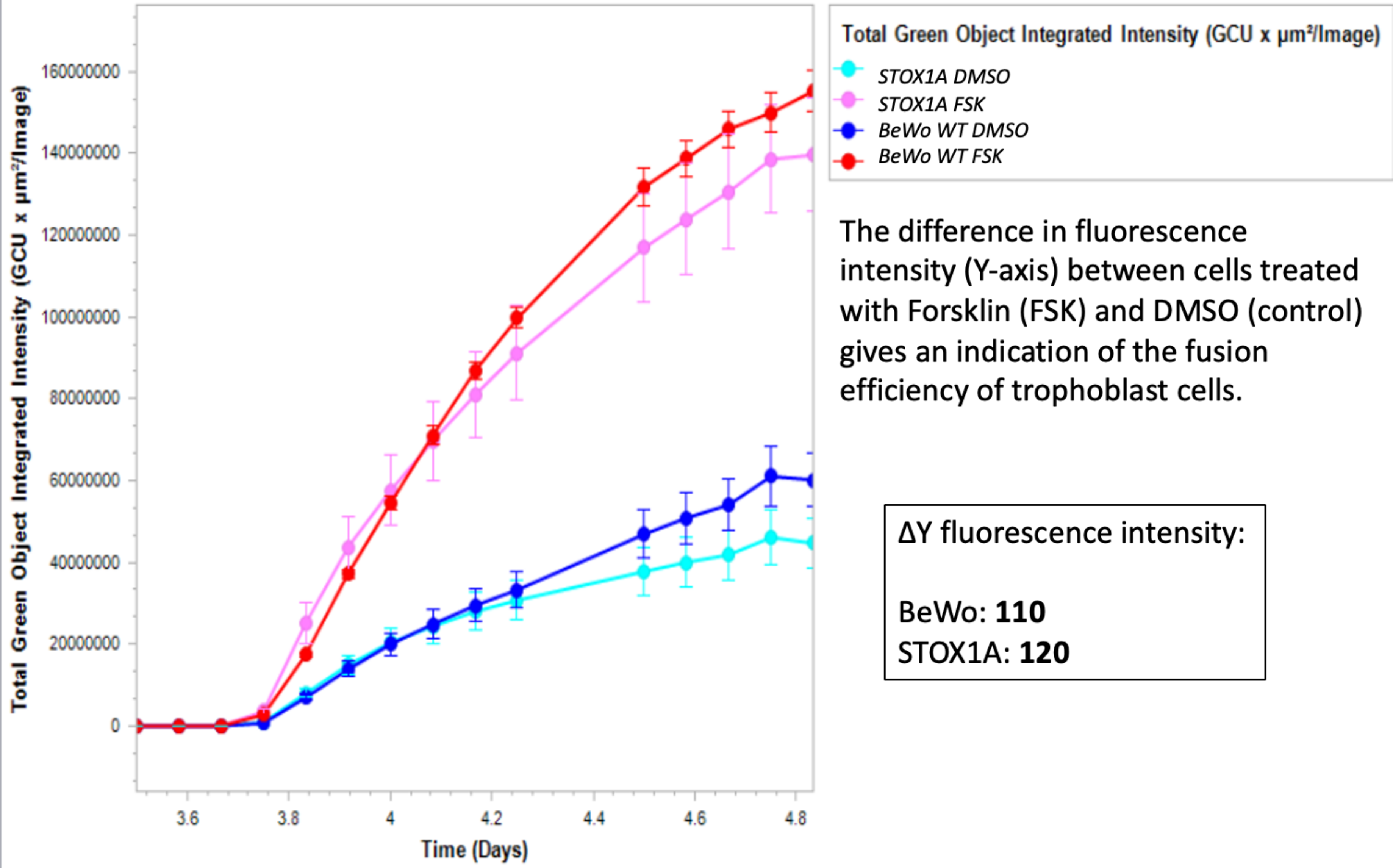


**annotate nearby**

avoid legends (where possible)



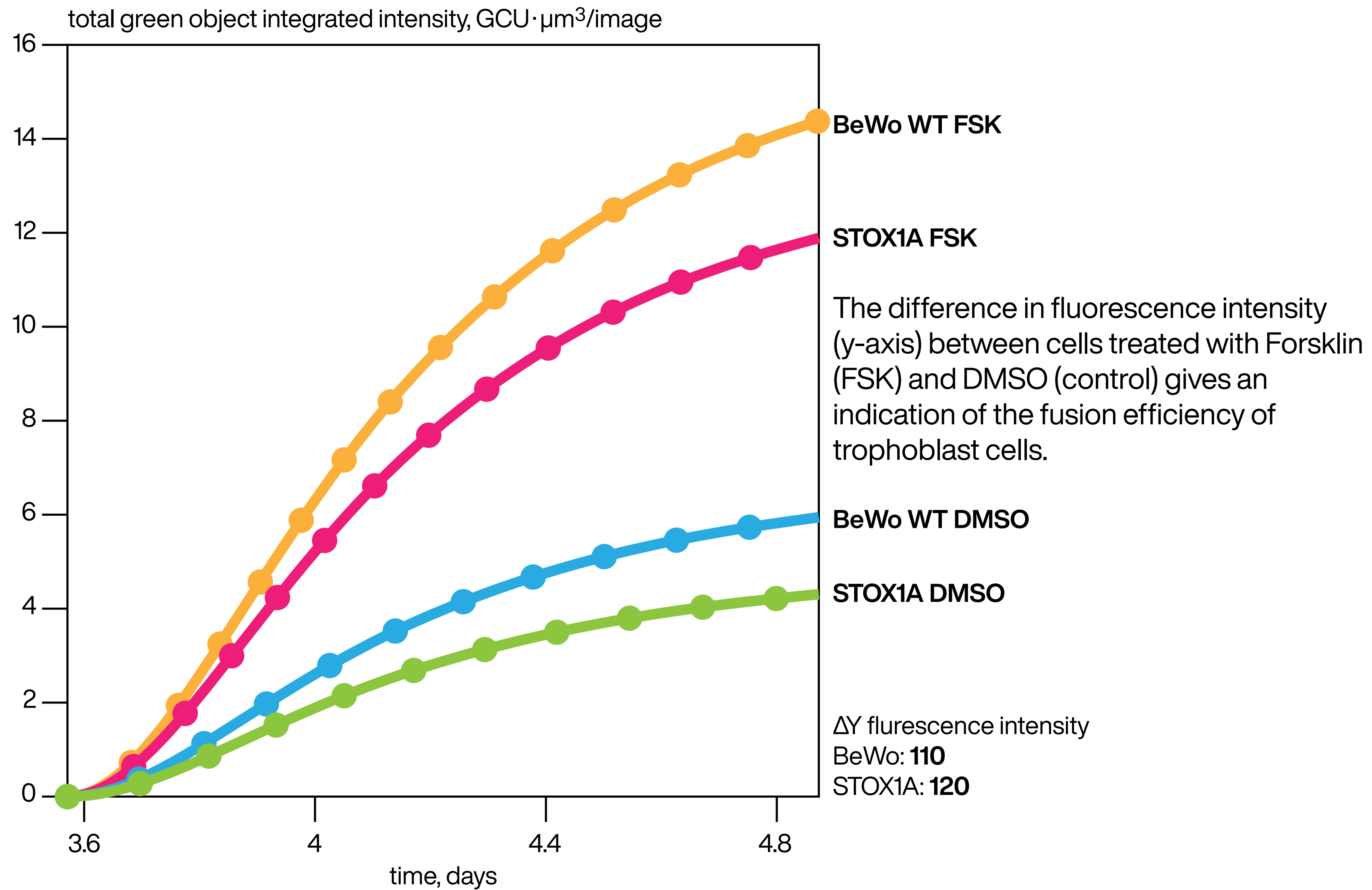
### Fusion efficiency of BeWo WT vs. STOX1A overexpressing cells



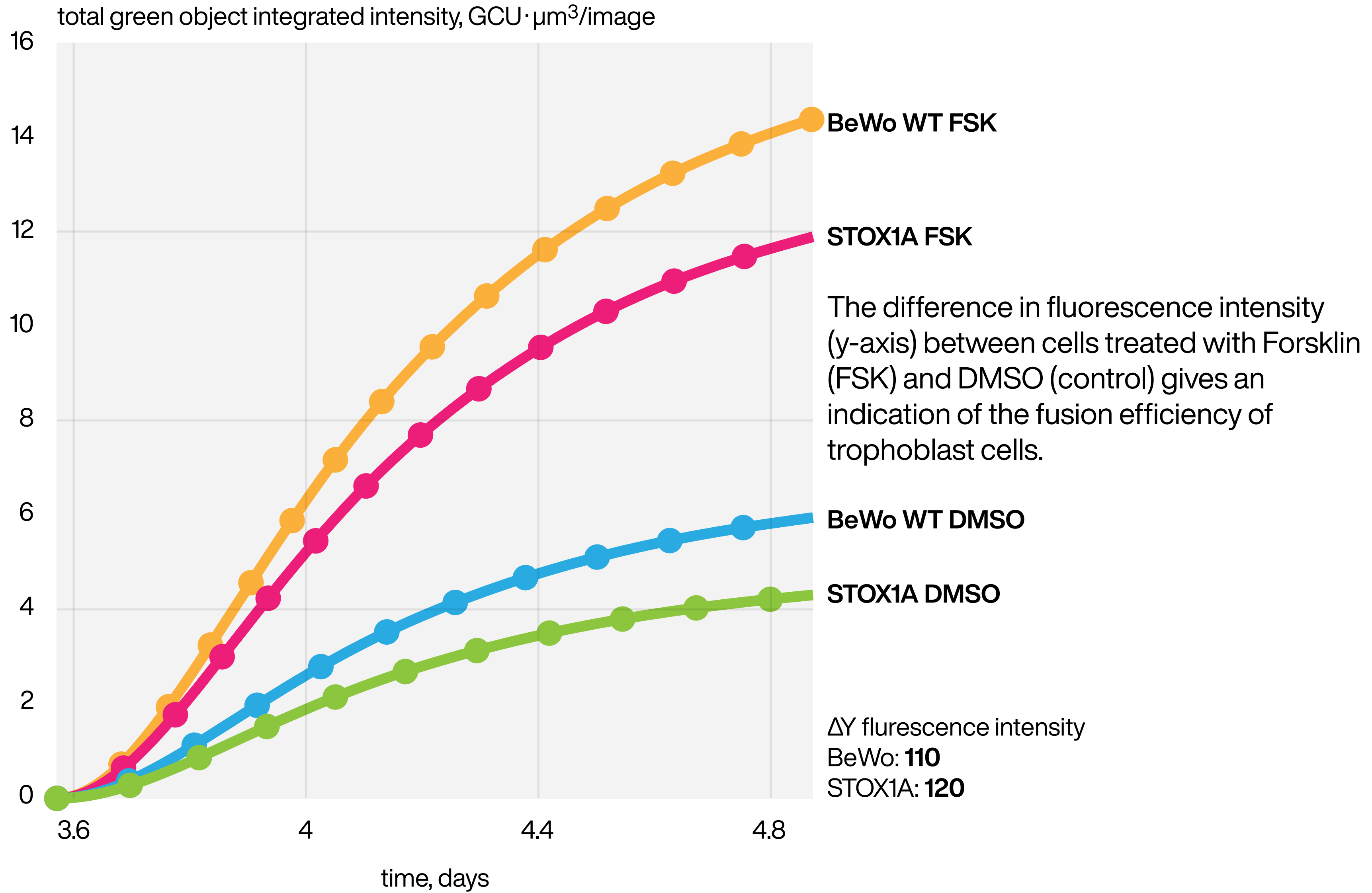
The difference in fluorescence intensity (Y-axis) between cells treated with Forskolin (FSK) and DMSO (control) gives an indication of the fusion efficiency of trophoblast cells.

$\Delta Y$  fluorescence intensity:  
BeWo: **110**  
STOX1A: **120**

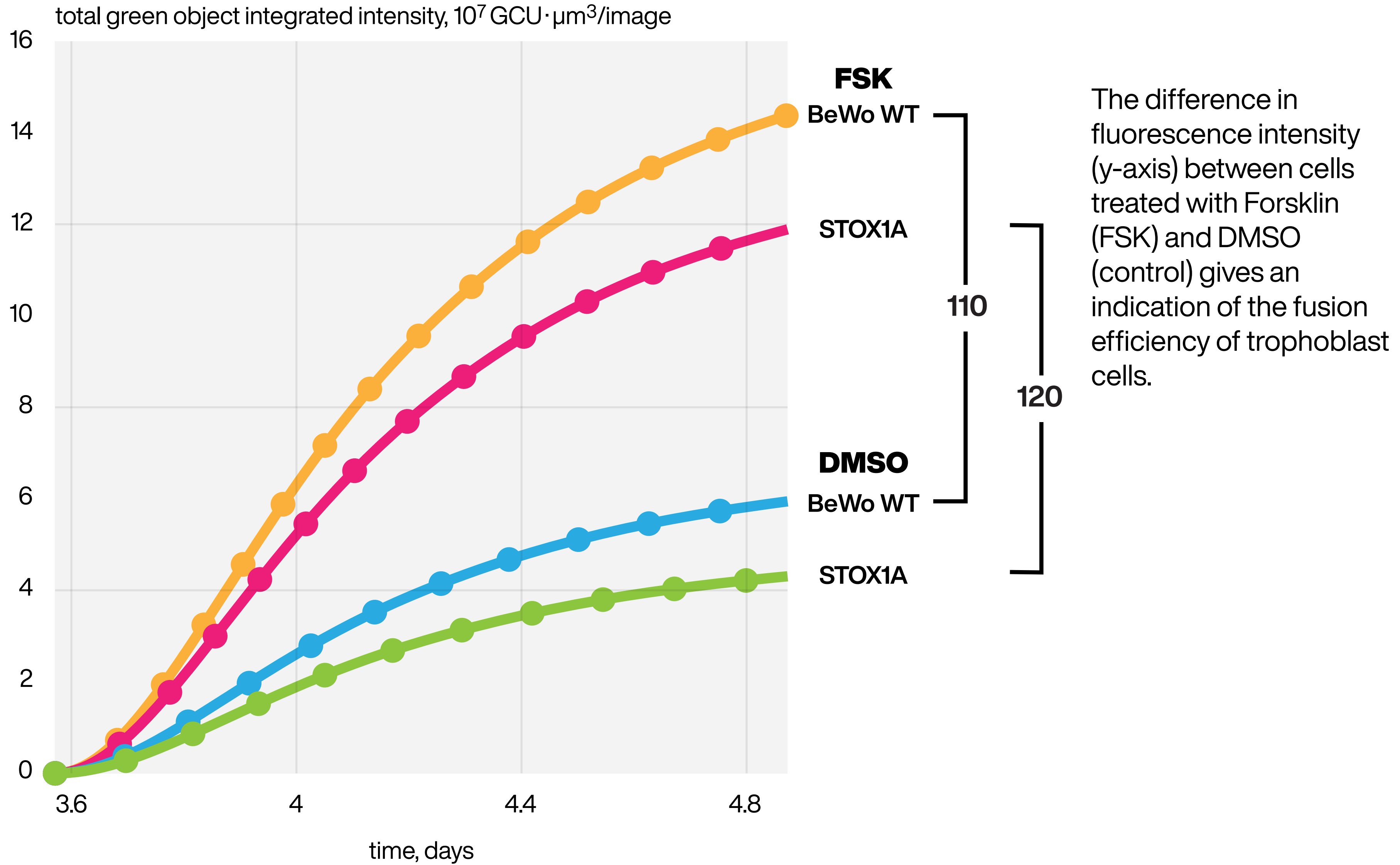
# Fusion efficiency of BeWo WT vs. STOX1A-overexpressing cells



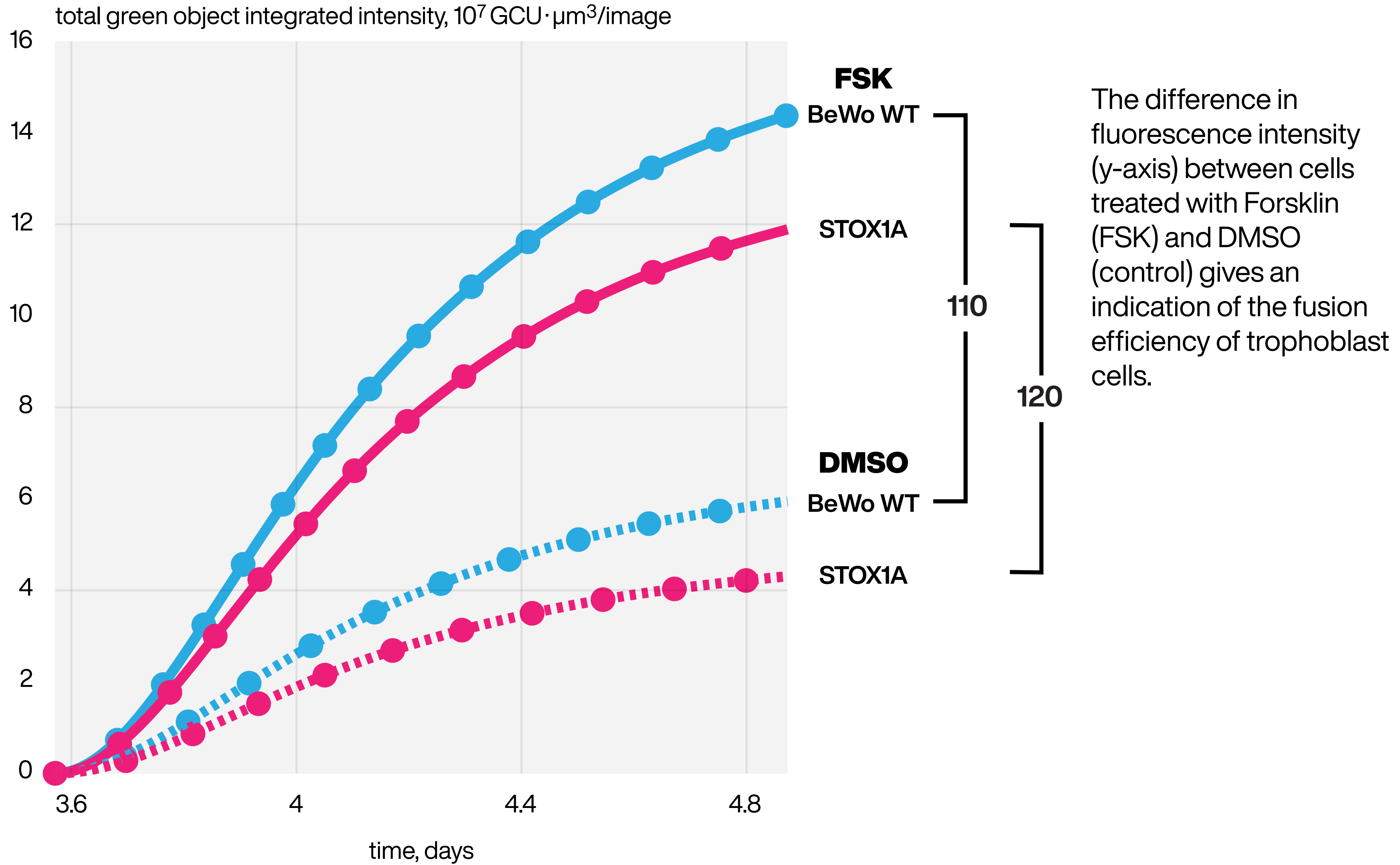
# Fusion efficiency of BeWo WT vs. STOX1A-overexpressing cells



# Fusion efficiency of BeWo WT vs. STOX1A-overexpressing cells

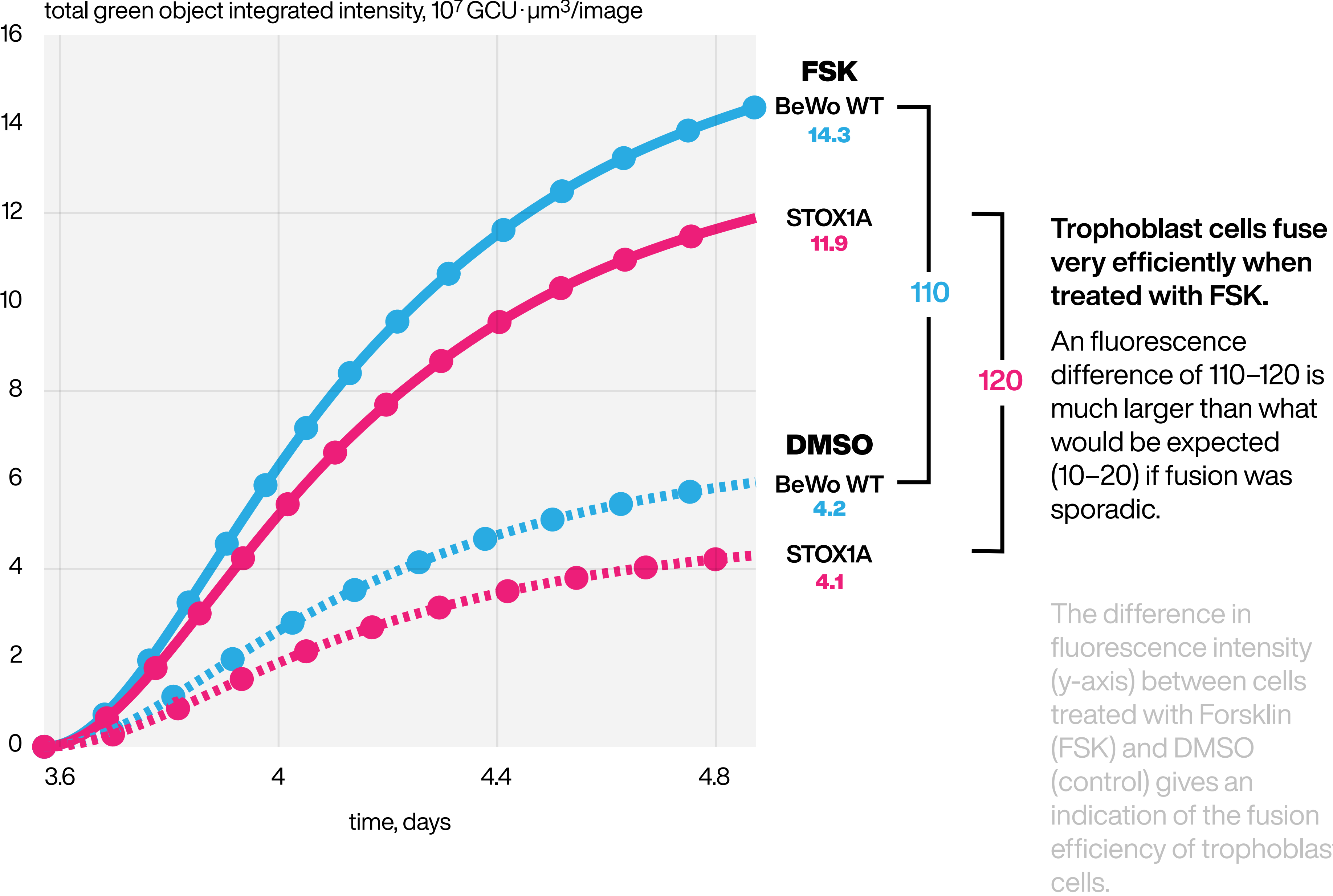


# Fusion efficiency of BeWo WT vs. STOX1A-overexpressing cells





# Fusion efficiency of BeWo WT vs. STOX1A-overexpressing cells





# **data stories**

quantitative narrative — where to look

# Vaccine Effectiveness (VE): 2 Doses | British Columbia (BC), Canada

**Vaccines:** mRNA (Pfizer Comirnaty & Moderna Spikevax), AstraZeneca Vaxzevria

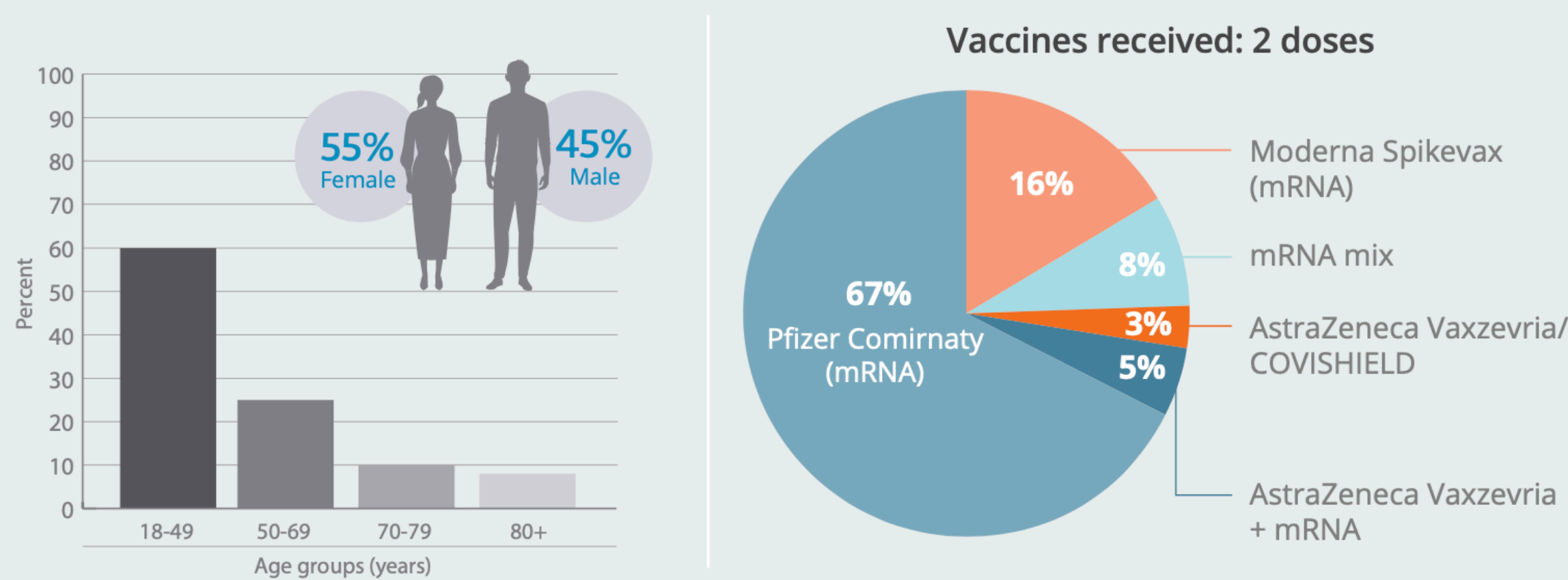
**Population:** 18+ year olds, excluding long term care residents

**Research method:** Test-negative design

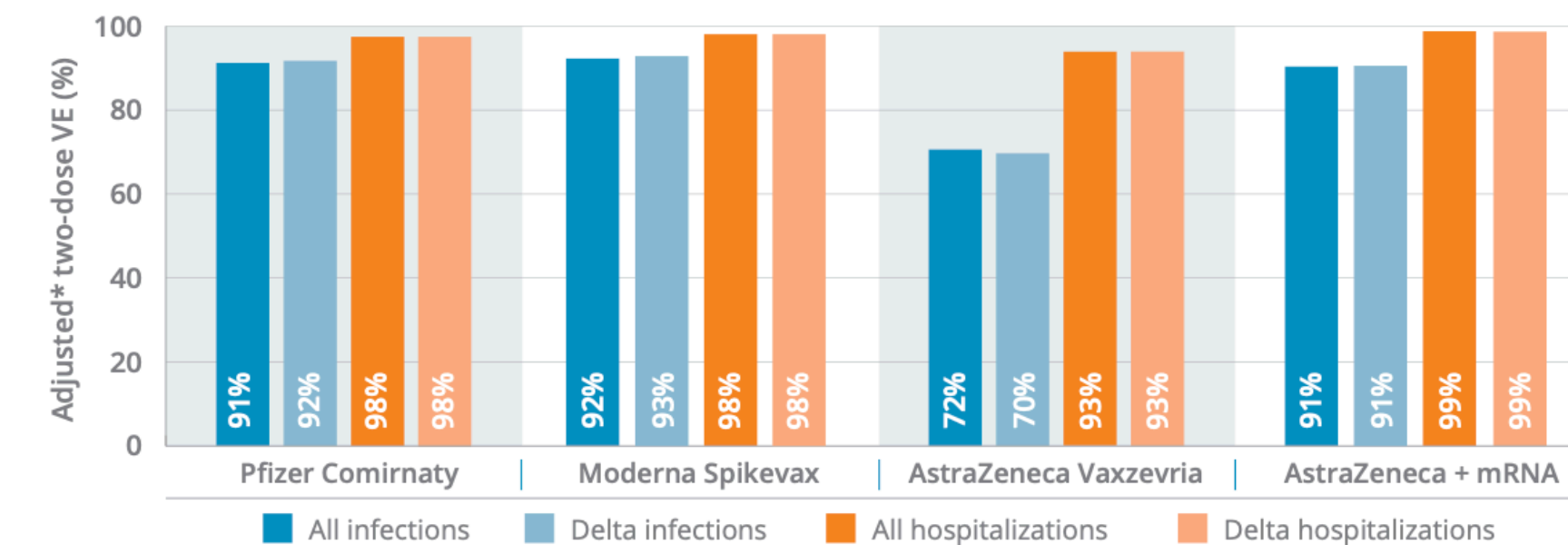
**Study period:** May 30 - Sept. 11, 2021, during rise of Delta variant in BC

**Sample size:** 246,656  
**Cases:** 17,077 **Controls:** 229,579

## Participant characteristics

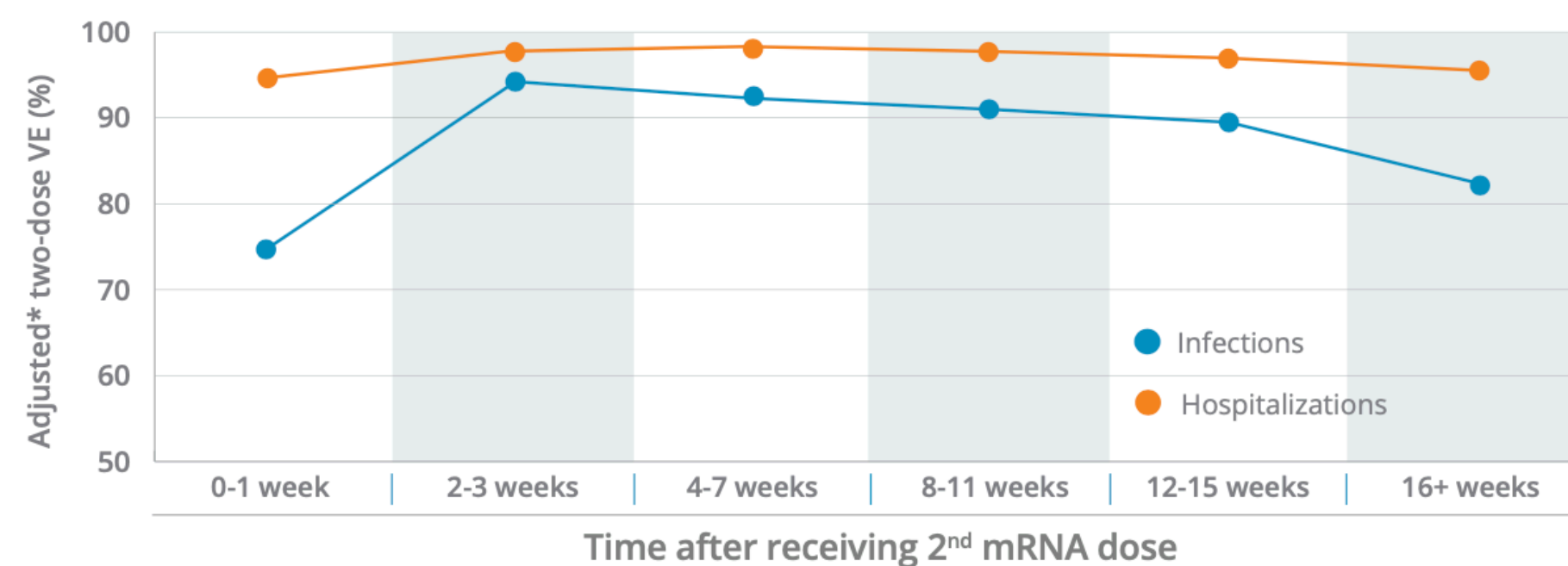


## 2 doses of any vaccine are highly protective, including against the Delta variant

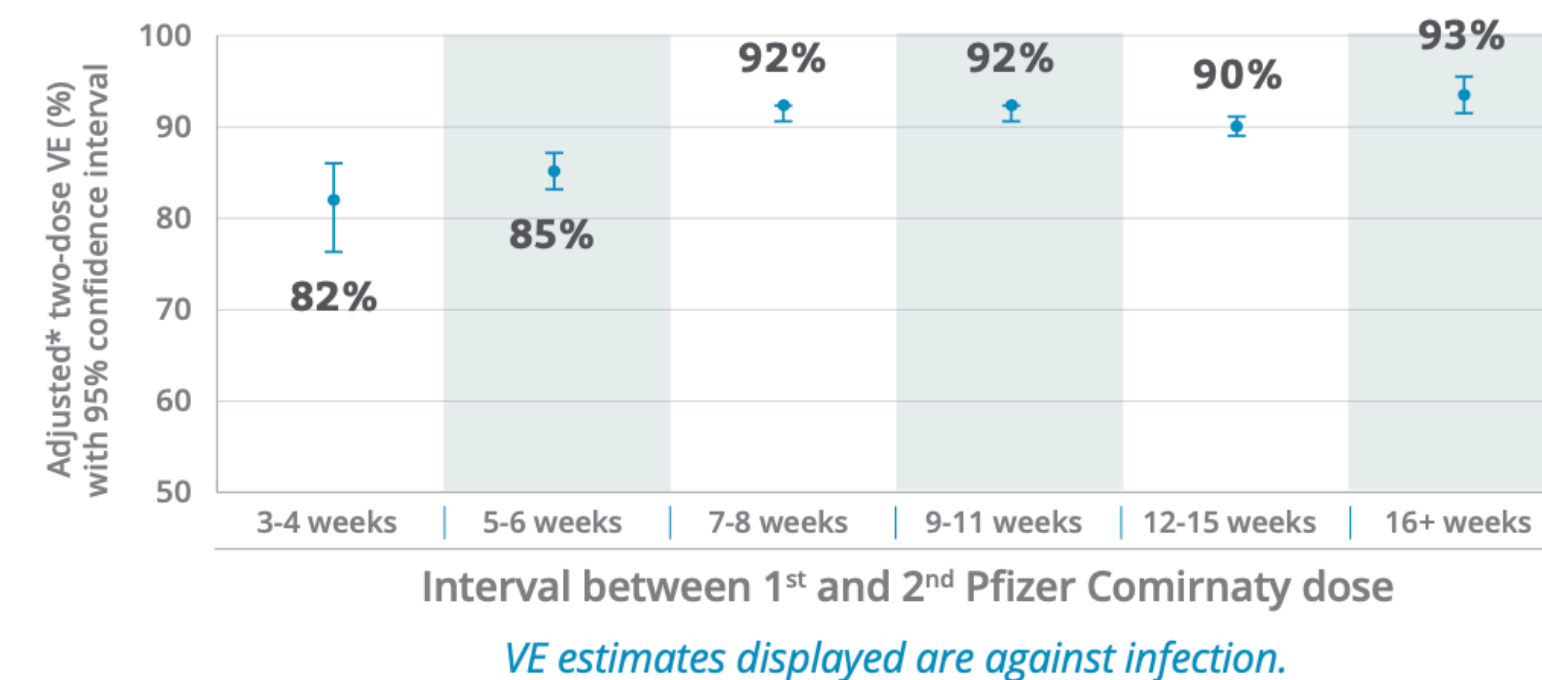


- Hospitalization risk in vaccinated people reduced by more than 90%
- Infection risk reduced by more than 90% for mRNA recipients and 70% for Vaxzevria
- Mixed doses (mRNA and Vaxzevria) offers protection similar to 2 mRNA doses

## Strong protection > 80-90% against infection maintained at least 4 months after the 2<sup>nd</sup> mRNA dose (monitoring continues, including for AstraZeneca Vaxzevria)



## Protection is even stronger when the interval between 1<sup>st</sup> and 2<sup>nd</sup> dose is more than 6 weeks



\*Adjusted for: age group, gender, epidemiological week (22 - 36) and health regions

# 2 Doses of vaccine are highly protective, including against Delta variant



BC Centre for Disease Control  
Provincial Health Services Authority

September 28, 2021

## Vaccines

mRNA  
mRNA  
viral

## Population

## Research method

## Study period

## Sample size

Cases  
Controls

## Participant characteristics

---

## Vaccines received: 2 doses

---

**2 doses of any vaccine are highly protective, including against the Delta variant**

---

**>80% protection against infection maintained at least 4 months after the 2nd mRNA dose**

---

**Protection is even stronger when the interval between 1st and 2nd dose is more than 6 weeks**

---

# 2 Doses of vaccine are highly protective, including against Delta variant



BC Centre for Disease Control  
Provincial Health Services Authority

September 28, 2021

## Vaccines

- mRNA Pfizer Comirnaty
- mRNA Moderna Spikevax
- viral AstraZeneca Vaxzevria

## Population

18+-year-olds,  
excluding long term care residents

## Research method

Test-negative design

## Study period

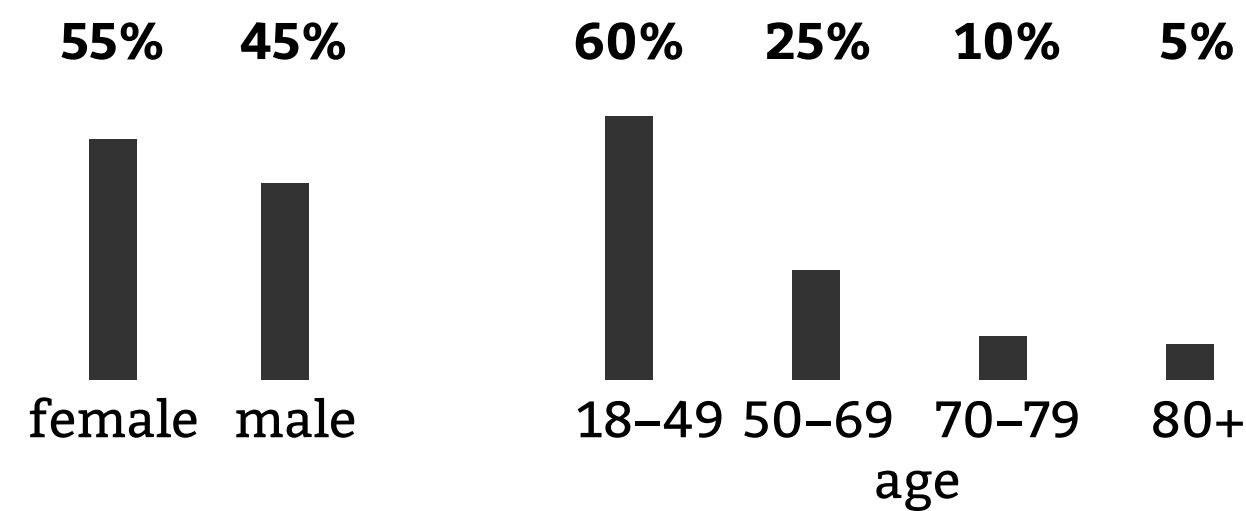
May 30 – Sep 11, 2021  
during rise of Delta variant in BC

Sample size 246,656

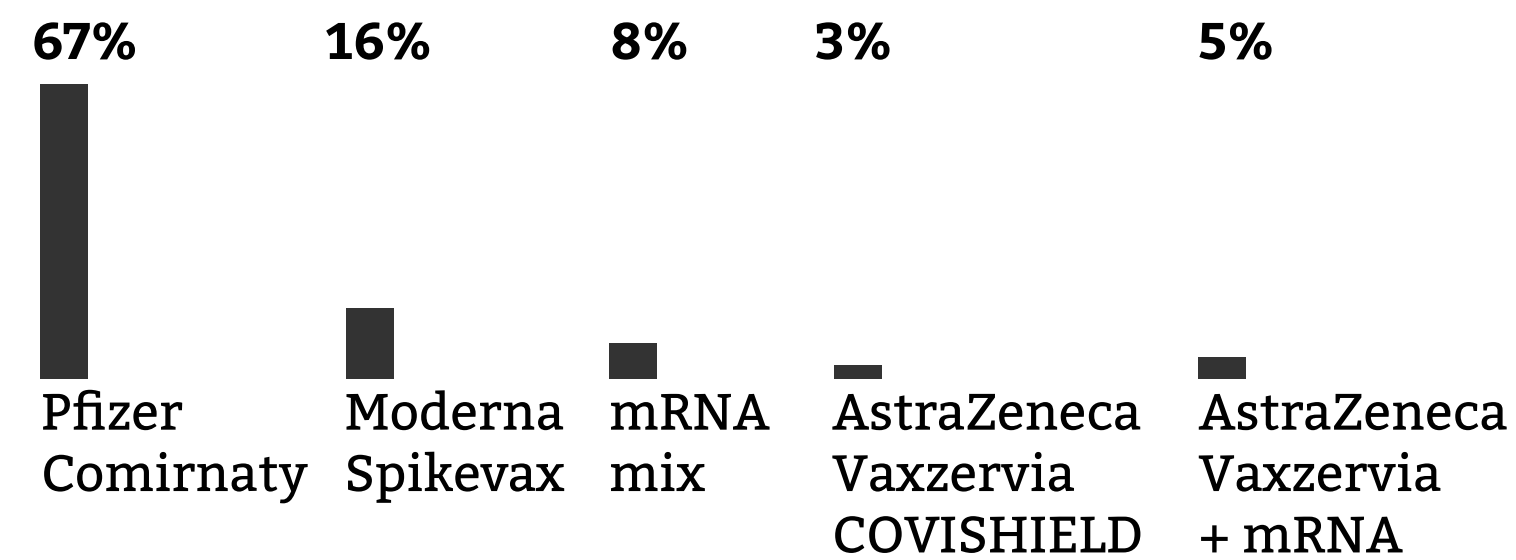
Cases 17,077

Controls 229,579

## Participant characteristics

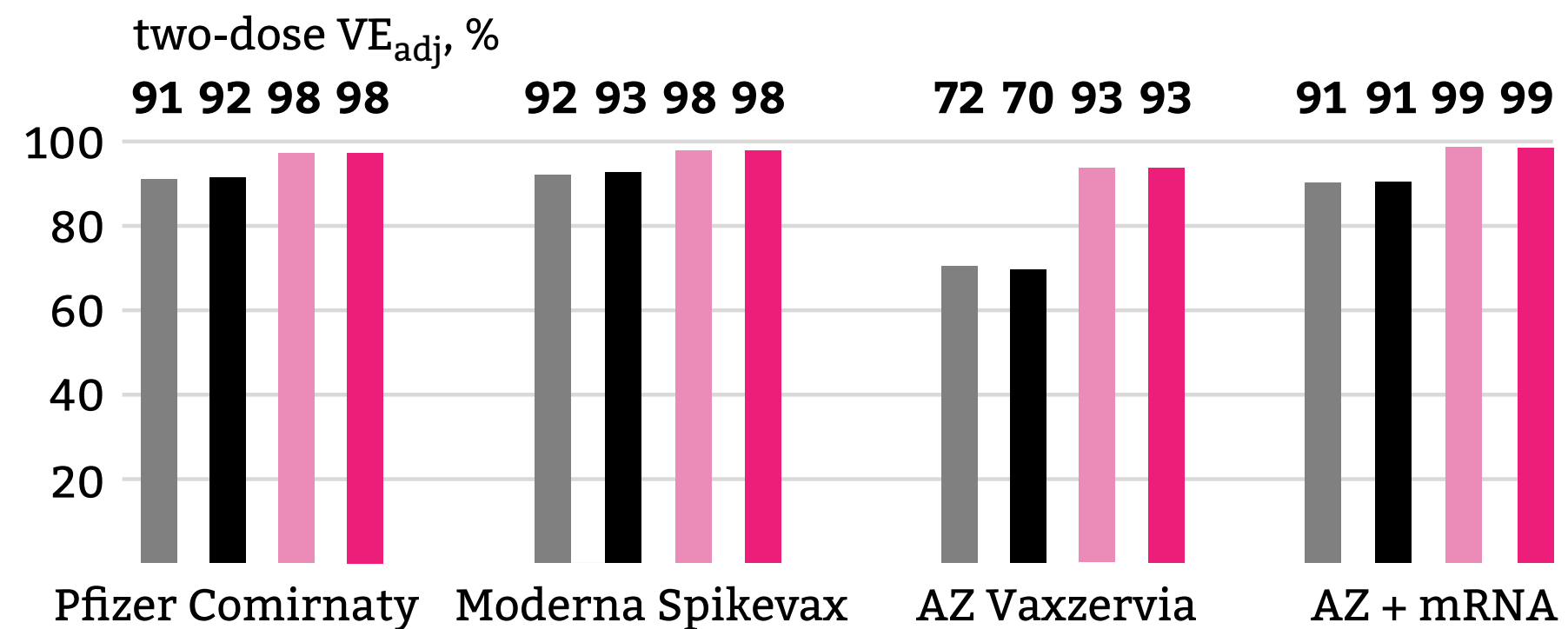


## Vaccines received: 2 doses

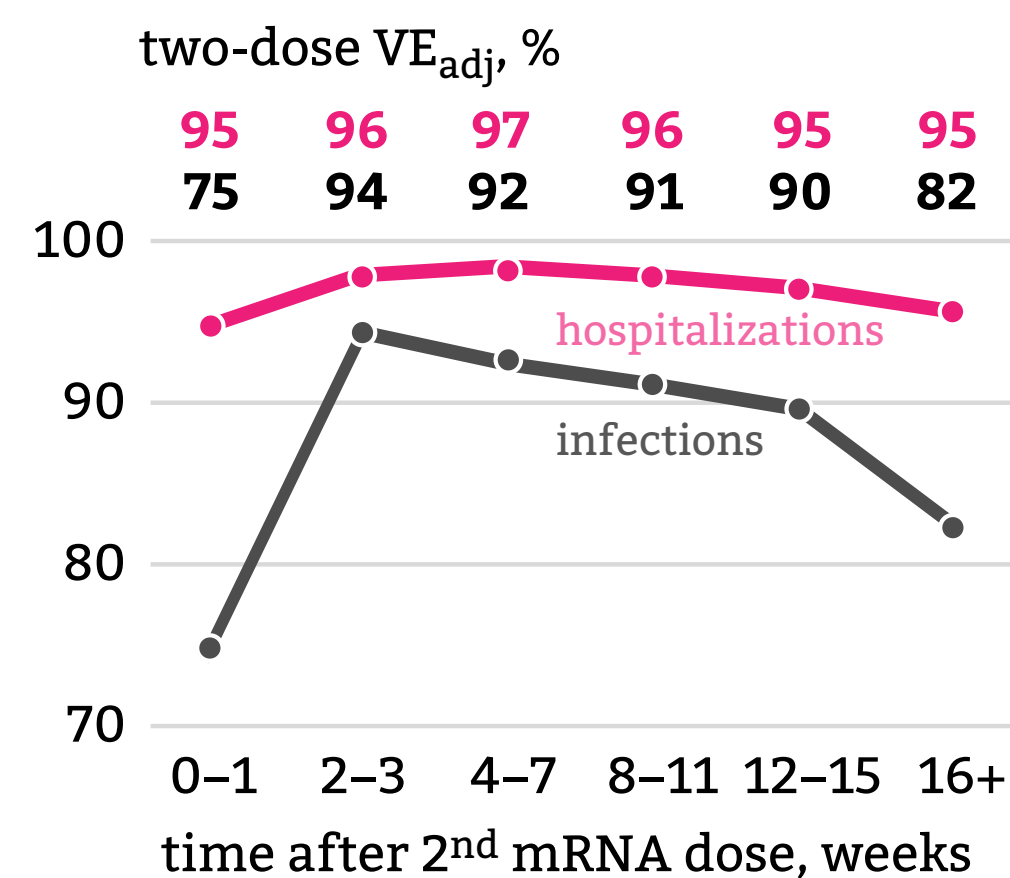


## 2 doses of any vaccine are highly protective, including against the Delta variant

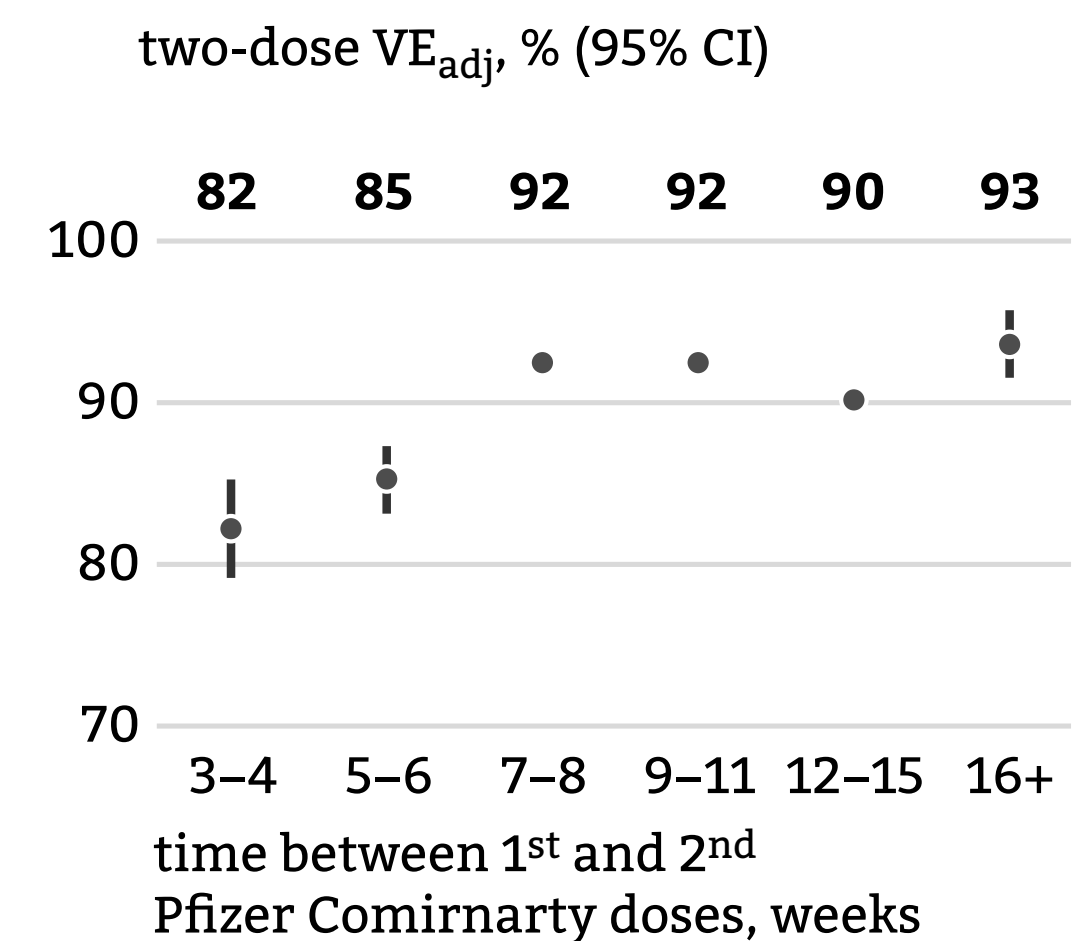
all Delta  
 infections  
 hospitalizations



## >80% protection against infection maintained at least 4 months after the 2nd mRNA dose



## Protection is even stronger when the interval between 1st and 2nd dose is more than 6 weeks





# 2 Doses of vaccine are highly protective, including against Delta variant

## Vaccines

**mRNA** Pfizer Comirnaty  
**mRNA** Moderna Spikevax  
**viral** AstraZeneca Vaxzevria

## Population

18+-year-olds,  
excluding long term care residents

## Research method

Test-negative design

## Study period

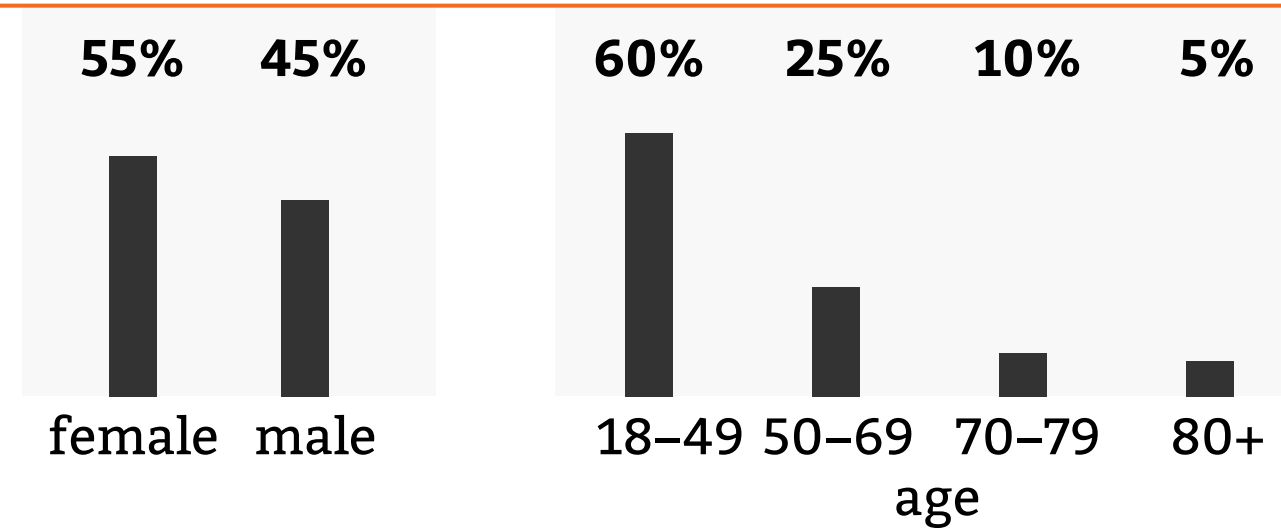
May 30 – Sep 11, 2021  
during rise of Delta variant in BC

**Sample size** 246,656

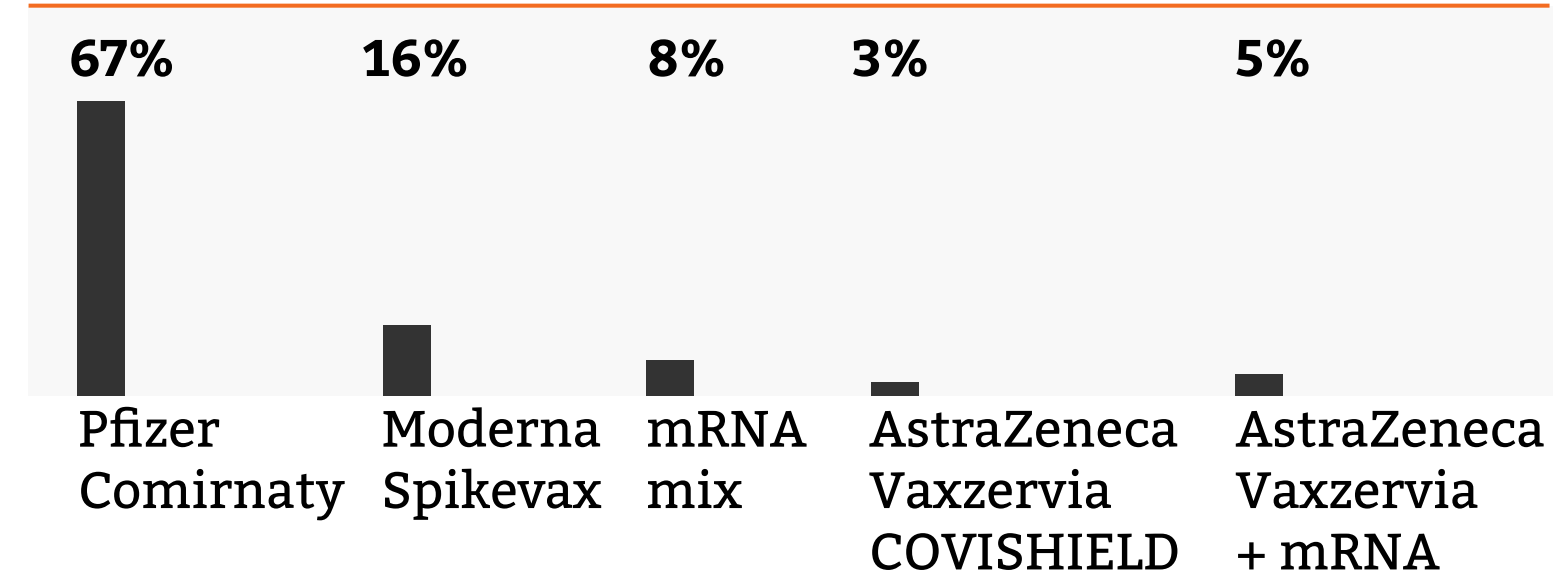
**Cases** 17,077

**Controls** 229,579

## Participant characteristics

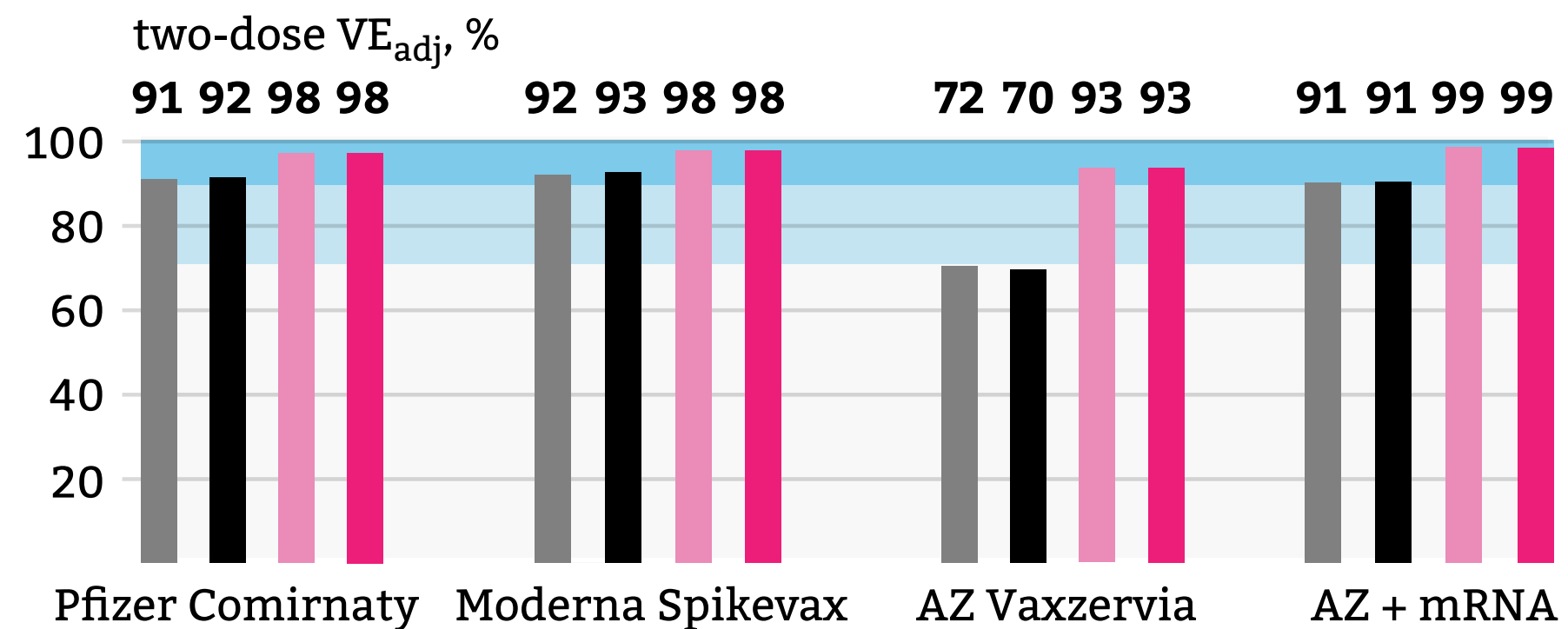


## Vaccines received: 2 doses

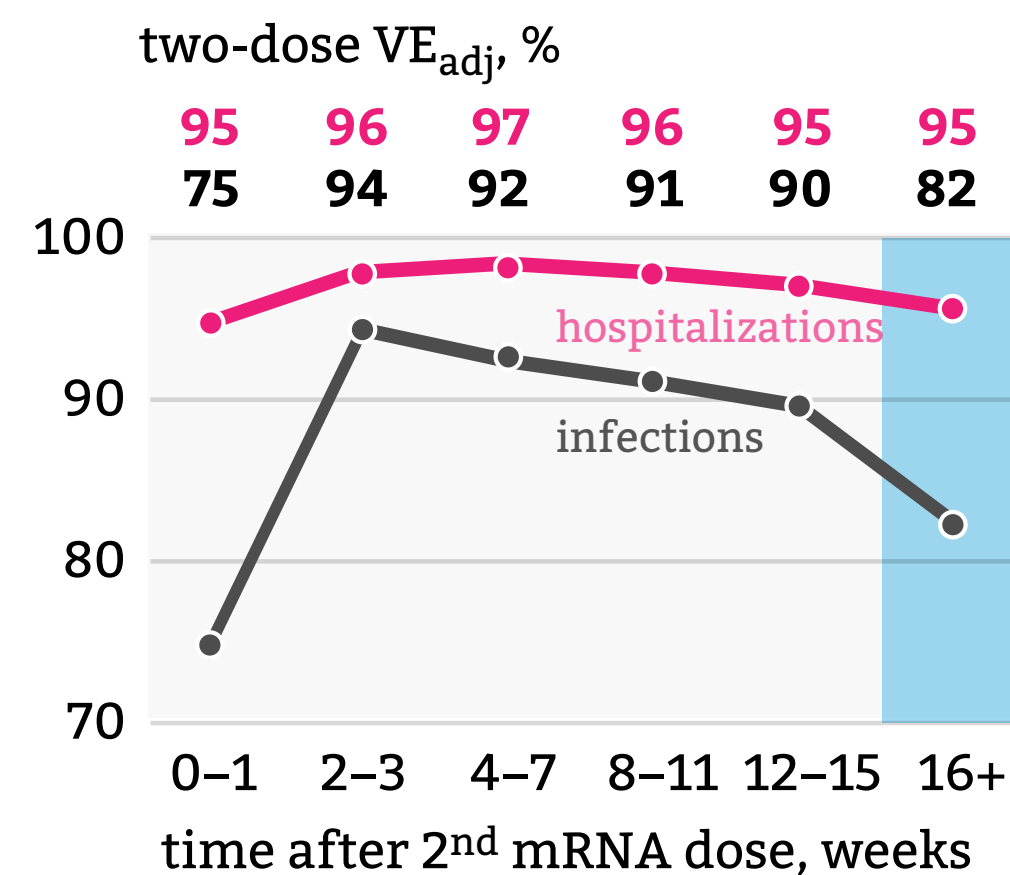


## 2 doses of any vaccine are highly protective, including against the Delta variant

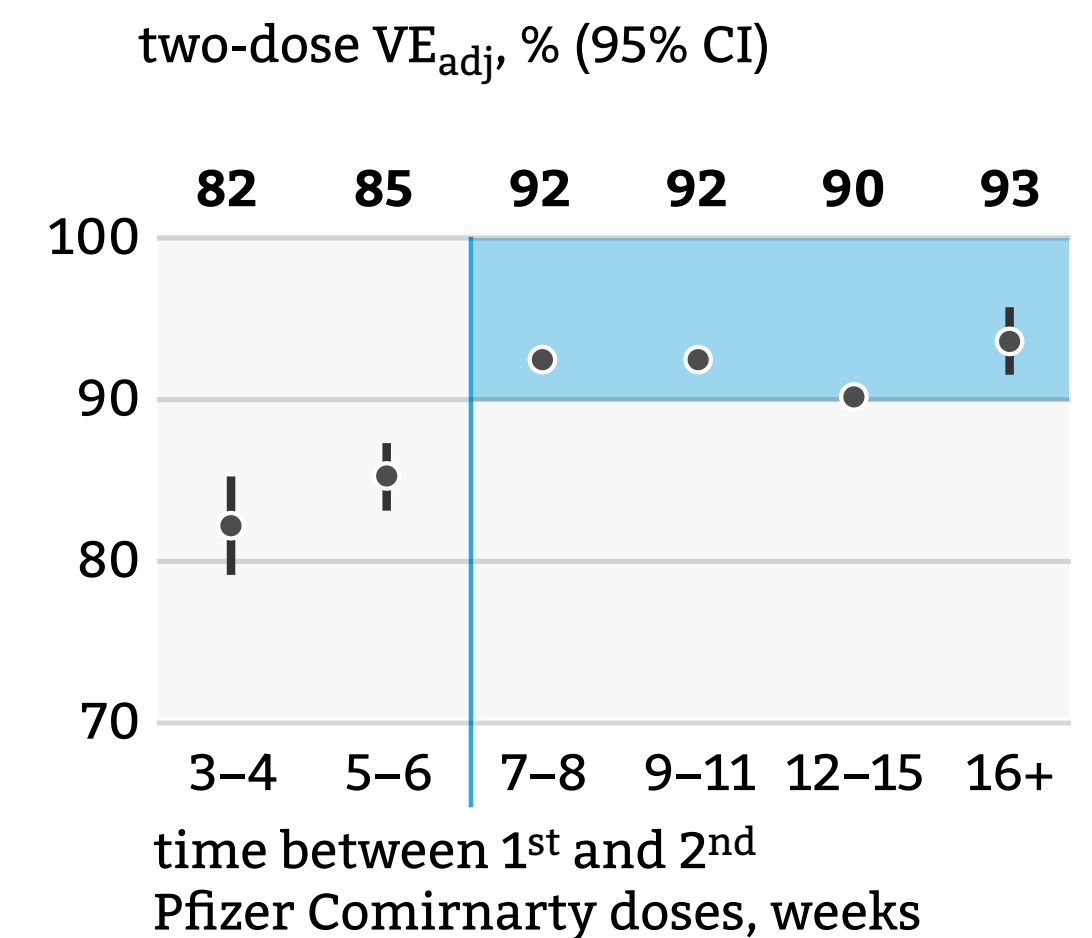
all Delta  
infections  
hospitalizations



## >80% protection against infection maintained at least 4 months after the 2nd mRNA dose



## Protection is even stronger when the interval between 1st and 2nd dose is more than 6 weeks



# 2 Doses of vaccine are highly protective, including against Delta variant



BC Centre for Disease Control  
Provincial Health Services Authority

September 28, 2021

## Vaccines

- mRNA Pfizer Comirnaty
- mRNA Moderna Spikevax
- viral AstraZeneca Vaxzevria

## Population

18+-year-olds,  
excluding long term care residents

## Research method

Test-negative design

## Study period

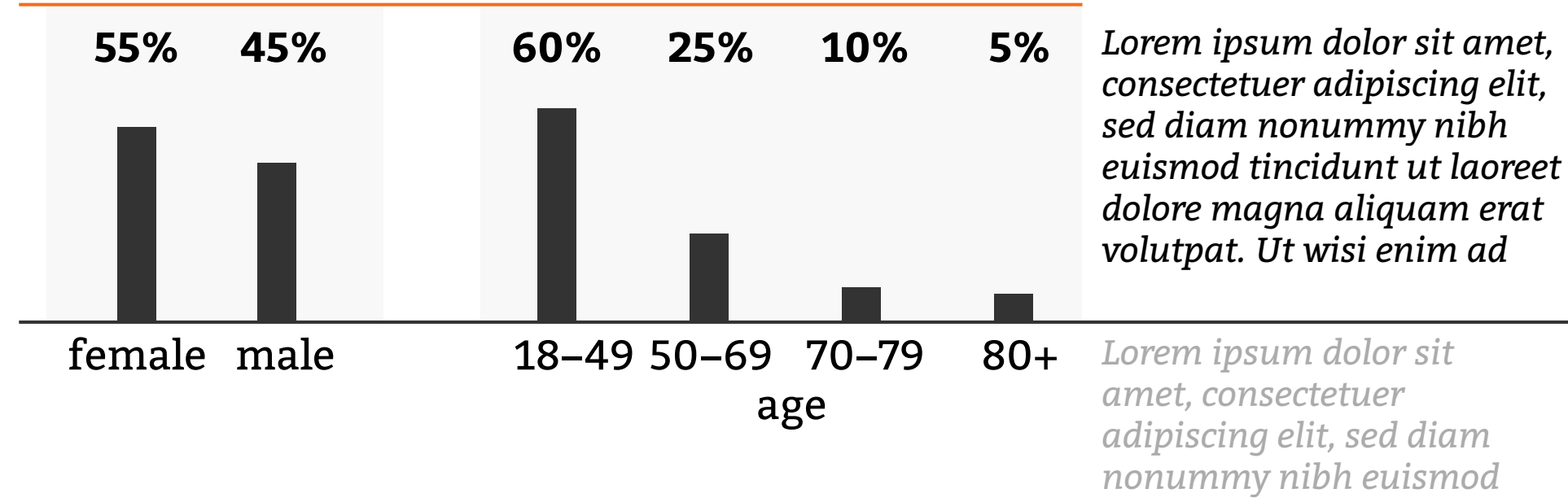
May 30 – Sep 11, 2021  
during rise of Delta variant in BC

Sample size 246,656

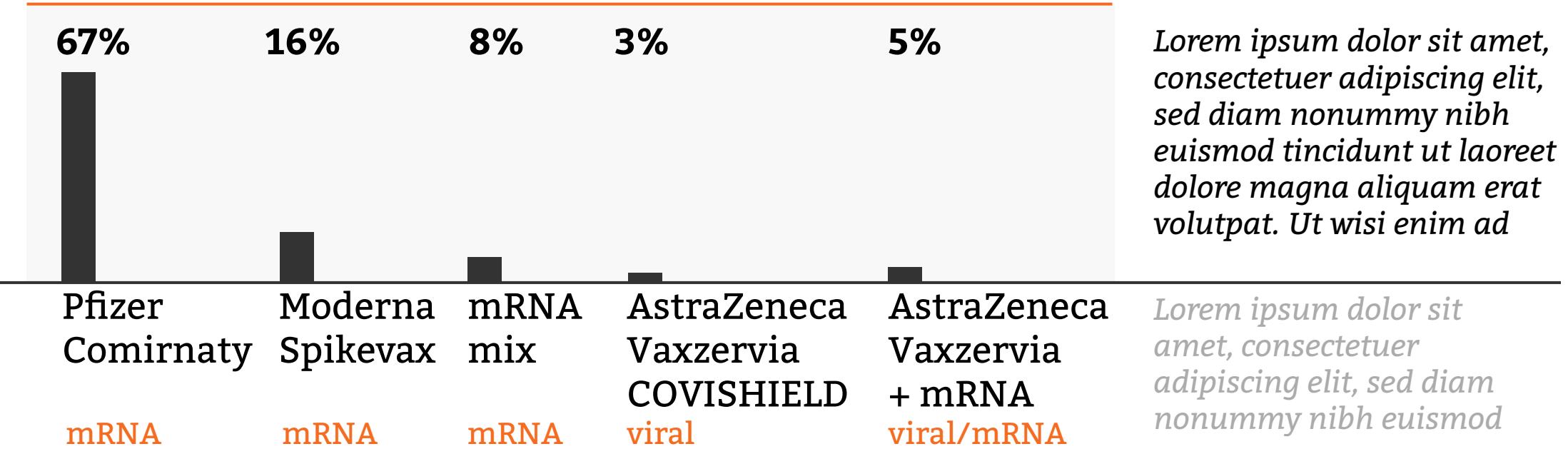
Cases 17,077

Controls 229,579

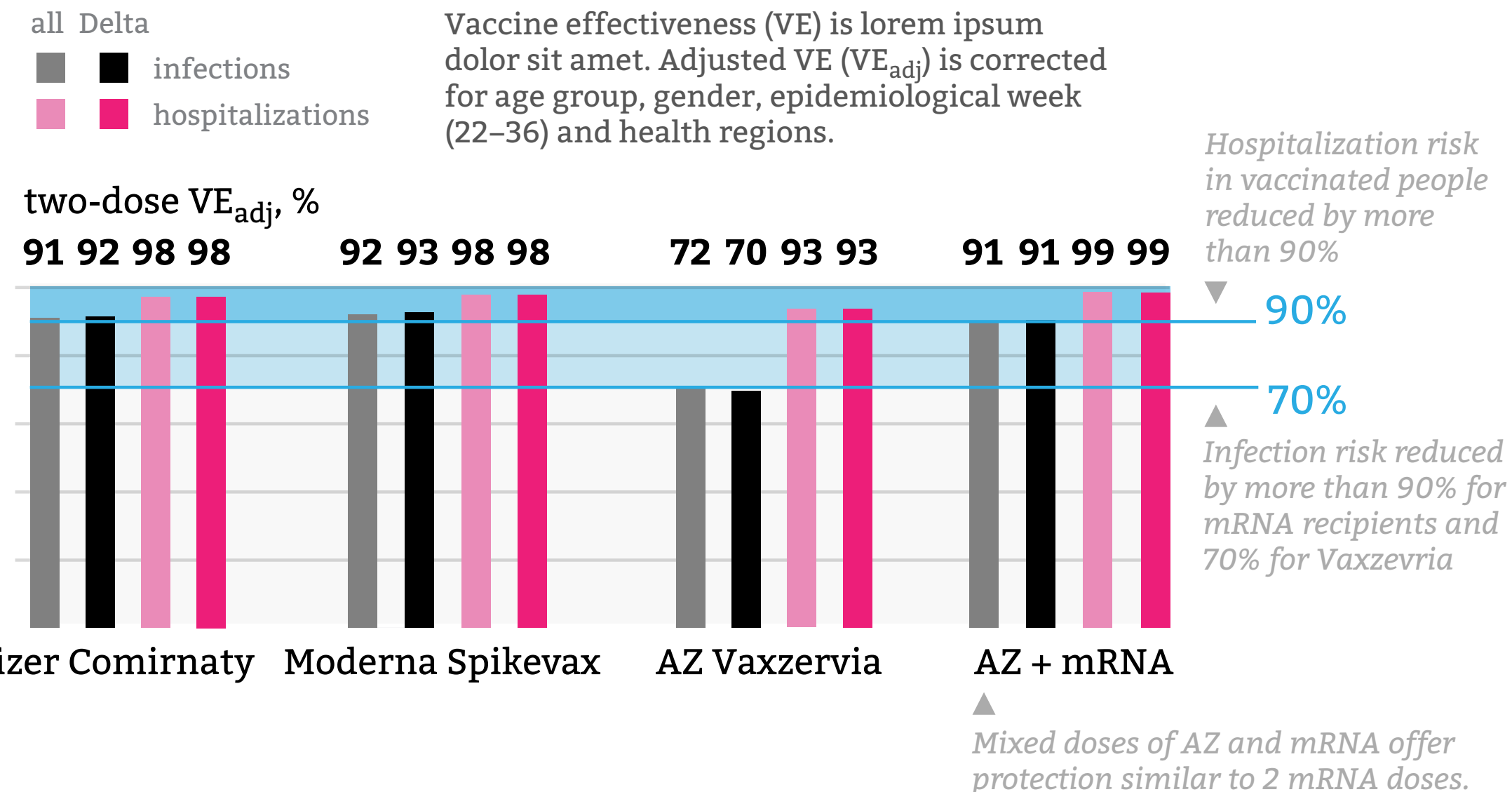
## Participant characteristics



## Vaccines received: 2 doses

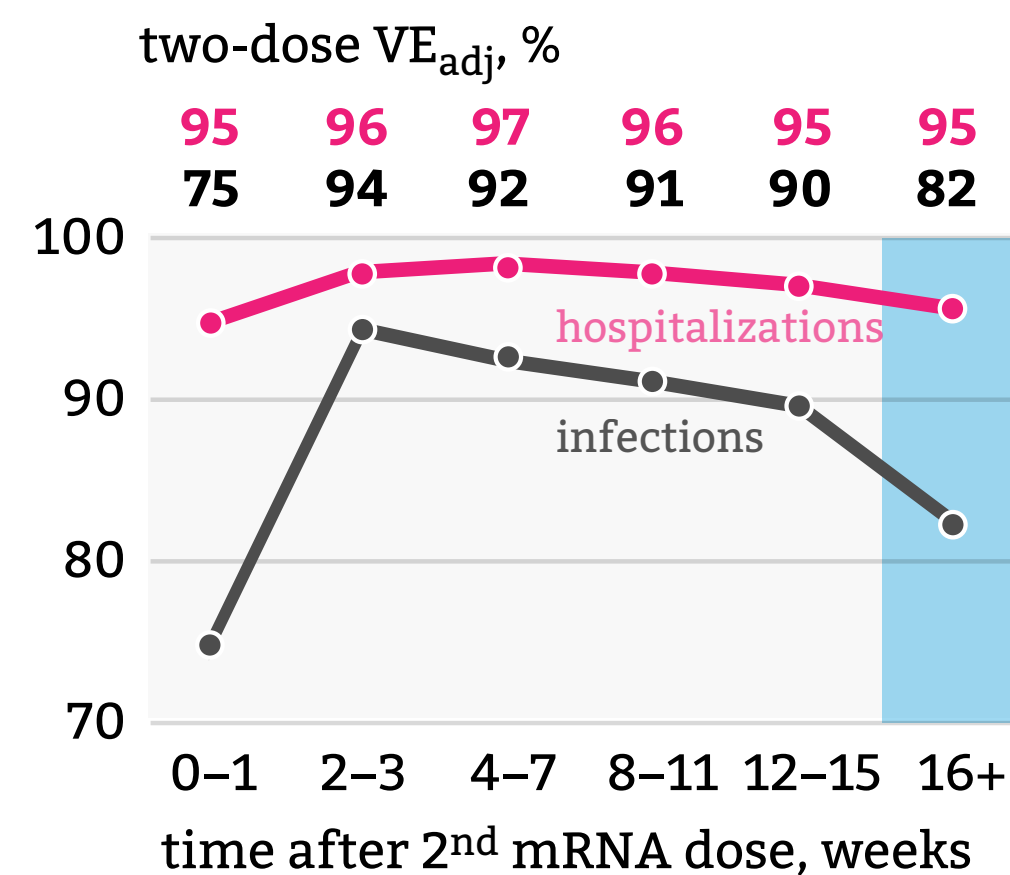


## 2 doses of any vaccine are highly protective, including against the Delta variant



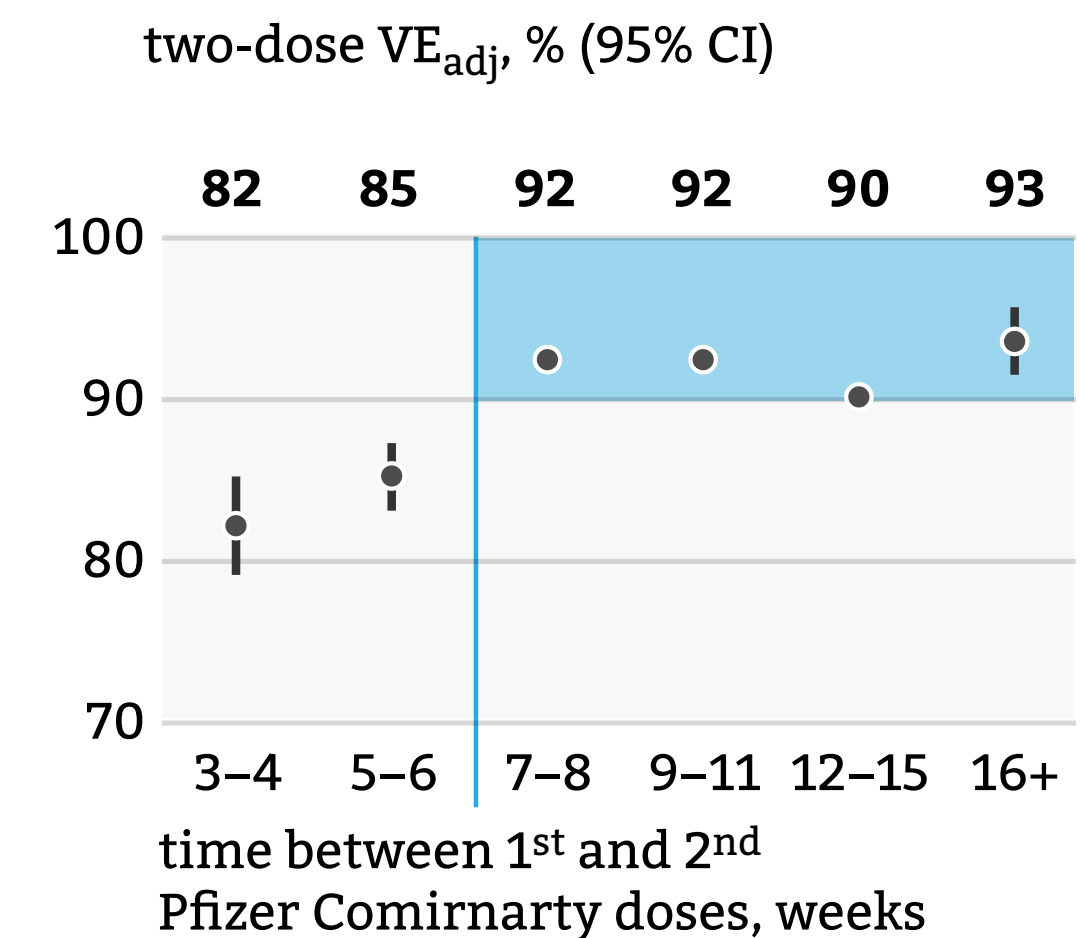
## >80% protection against infection maintained at least 4 months after the 2nd mRNA dose

monitoring continues, including for AstraZeneca Vaxzevria



## Protection is even stronger when the interval between 1st and 2nd dose is more than 6 weeks

VE estimates are against infection



# 2 Doses of vaccine are highly protective, including against Delta variant



BC Centre for Disease Control  
Provincial Health Services Authority

September 28, 2021

## Vaccines

mRNA Pfizer Comirnaty  
mRNA Moderna Spikevax  
viral AstraZeneca Vaxzevria

## Population

18+-year-olds,  
excluding long term care residents

## Research method

Test-negative design

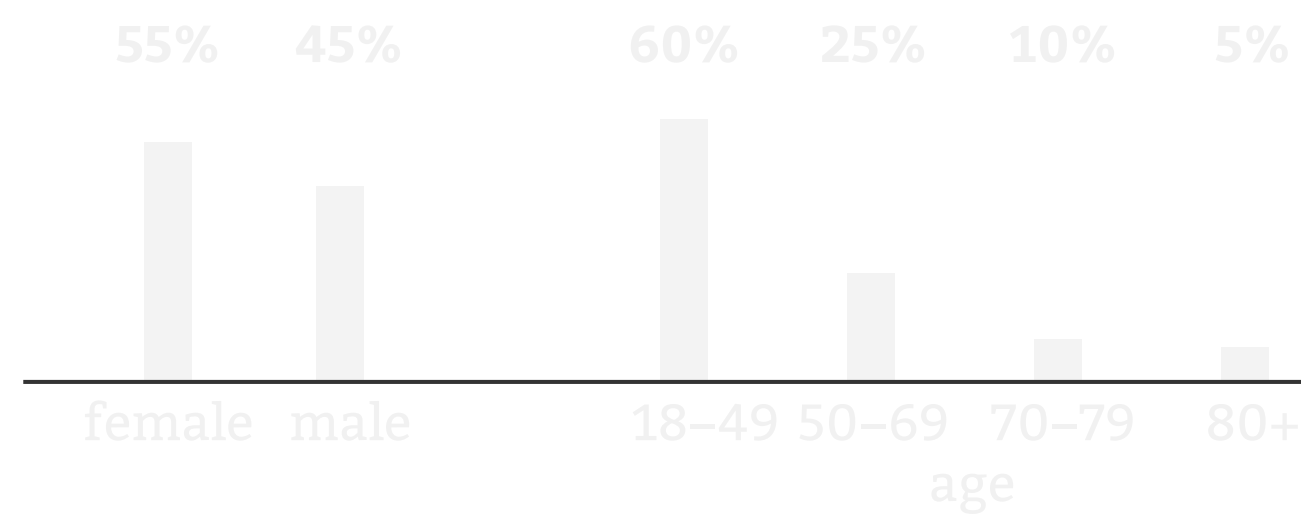
## Study period

May 30 – Sep 11, 2021  
during rise of Delta variant in BC

## Sample size

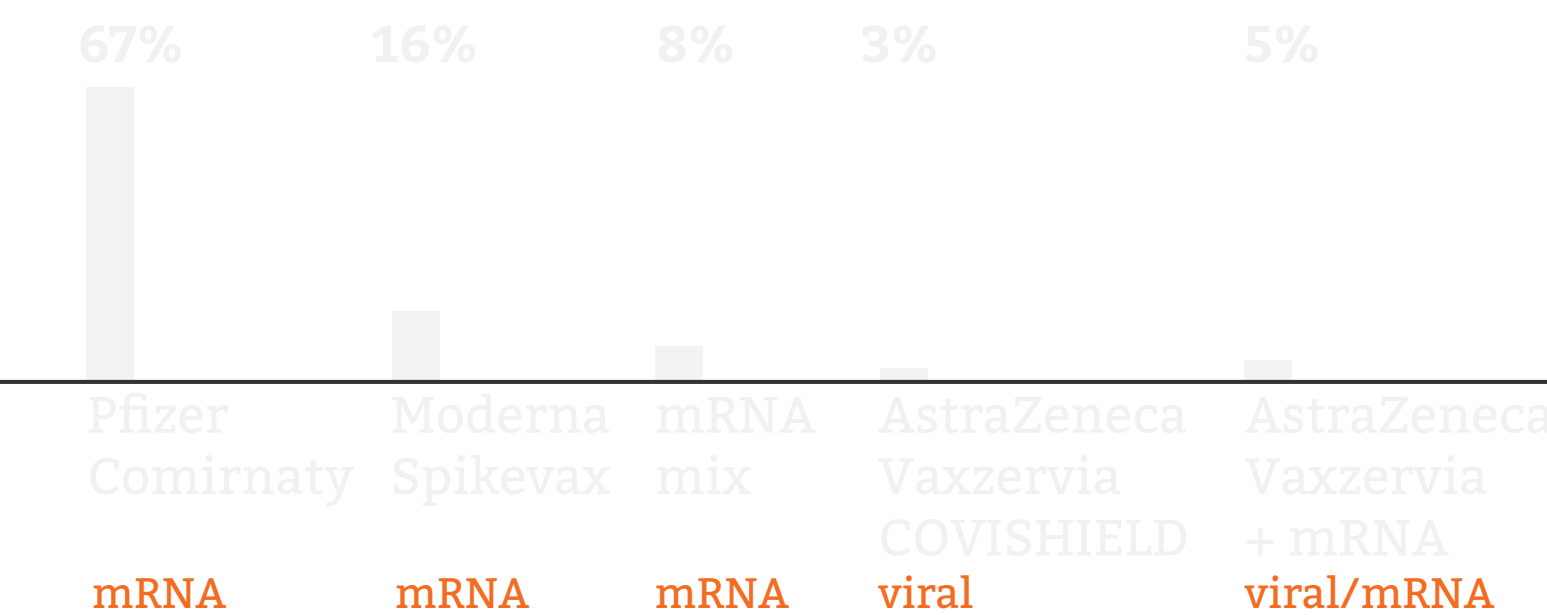
246,656  
Cases 17,077  
Controls 229,579

## Participant characteristics



Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad

## Vaccines received: 2 doses

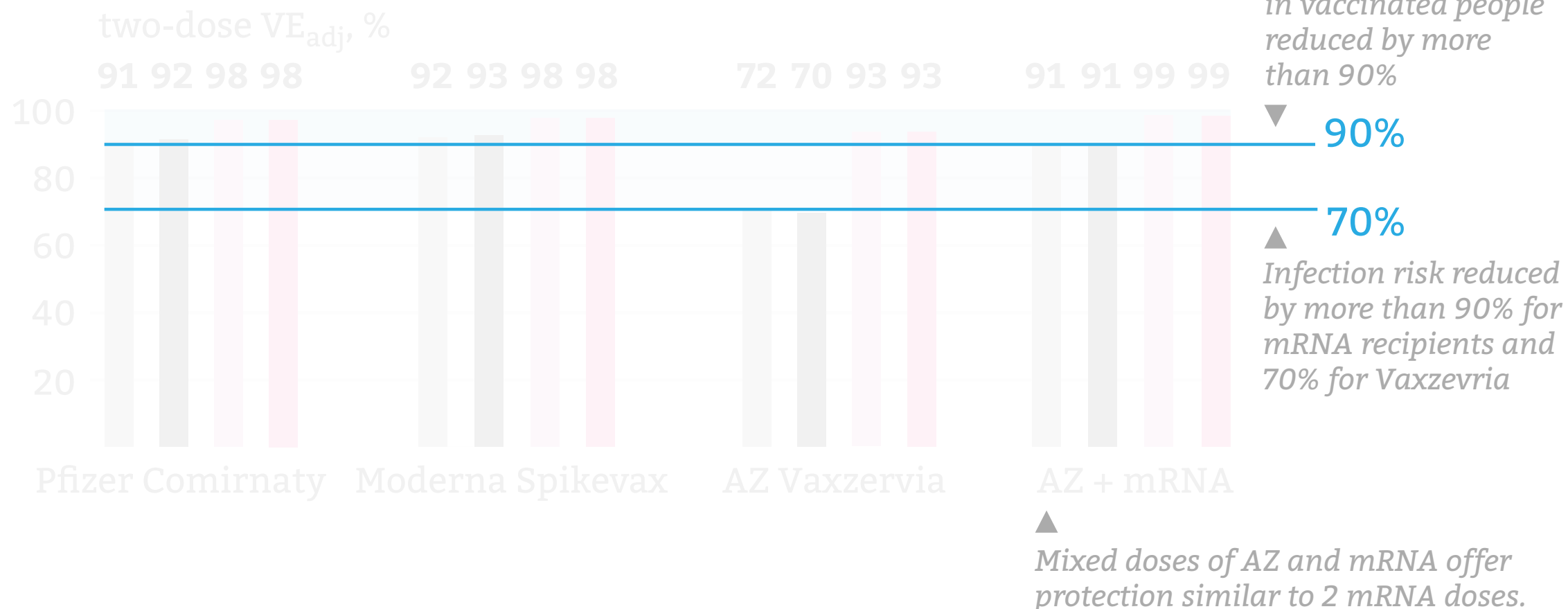


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad

## 2 doses of any vaccine are highly protective, including against the Delta variant

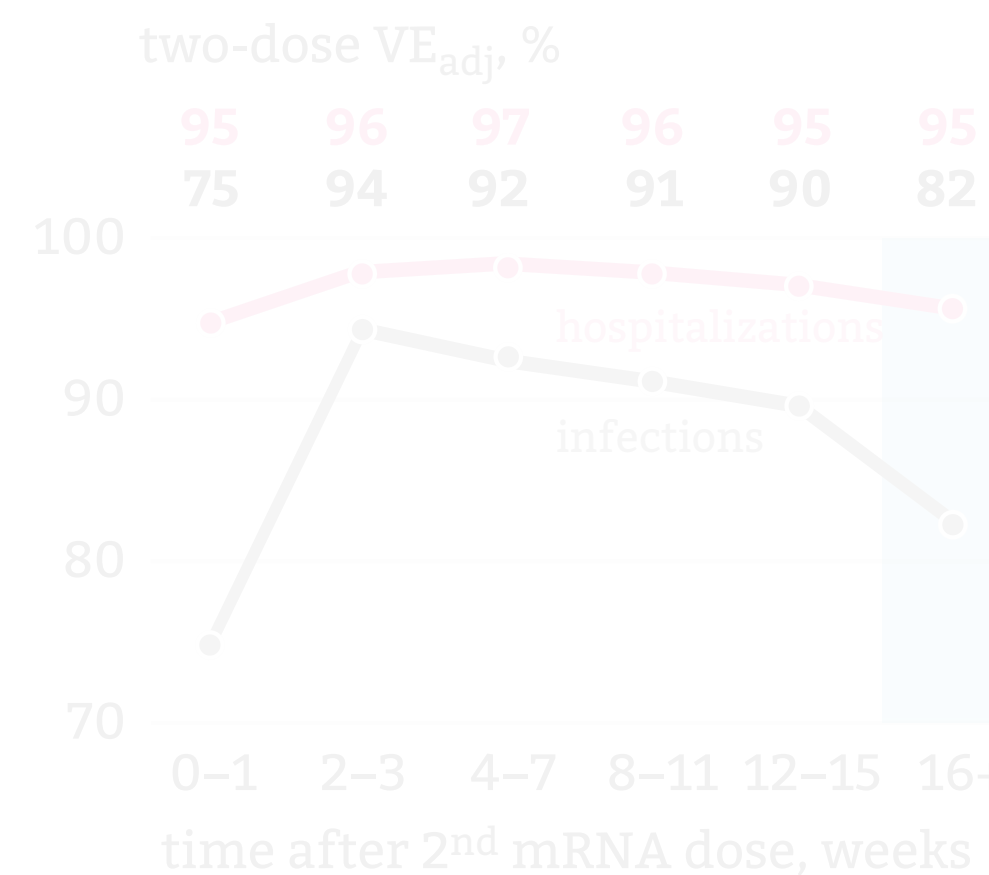
all Delta  
infections  
hospitalizations

Vaccine effectiveness (VE) is lorem ipsum dolor sit amet. Adjusted VE (VE<sub>adj</sub>) is corrected for age group, gender, epidemiological week (22-36) and health regions.



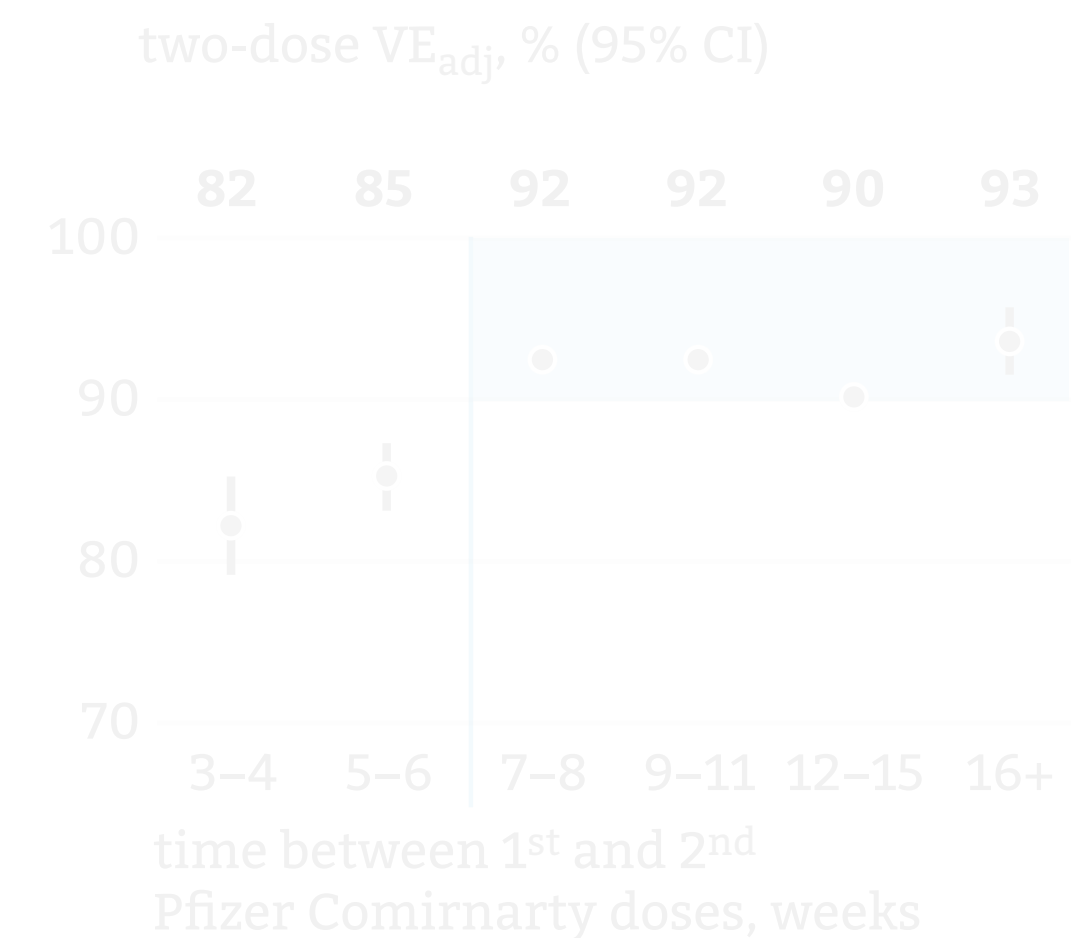
## >80% protection against infection maintained at least 4 months after the 2nd mRNA dose

monitoring continues, including for AstraZeneca Vaxzevria



## Protection is even stronger when the interval between 1st and 2nd dose is more than 6 weeks

VE estimates are against infection





## **resources**

instead of many books, a few books many times



# The Elements of Typographic Style

version 3.0

*Robert Bringhurst*





*the penalty of the law in force against witchcraft ... and ... the marriage, upon conviction, shall stand null and void.*

*First  
Principles*

The function of typography, as I understand it, is neither to further the power of witches nor to bolster the defences of those, like this unfortunate parliamentarian, who live in terror of being tempted and deceived. The satisfactions of the craft come from elucidating, and perhaps even ennobling, the text, not from deluding the unwary reader by applying scents, paints and iron stays to empty prose. But humble texts, such as classified ads or the telephone directory, may profit as much as anything else from a good typographical bath and a change of clothes. And many a book, like many a warrior or dancer or priest of either sex, may look well with some paint on its face, or indeed with a bone in its nose.

#### 1.1.2 *Letters have a life and dignity of their own.*

Letterforms that honor and elucidate what humans see and say deserve to be honored in their turn. Well-chosen words deserve well-chosen letters; these in their turn deserve to be set with affection, intelligence, knowledge and skill. Typography is a link, and it ought, as a matter of honor, courtesy and pure delight, to be as strong as the others in the chain.

Writing begins with the making of footprints, the leaving of signs. Like speaking, it is a perfectly natural act which humans have carried to complex extremes. The typographer's task has always been to add a somewhat unnatural edge, a protective shell of artificial order, to the power of the writing hand. The tools have altered over the centuries, and the exact degree of unnaturalness desired has varied from place to place and time to time, but the character of the essential transformation between manuscript and type has scarcely changed.

The original purpose of type was simply copying. The job of the typographer was to imitate the scribal hand in a form that permitted exact and fast replication. Dozens, then hundreds, then thousands of copies were printed in less time than a scribe would need to finish one. This excuse for setting texts in type has disappeared. In the age of photolithography, digital scanning and offset printing, it is as easy to print directly from handwritten copy as from text that is typographically composed. Yet the typographer's task is little changed. It is still to

give the illusion of superhuman speed and stamina – and of superhuman patience and precision – to the writing hand.

Typography is just that: idealized writing. Writers themselves now rarely have the calligraphic skill of earlier scribes, but they evoke countless versions of ideal script by their varying voices and literary styles. To these blind and often invisible visions, the typographer must respond in visible terms.

In a badly designed book, the letters mill and stand like starving horses in a field. In a book designed by rote, they sit like stale bread and mutton on the page. In a well-made book, where designer, compositor and printer have all done their jobs, no matter how many thousands of lines and pages, the letters are alive. They dance in their seats. Sometimes they rise and dance in the margins and aisles.

Simple as it may sound, the task of creative non-interference with letters is a rewarding and difficult calling. In ideal conditions, it is all that typographers are really asked to do – and it is enough.

#### 1.1.3 *There is a style beyond style.*

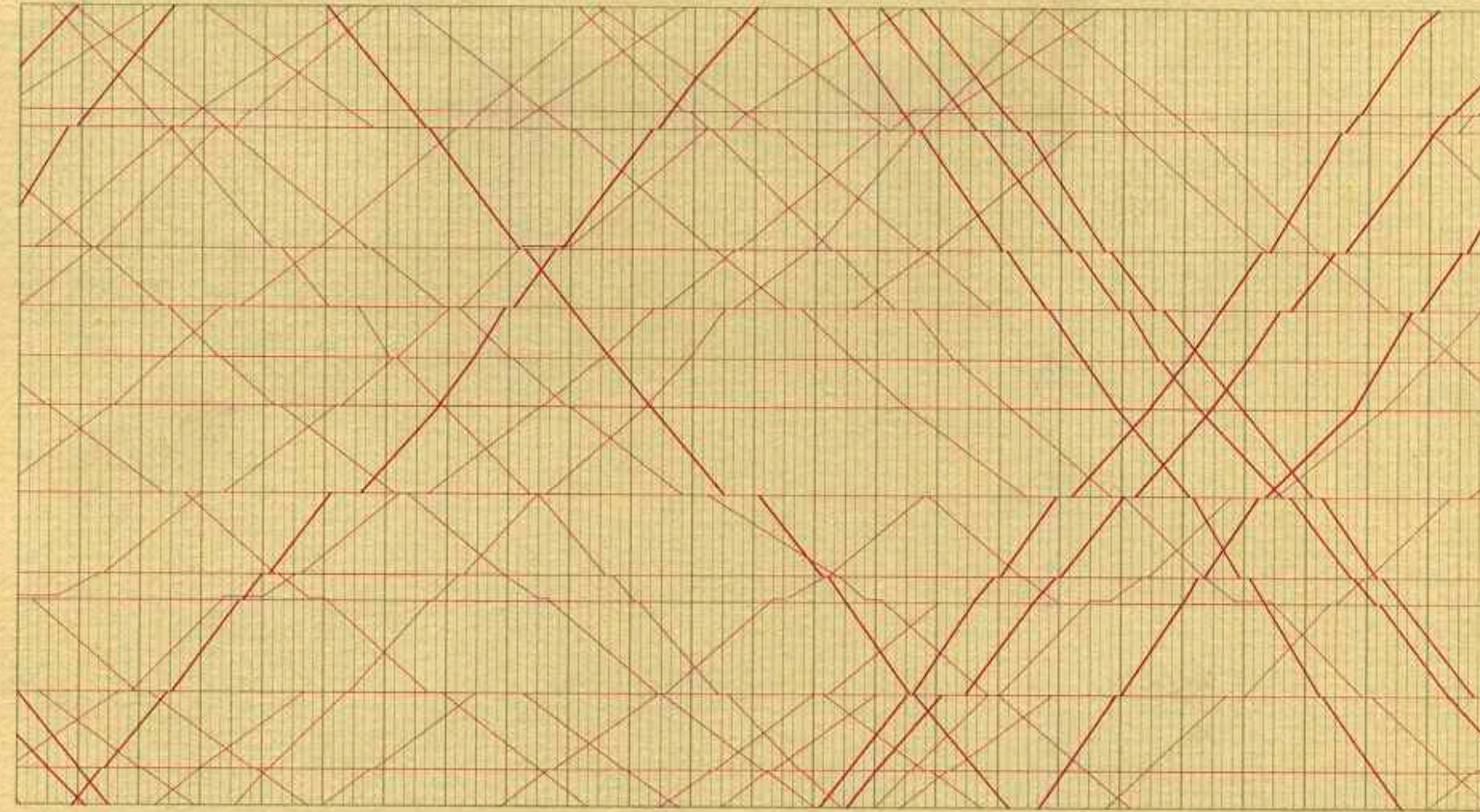
Literary style, says Walter Benjamin, “is the power to move freely in the length and breadth of linguistic thinking without slipping into banality.” Typographic style, in this large and intelligent sense of the word, does not mean any particular style – my style or your style, or Neoclassical or Baroque style – but the power to move freely through the whole domain of typography, and to function at every step in a way that is graceful and vital instead of banal. It means typography that can walk familiar ground without sliding into platitudes, typography that responds to new conditions with innovative solutions, and typography that does not vex the reader with its own originality in a self-conscious search for praise.

Typography is to literature as musical performance is to composition: an essential act of interpretation, full of endless opportunities for insight or obtuseness. Much typography is far removed from literature, for language has many uses, including packaging and propaganda. Like music, it can be used to manipulate behavior and emotions. But this is not where typographers, musicians or other human beings show us their finest side. Typography at its best is a slow performing art, worthy of the same informed appreciation that we sometimes give to mu-

*The  
Grand  
Design*

From part 2 of Benjamin's essay on Karl Kraus, in *Illuminationen* (Frankfurt, 1955). There is an English translation in Walter Benjamin, *Reflections*, ed. Peter Demetz (New York, 1978).





The Visual Display  
of Quantitative Information

EDWARD R. TUFTE



Z E N



A R T

of MOTORCYCLE

MAINTENANCE

— an inquiry into values —

ROBERT M. PIRSIG

## **Classical thinking, romantic thinking.**

The classic style is straightforward, unadorned, unemotional, economical and carefully proportioned. Its purpose is not to inspire emotionally, but to bring order out of chaos and make the unknown known.



# Best titles are short conclusions, not long introductions.

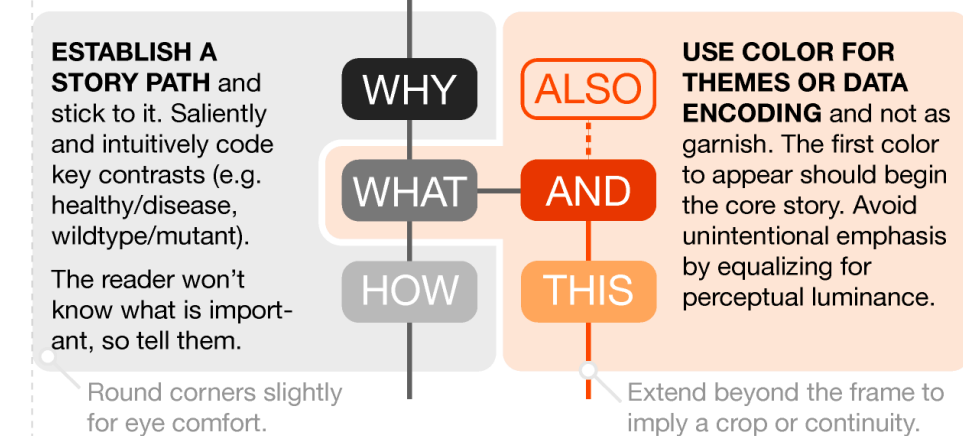
Martin Krzywinski [mkweb.bcgsc.ca/poster.design](http://mkweb.bcgsc.ca/poster.design)  
Canada's Michael Smith Genome Sciences Center [bcgsc.ca](http://bcgsc.ca)  
Avoid long addresses—no postal codes, no zip codes.

## POSTER CHILD OF SCIENCE

A poster is your first opportunity to organize and communicate your research to members outside of your lab. It will help you to practise telling and “drawing” your science story and its design should be based on its concepts, themes and transitions.

Most posters are bad not because they are ugly (they are) but because they fail to present concisely what was done and, more importantly, why it was done. Most posters have too much on them. Less is more: get to the point, then stop.

Map salience to pertinence. When used in moderation, colors like orange or magenta say “look here”. You cannot look everywhere.



Good explanations are ones conveniently placed. Embed simple diagrams next to relevant text. Some graphics don't need a legend—make room for explanations within. Callout lines should be rectilinear or at 45° if the graphic already has such elements.

## ALL SCIENCE DESERVES EXCELLENT EXPLANATIONS

Explain quickly and clearly. Motivate why the work was done—what is the cost of not doing it?

The poster is your prop. In most settings, you will be there to present it. Match its content to the story you will tell.

## ONLY YOU CAN STOP POSTER DUMPSTER FIRES

Clip art, pie charts, bullet points, boxes around text, background fills and gradients. Only you can stop it.

Maintain good Gestalt—similar shapes and colors will form groups. Use them to encode real-world relationships and be on the lookout for unintended accidental groupings.

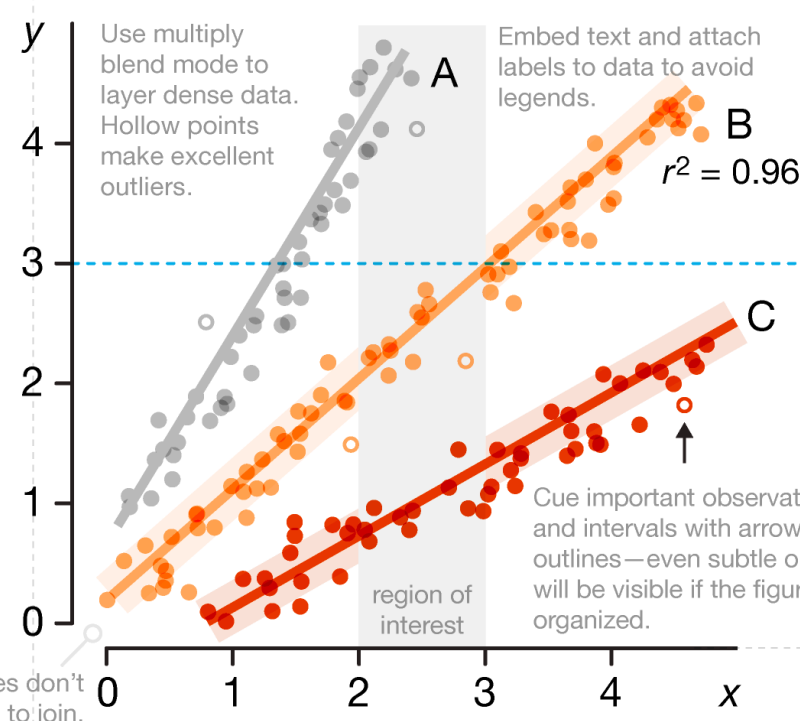
**EVERYTHING IS IMPORTANT, BUT SOME THINGS ARE MORE IMPORTANT THAN OTHERS.** Establish a visual hierarchy by emphasizing your hypothesis, conclusion and the key points that connect them. Relegate protocols, technical methods, and other minutiae to the bottom of the poster. Always be mindful of what the reader needs to know to understand enough to ask insightful questions and frontload this information.

Your work is a “study” and explores a “relationship” to look for an “effect”. Treat that as a given and say what is important.

Don't try to be snarky, cheeky or witty—most attempts do not succeed. Don't trigger the jokers, cynics, cranks and curmudgeons.

## 1 Use figure titles to explain trends, not merely to specify the axes.

*Establish subordinate content with italics.*



Don't tell the reader what is obvious: “a linear fit to a scatter plot” is redundant. Don't tell me what I'm seeing—interpret the figure instead. Italicize variables in fit diagnostics and use shaded bands for confidence intervals. Highlight regions of interests with a solid color (or grey), not outlines.

Allow content to establish layout proportions and do not emphasize gutters with lines. One or two such dividers can be effective, but too many will turn the poster into a jail.

## USE SMALL MULTIPLES

Use ink sparingly to make compact figures legible—dense is not necessarily crowded. Explain an encoding once and reuse it. Create a visual key for complex encodings and choose graphical explanations over text.

Avoid visual complications that are not relevant—for example, color blending can create distracting intersections of color. Superimpose white outlines to emphasize shapes with an opaque fill.

**TABULATE** plots and text seamlessly with a column or row for explanations. Italicize text with care and look for unintended italics in subscripts.

**ARROWS** imply a relationship or change. Do not use them to guide the eye, which can be achieved with spacing and alignment.

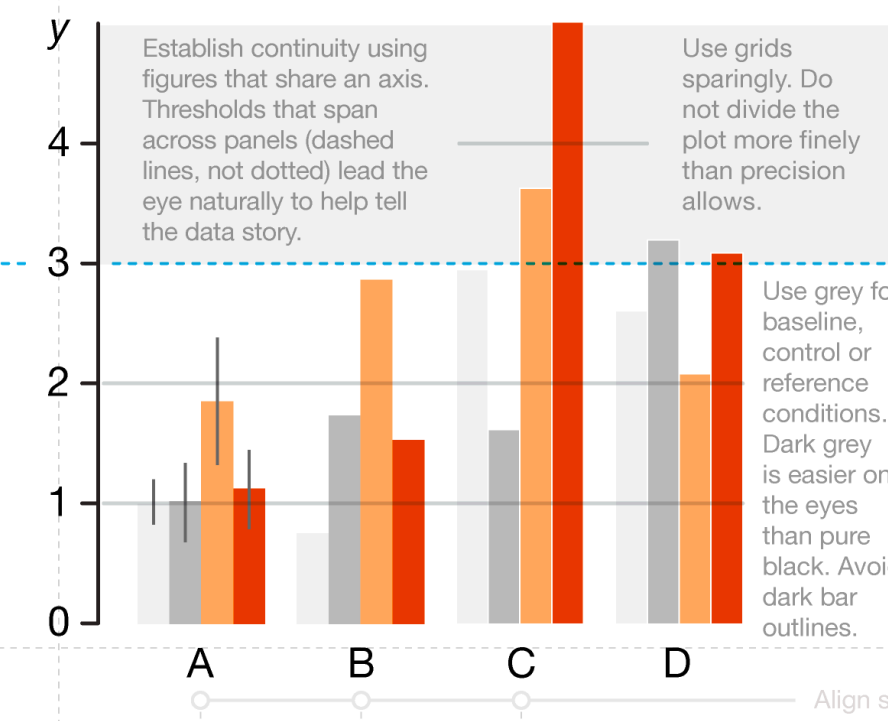
Align independently of subscripts.

**FORCE LINE BREAKS** that split a sentence into noun phrases or offer a natural pause, such as at a comma or a period. Balance layout by shortening sentences—there are many ways to say something and some ways are easier to typeset. Do not let a template bully you into using a specific column width. Change proportions to suit content.

Don't say everything you know—make room for empty space. Your most valuable resource is the reader's time.

## 2 Share axes or align panels to clarify variables or emphasize changing scale.

*Reserve small text for tangents and detail beyond the first explanation.*



Categorical variables in bar charts do not need an explicit axis. Specify sample sizes and what error bars represent (e.g. standard error of mean,  $n = 5$ ). Report  $P$ -values with effect sizes or confidence intervals. A statistically significant observation isn't necessarily of biological interest.

Alignment of similar quantities subtly suggests where to look next.

## MAINTAIN AND CONTROL PROPORTIONS

This poster is 16” × 12” (1152 × 864 pt), uses Helvetica Neue with a 5, 8, 13, 21, 34, 55 pt scale ladder and is legible on most screens.

Sans-serif is clearer than serif at small sizes and suitable for modest amounts of copy.

Keep line length short and hyphenate instead of fully justifying.

**AVOID OBVIOUS HEADINGS** such as “references”. Citations can be set in a block of text, with bold numbers like this 1. R. Bringhurst, *Elements of Typographical Style*. 4th ed (2012) and 2. W. Strunk Jr., *Elements of Style* (1918). Unless a specific citation style is required, use a compact style that also includes the title.

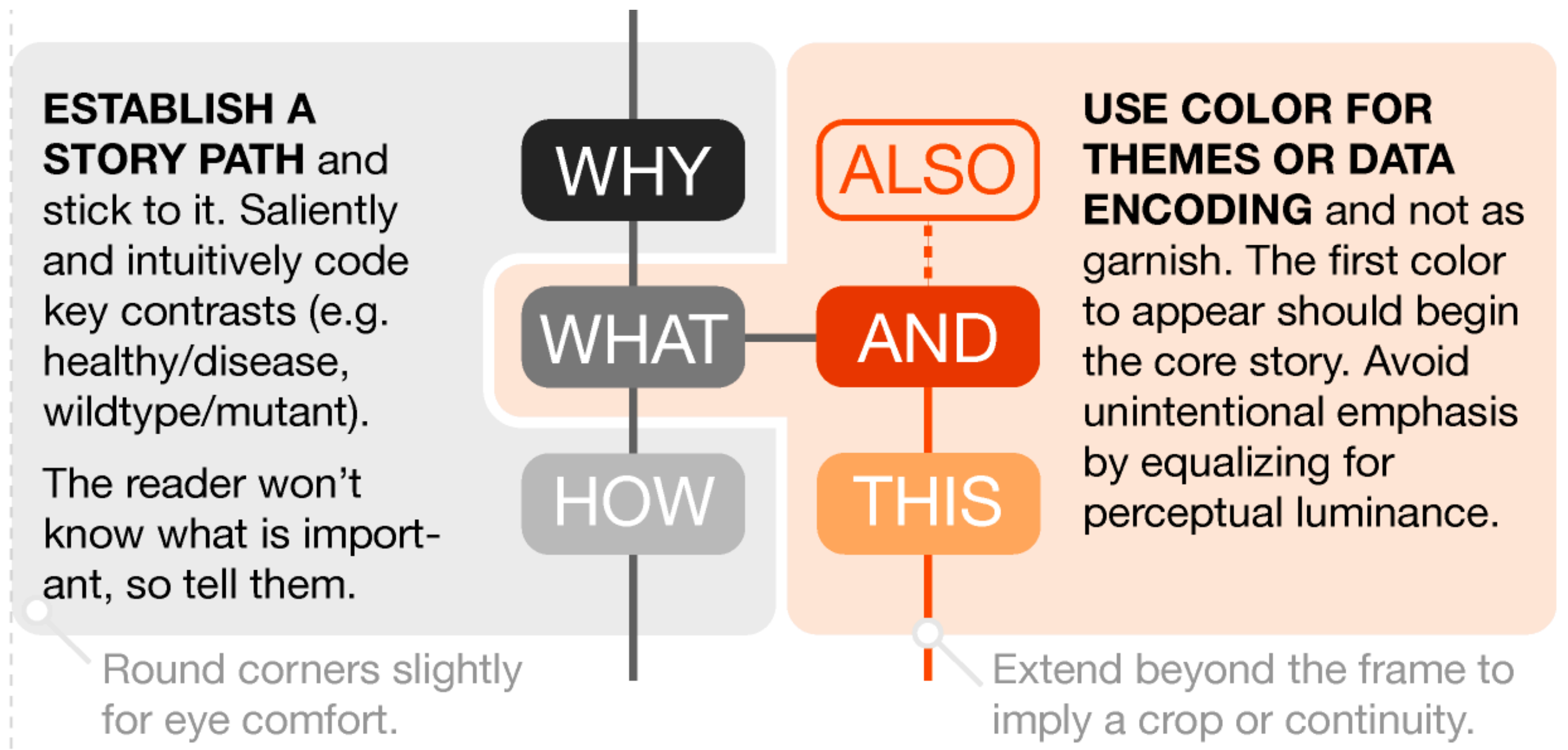
Balance visual weight and size the logos equally. If acknowledging institutional support, place it next to the logo.

Use vector-based logos, not low-resolution bitmaps. Do not change logos' aspect ratio or crowd it with other elements—both are likely against its branding style.



[bcgsc.ca](http://bcgsc.ca)

[bccancer.ca](http://bccancer.ca)



Good explanations are ones conveniently placed. Embed simple diagrams next to relevant text. Some graphics don't need a legend—make room for explanations within. Callout lines should be rectilinear or at 45° if the graphic already has such elements.



# text no larger than 12 pt

Provide sufficient space around text. Don't crowd labels.

## main headings 8 pt medium

A small (7 pt) margin is fine.

### major labels 6 pt medium

major label annotation 5 pt bold grey  
**ALL CAPS** 5pt bold light grey

dark grey text is classy

*Avoid Superfluous Capitalization*

### minor labels 6pt

text no smaller than 5 pt  
avoid underlines

no dark on dark

Line breaks at phrases, list boundaries or natural pauses.

### annotations 6pt italic

annotations 5 pt italic grey  
annotations 5 pt italic grey

no color flipping

discretionary annotations 4pt

no vertical text

## lines and arrows

Use lines no thinner than 1 pt.

Weight	Line Style	dash	gap
3	Solid		
2	Solid		
1	Solid		
0.5	Solid		
	Dotted	2	1.5
	Dotted	0	2
	Dashed	2	1.5
	Dashed	0	1

sparingly

Make arrows no thicker than 1.5 pt.

Weight	Arrow Style	Notes
1.5	Solid	
1	Solid	
0.5	Solid	

Fade out arrows to reserve emphasis for elsewhere.

Separate and organize using generous gutters and margins.

Use line dividers sparingly.

no boxes around text

no boxes around text

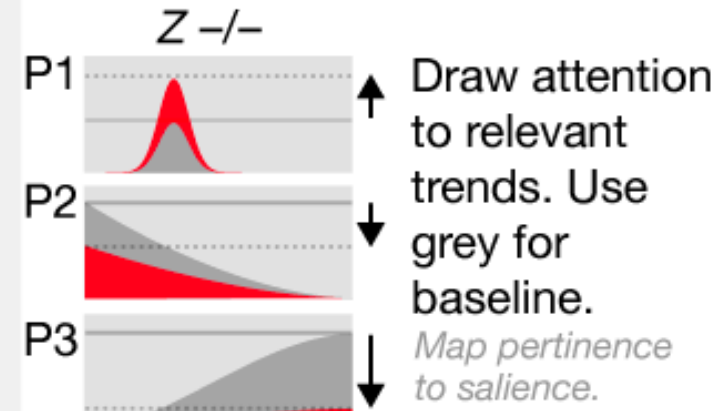
no nested boxes of any kind

use space and alignment to create groups

a b c d e

Justify small annotations to the side they are pointing to.

## data

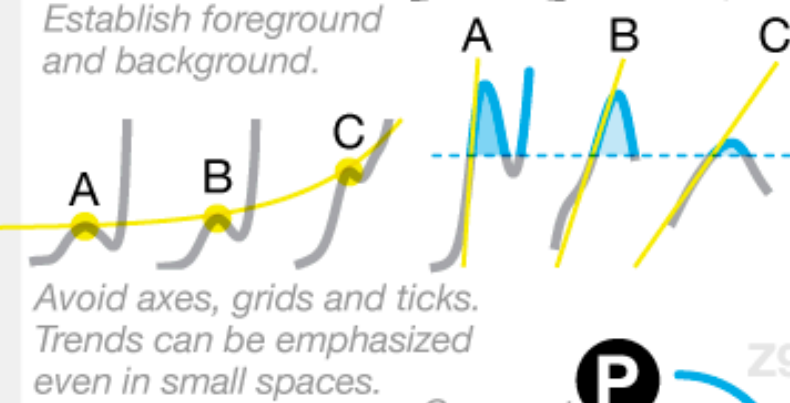


Draw attention to relevant trends. Use grey for baseline.

Map pertinence to salience.

Create tracks with light fill. Establish foreground and background.

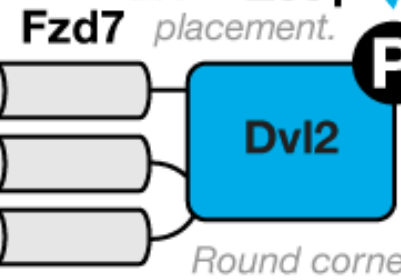
Normal distribution as archetype.



Avoid axes, grids and ticks. Trends can be emphasized even in small spaces.

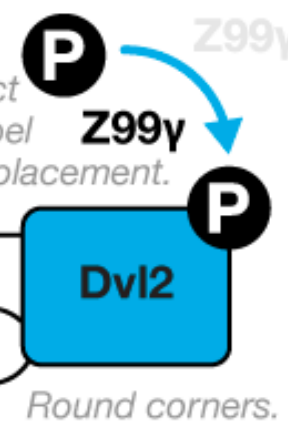
Compact label placement.

Wnt7a



Open form.

If using a single color, keep theme continuity with colored arrows (sparingly).



Round corners.

Circular bursts.

Use equilateral triangle arrow heads of constant size.



Use curved arrows based on a circle to indicate movement. No distorted arrows. The worst.

Use a same circle or ellipse for all arrows.

## colors

Avoid pure colors and rainbows. Mix in white.

Choose colors that are safe for colorblindness. Deuteranopia.

Normalize luminance. L channel in Lab color space.

Reserve bold colors for emphasis. Maintain contrast.

Use LCH ramps for series. davidjohnstone.net/pages/lch-lab-colour-gradient-picker marlam.de/gencolormap/wasm-demo/

Curved paths take effort. Not always worth it. Never stars! No obvious or overly specific equipment.

Smooth, simple and straight shapes. Don't color text. Use color or shape to establish themes.

Don't over think it. No gradients! Extend beyond frame: open form.

Membranes are context. Subtle and simple. No color. No jitter.

Use equilateral triangle arrow heads of constant size.



Use curved arrows based on a circle to indicate movement

**No distorted arrows.**

*The worst.*

*Use a same circle or ellipse for all arrows.*



