

The background features a faint, light blue illustration of a cow's head in profile, facing right. Overlaid on this is a network of thin, light blue lines connecting various points, resembling a molecular or data network. The overall aesthetic is clean and scientific.

Maintaining a Healthy Ruminant Digestive Tract

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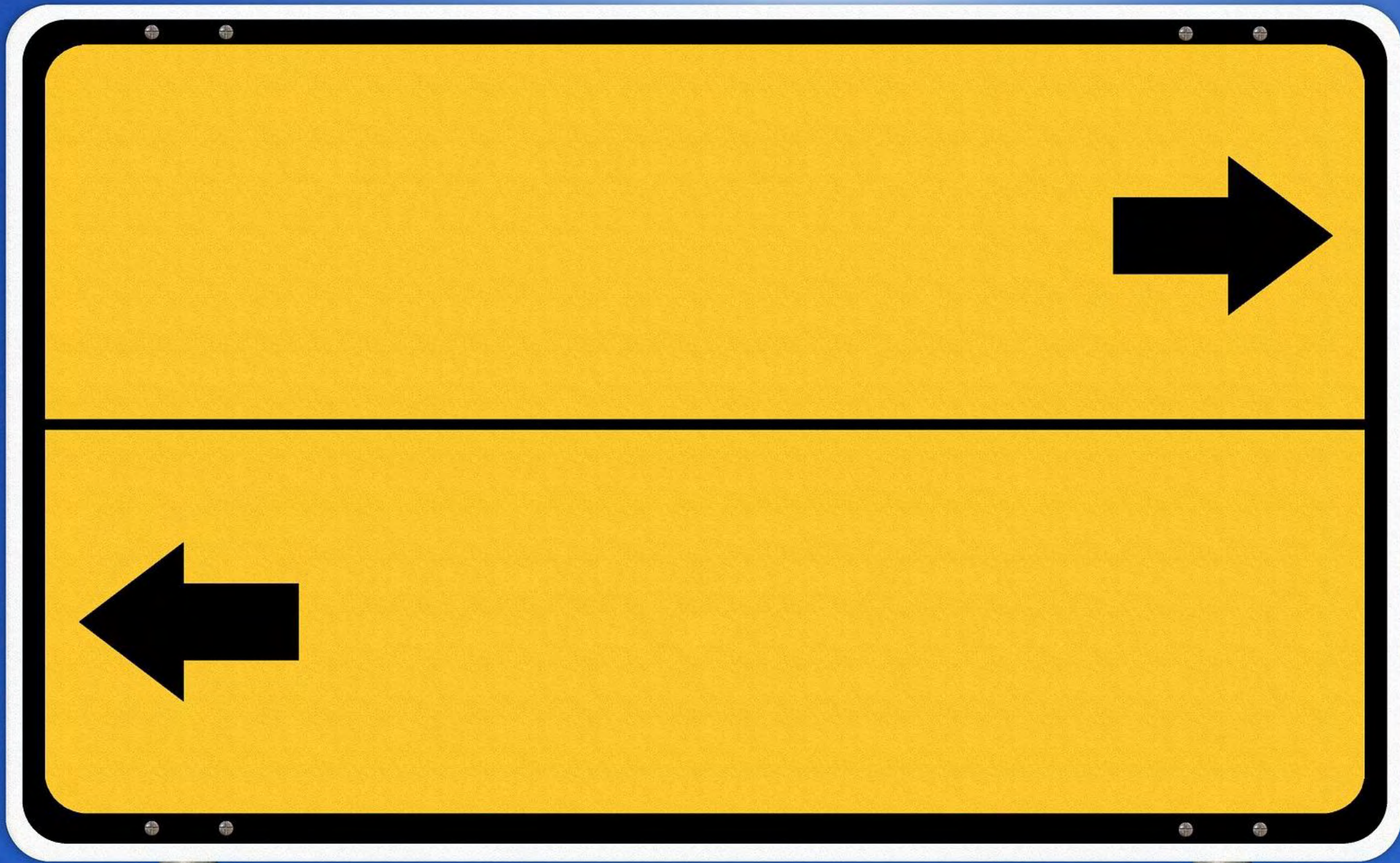


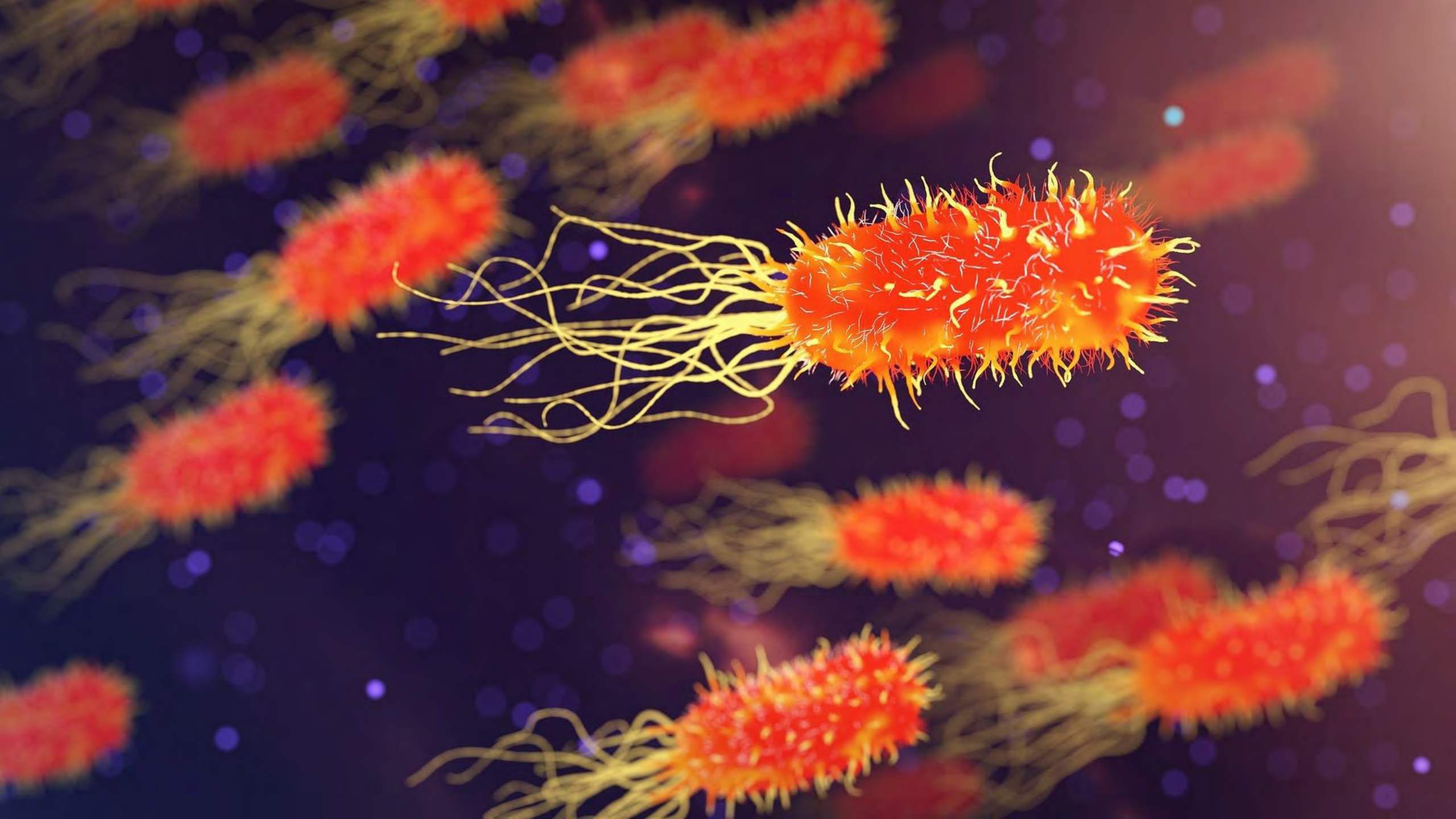
Health

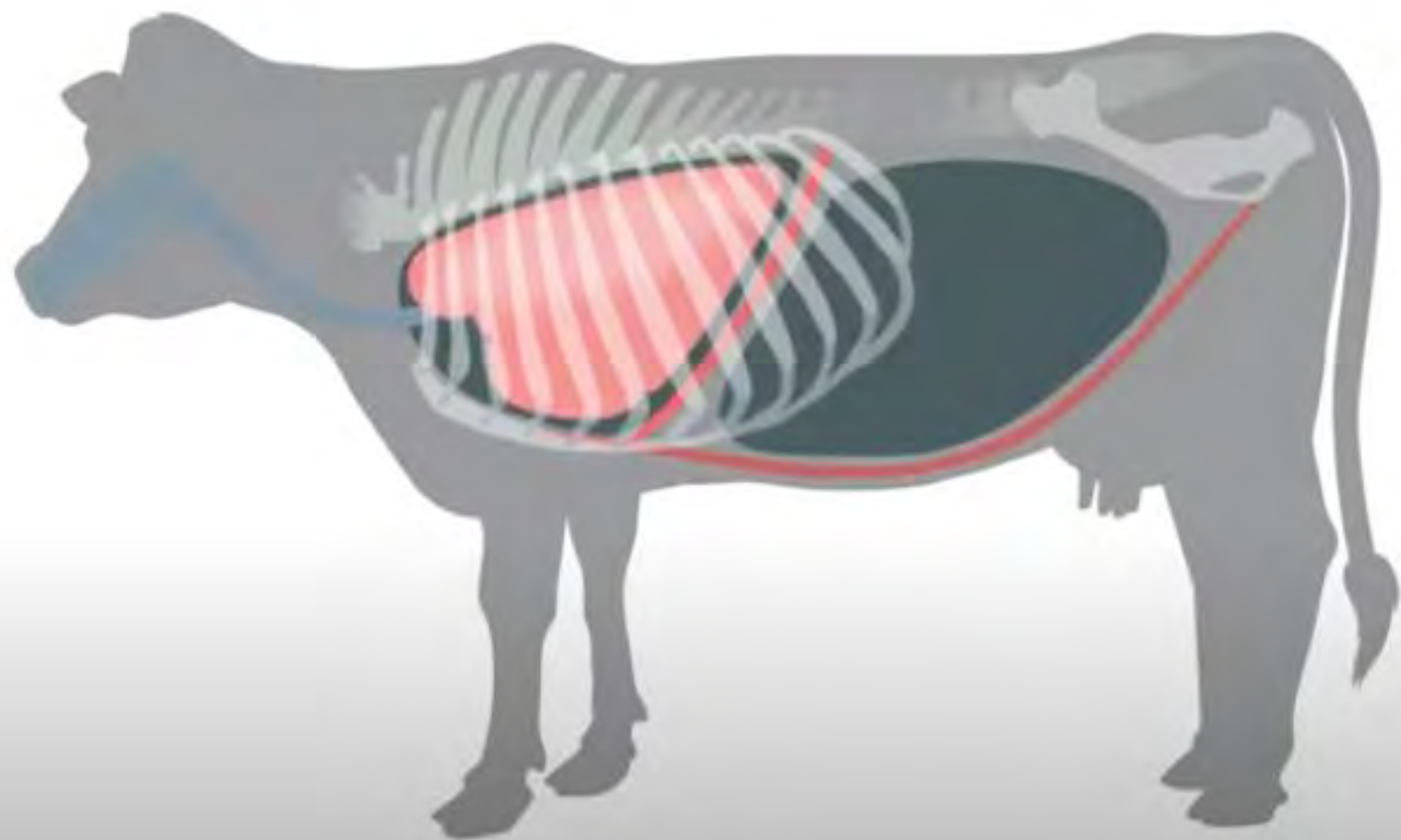
Disease

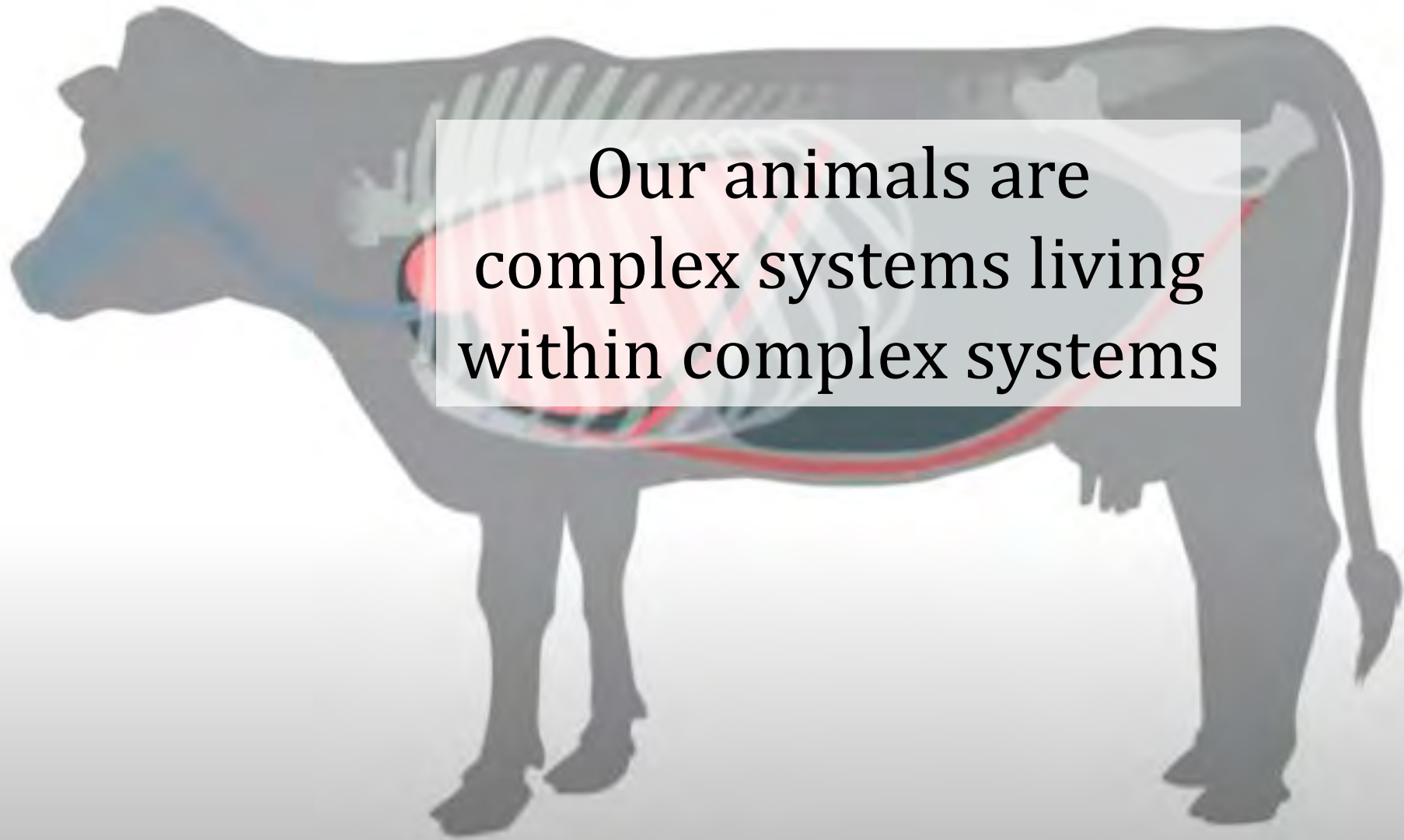




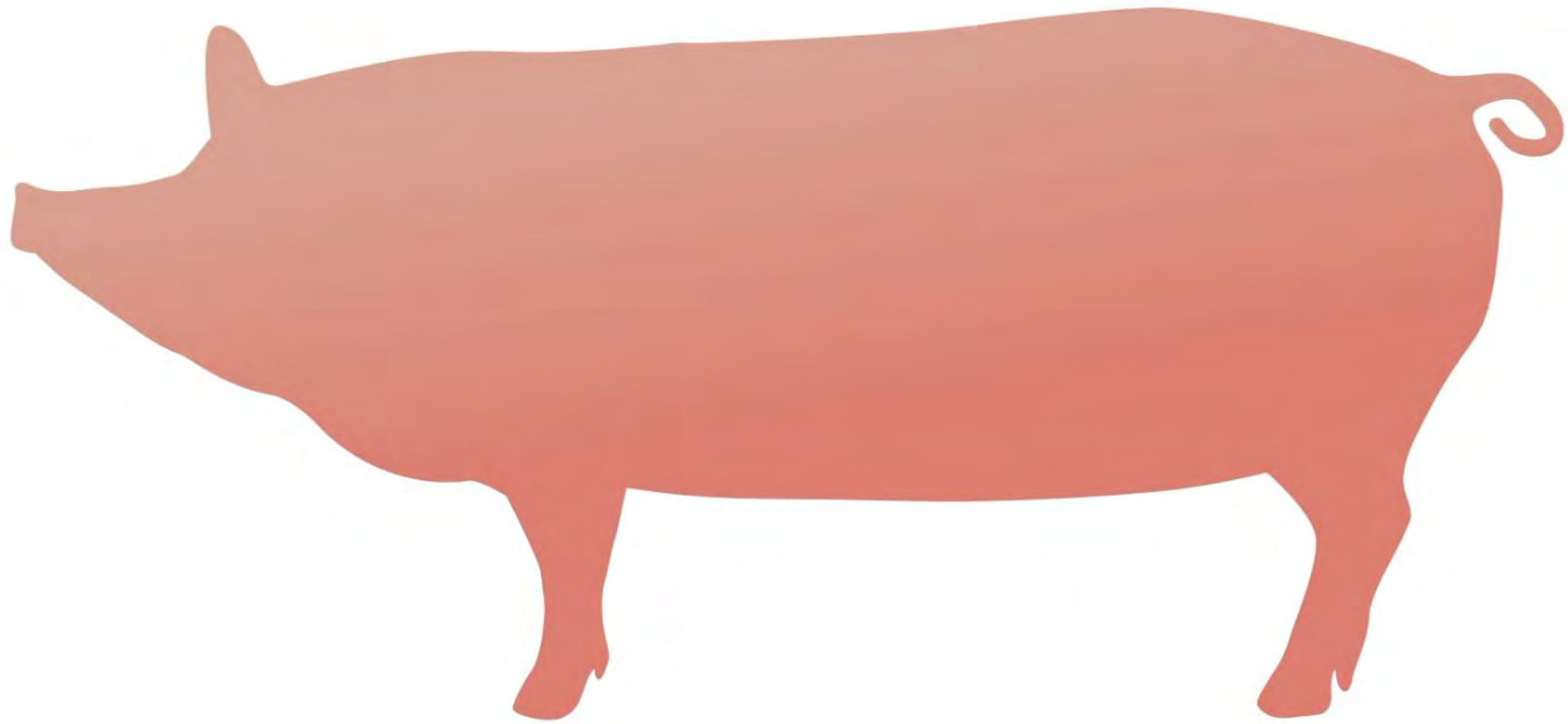


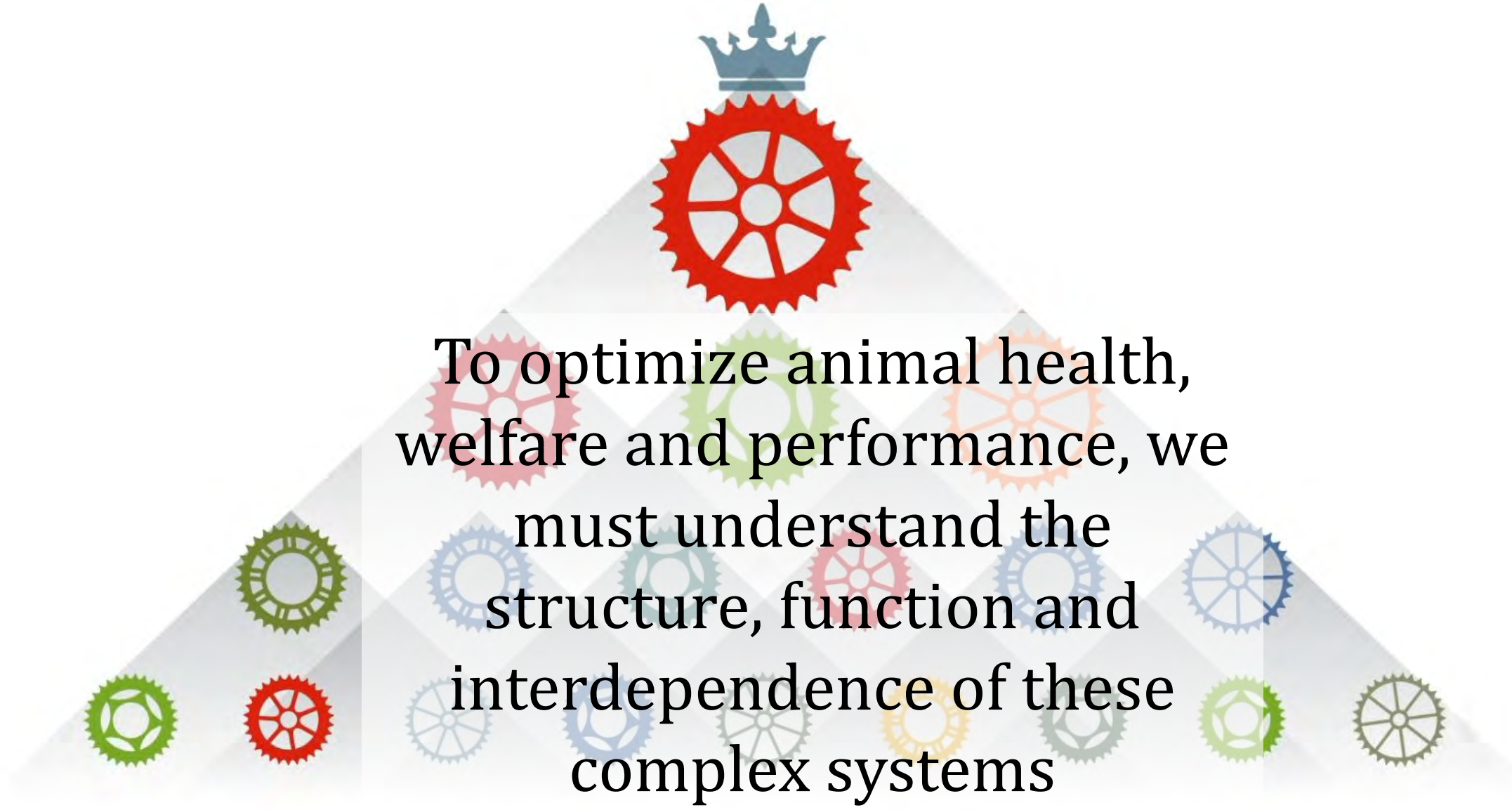






Our animals are
complex systems living
within complex systems



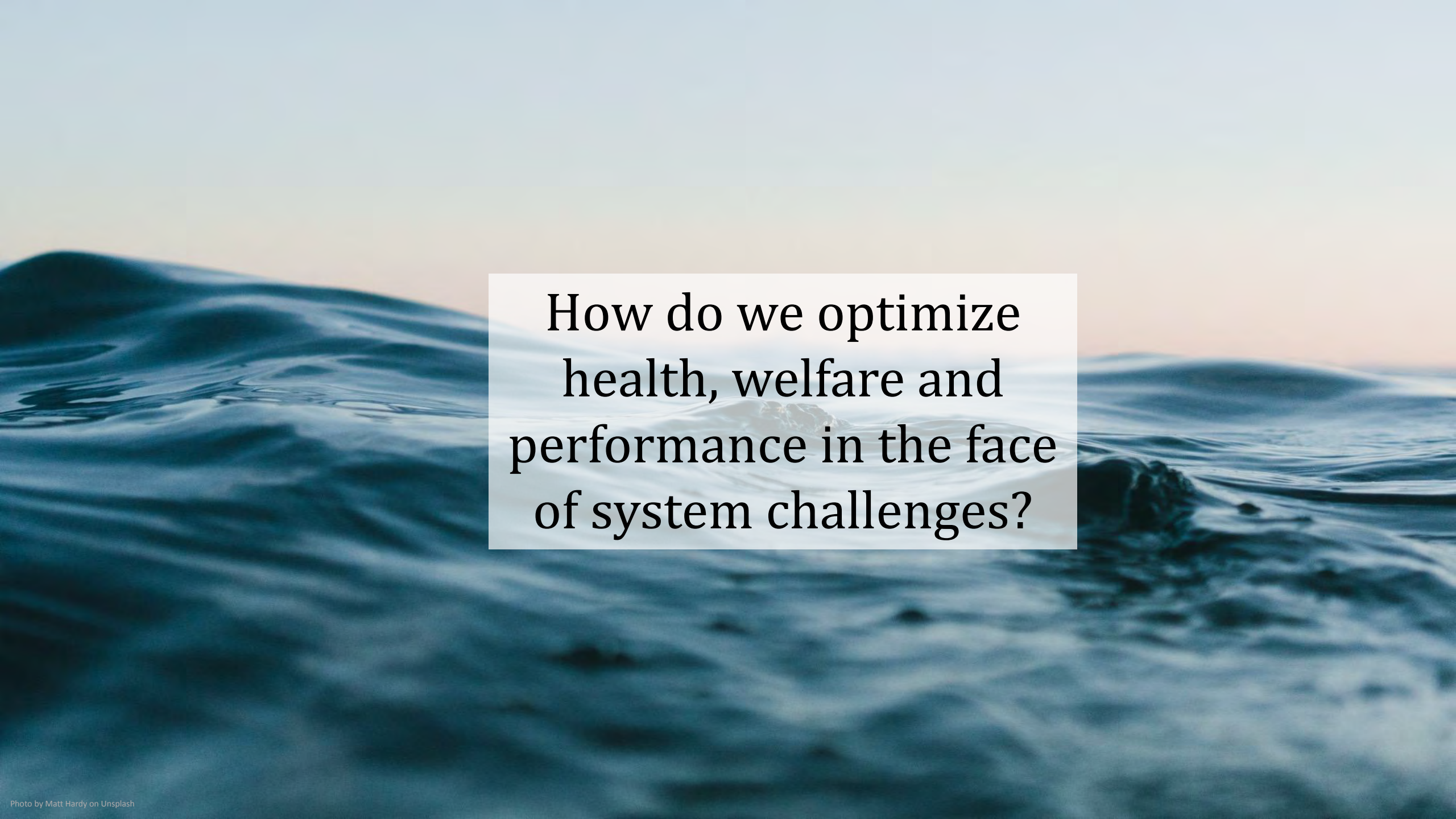


To optimize animal health,
welfare and performance, we
must understand the
structure, function and
interdependence of these
complex systems









How do we optimize
health, welfare and
performance in the face
of system challenges?

Resistant Phenotype





Health

Disease

The image features two hands shaking in a firm grip, symbolizing agreement or support. The hands are positioned horizontally across the frame. In the center, where the hands meet, there is a bright orange circle with a thin blue border. Inside this circle, the text "Health is not binary" is written in a clean, white, sans-serif font, centered vertically and horizontally. The background is a blurred, out-of-focus scene of people in what appears to be a professional or public setting, with soft lighting and a bokeh effect.

Health is
not
binary



Normal, healthy state

Resilient to perturbations
or disruption of homeostasis



Pre-disease state

Unstable and vulnerable
to perturbation

Reversible and a good
time for intervention



Normal, healthy state

Resilient to perturbations
or disruption of homeostasis



Pre-disease state

Unstable and vulnerable
to perturbation

Reversible and a good
time for intervention



Disease state

Clinical deterioration



HEALTH

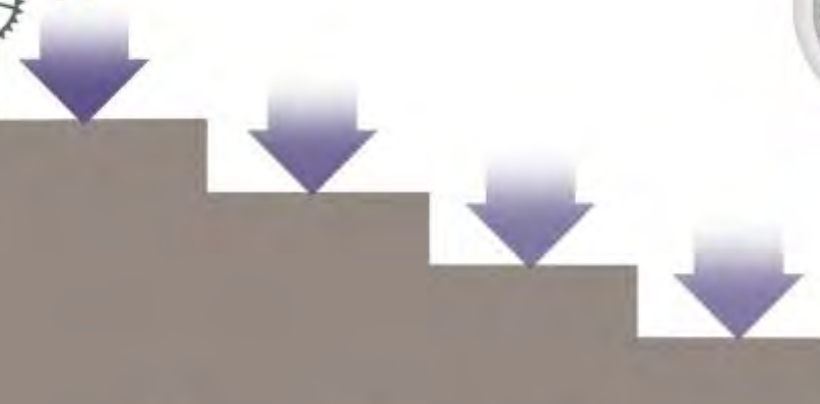
Sudden,
major change



PRE-DISEASE



HEALTH



Many minor changes



PRE-DISEASE

Disease is a failure to
maintain homeostasis



Individual animals exhibit
a 'dynamic' health
phenotype



Resistant Phenotype











Healthy

Time

Pre-diseased

Diseased



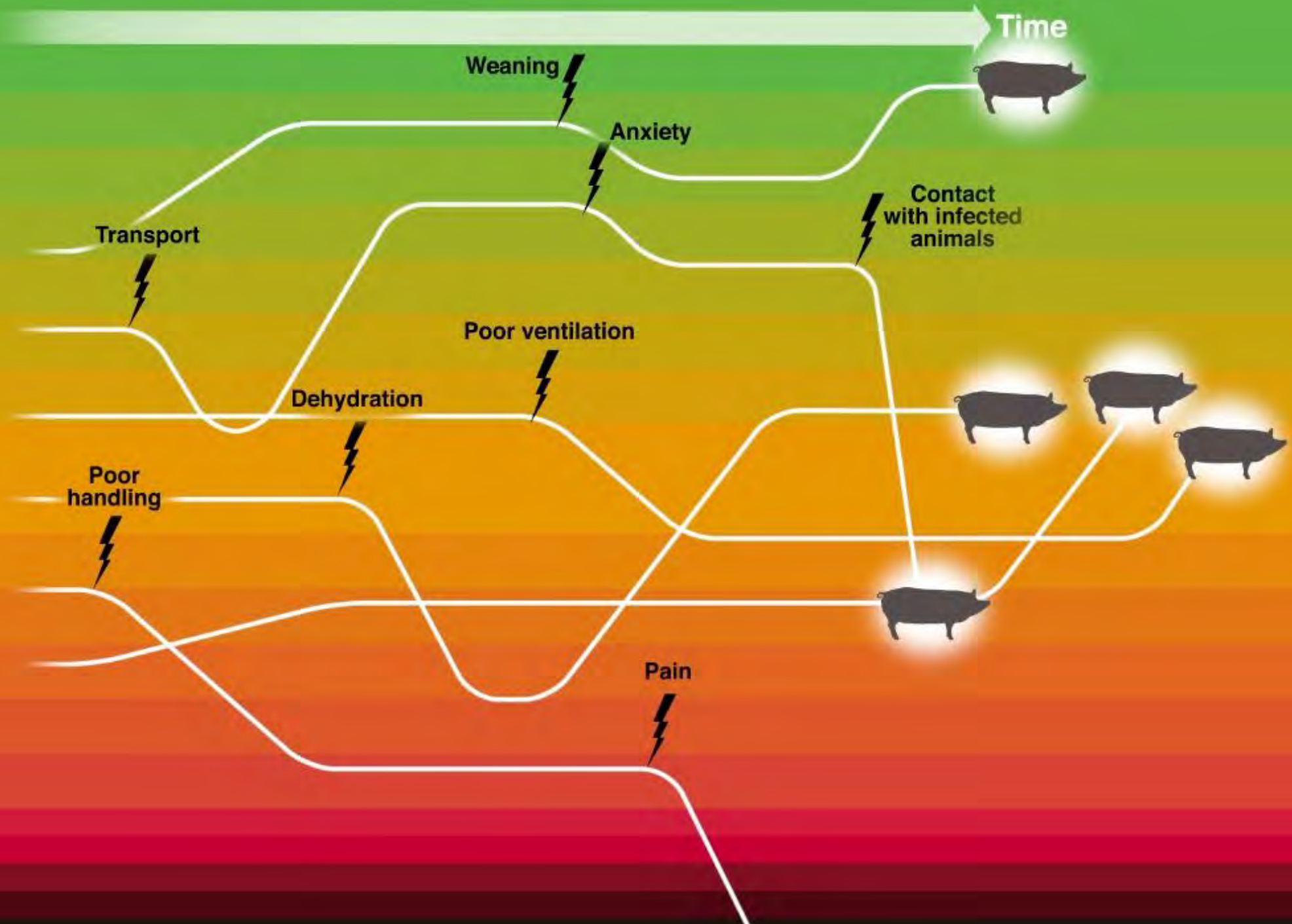
Healthy




Pre-diseased

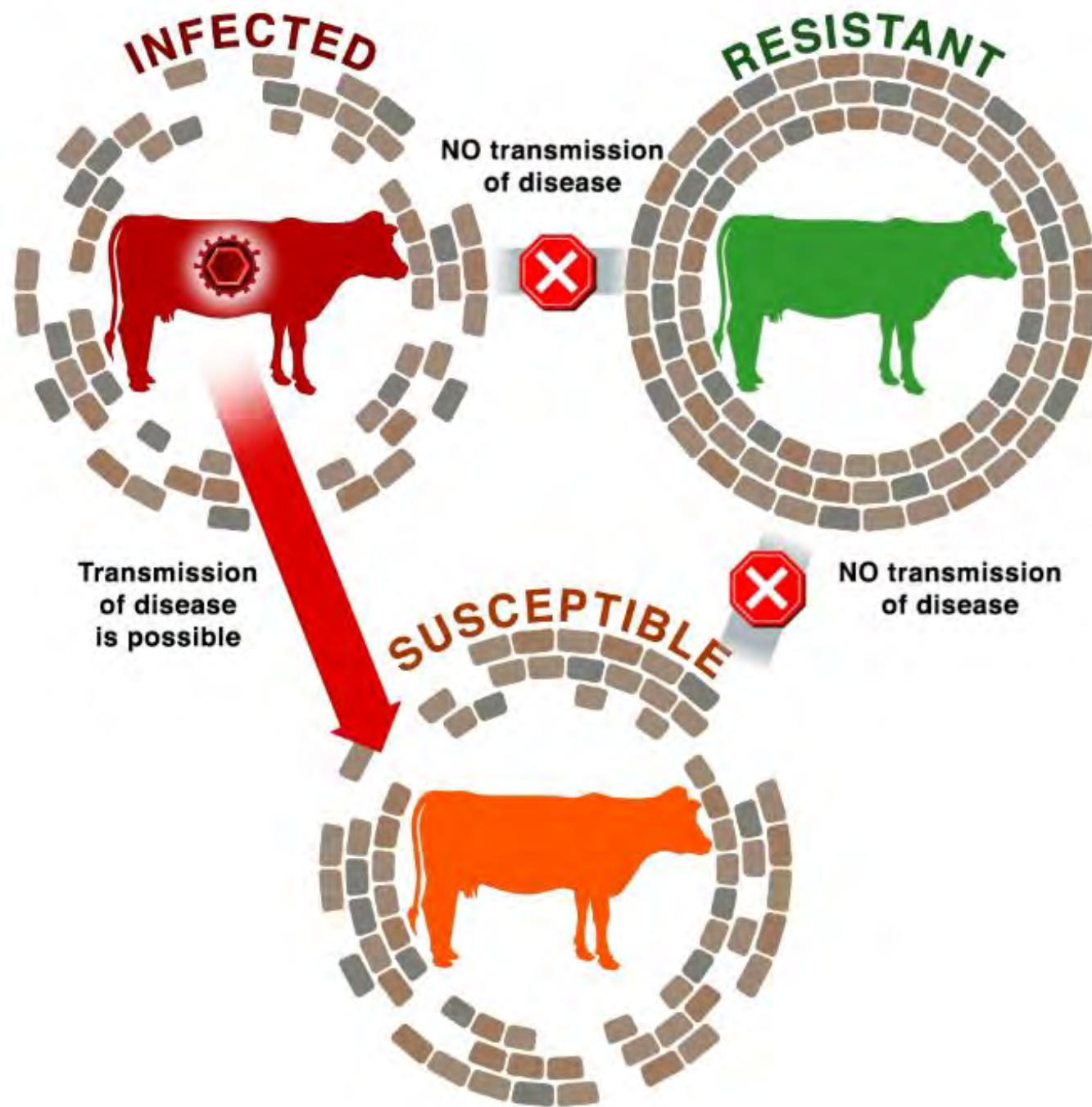


Diseased





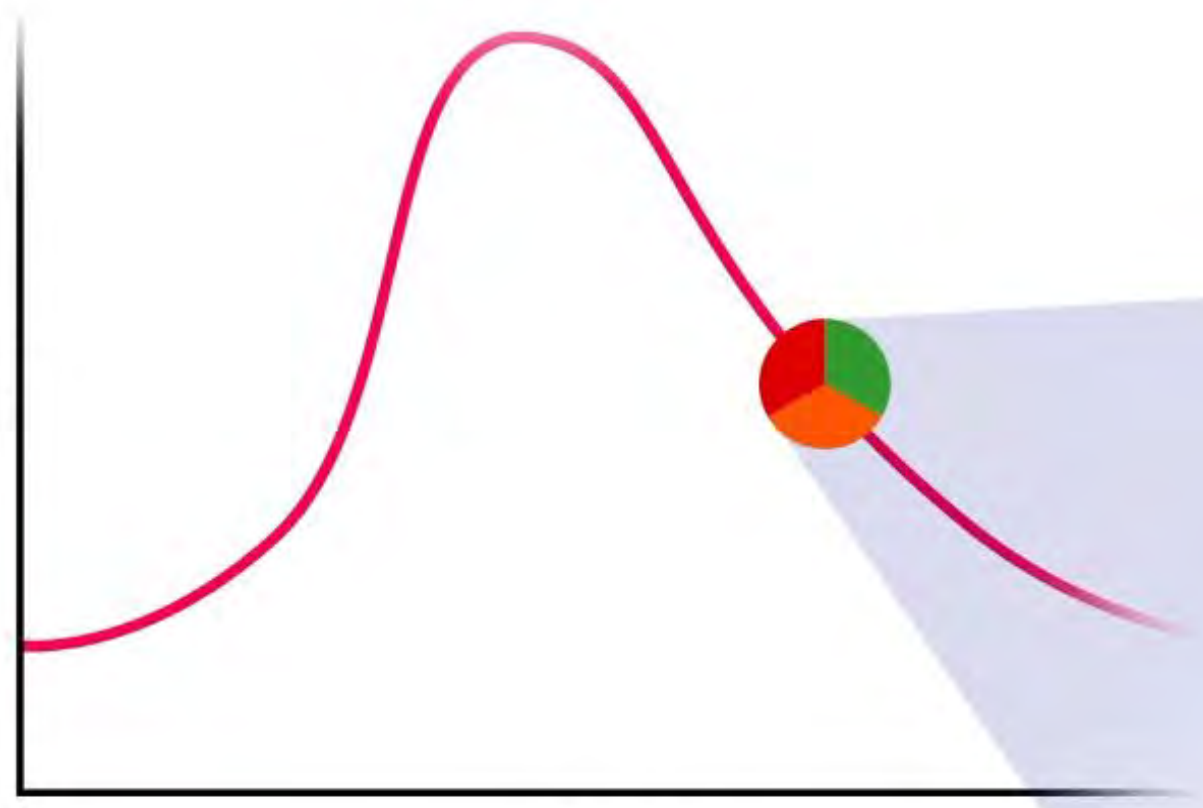
Not
everyone has
the same
health
phenotype



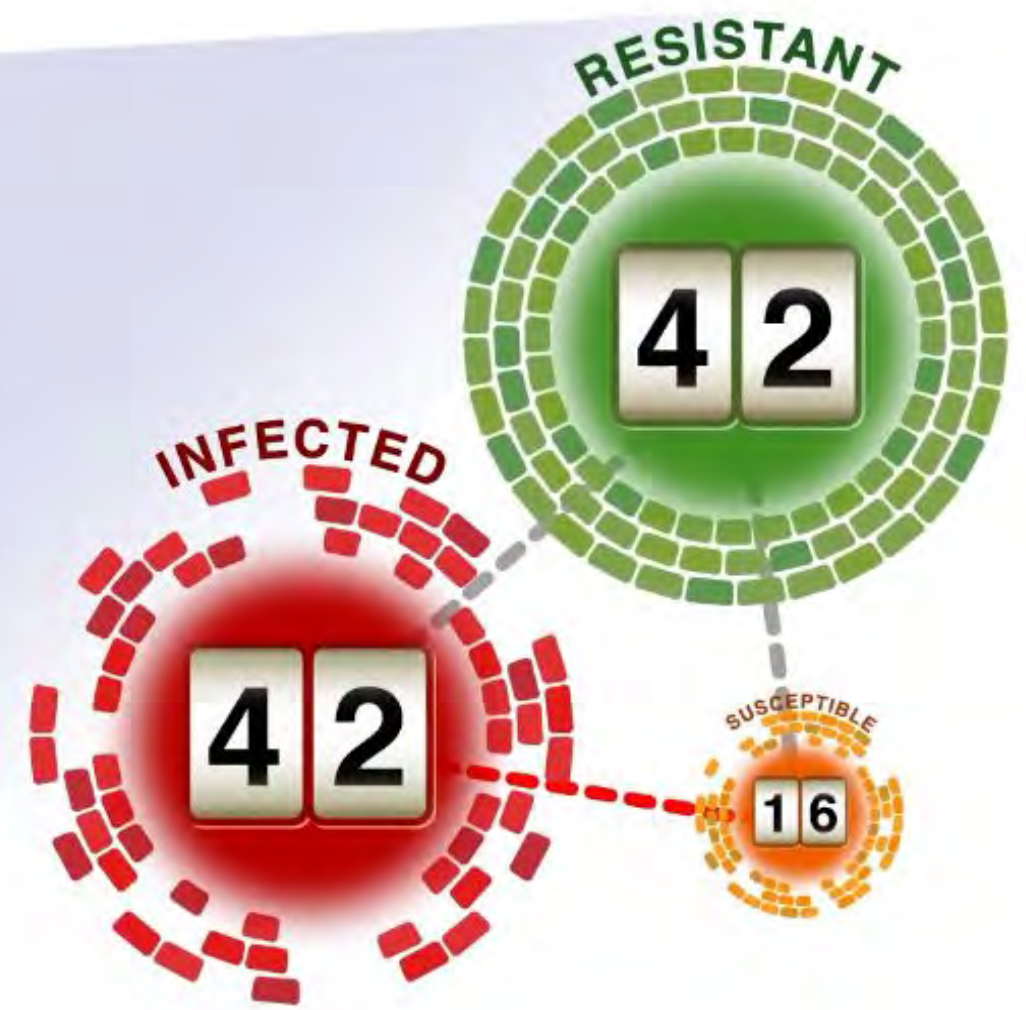


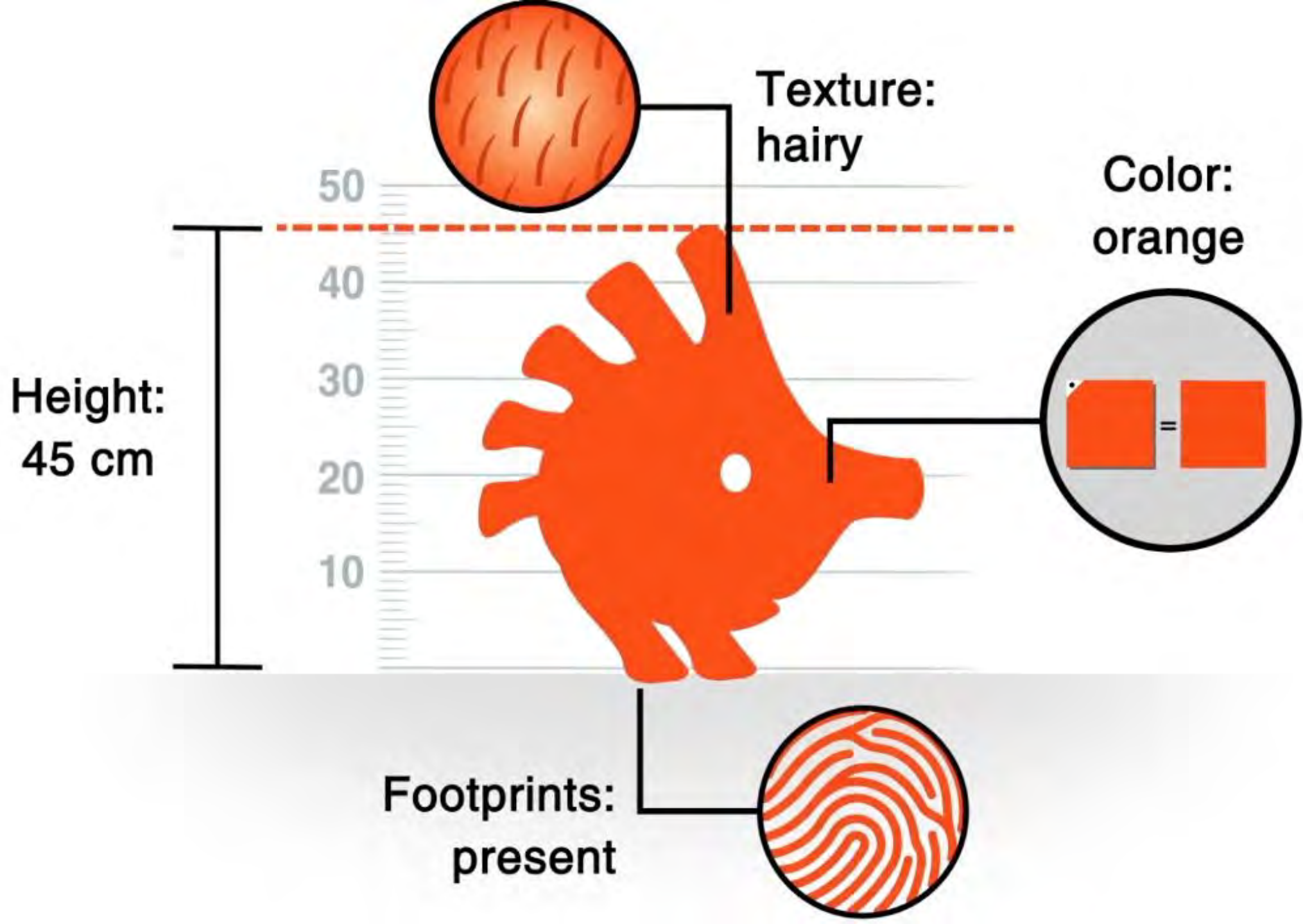


Number of cases



Time







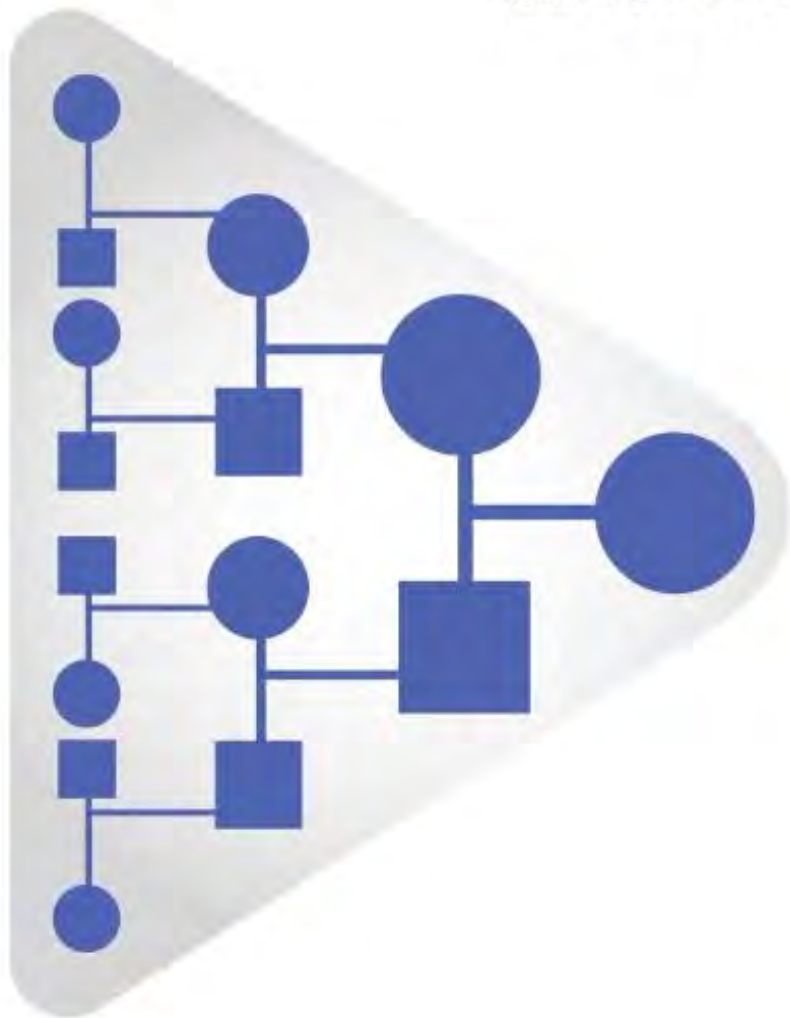


GENOTYPE

X



ENVIRONMENT





GENOTYPE

X

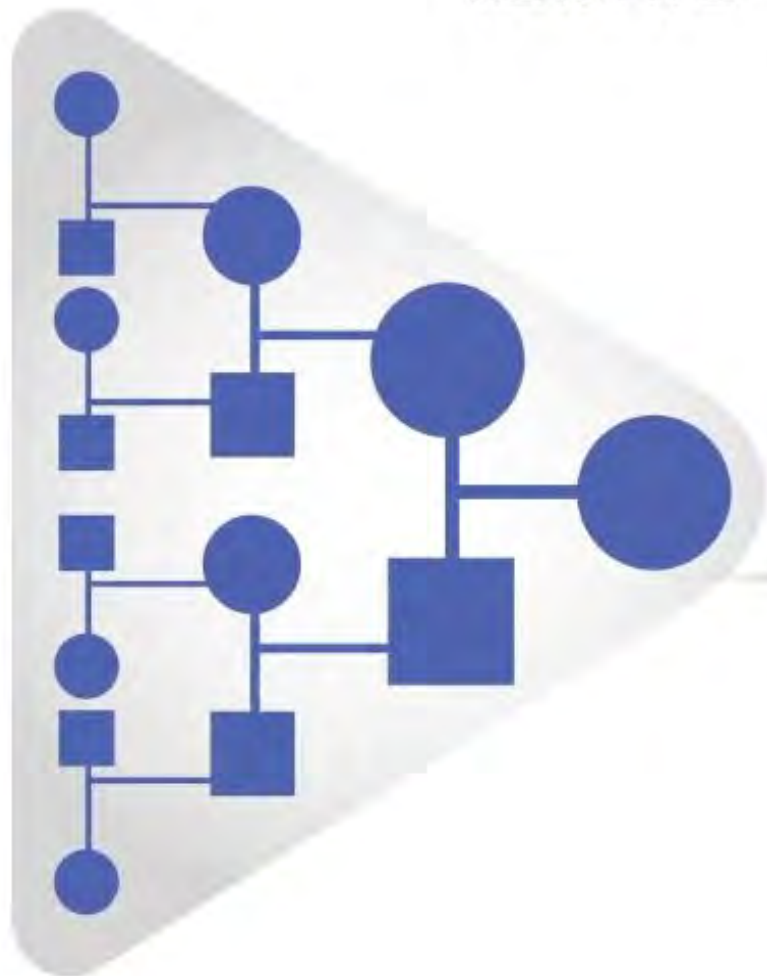


ENVIRONMENT

X



TIME

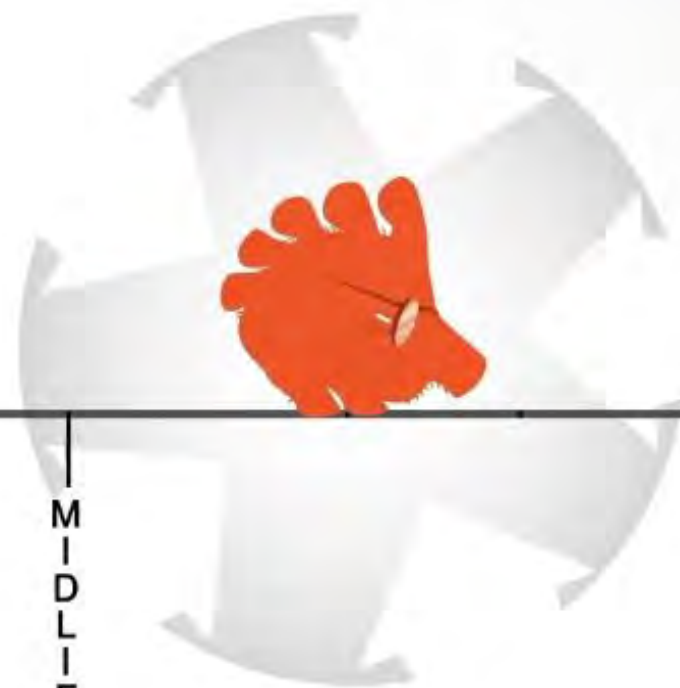


BIRTH

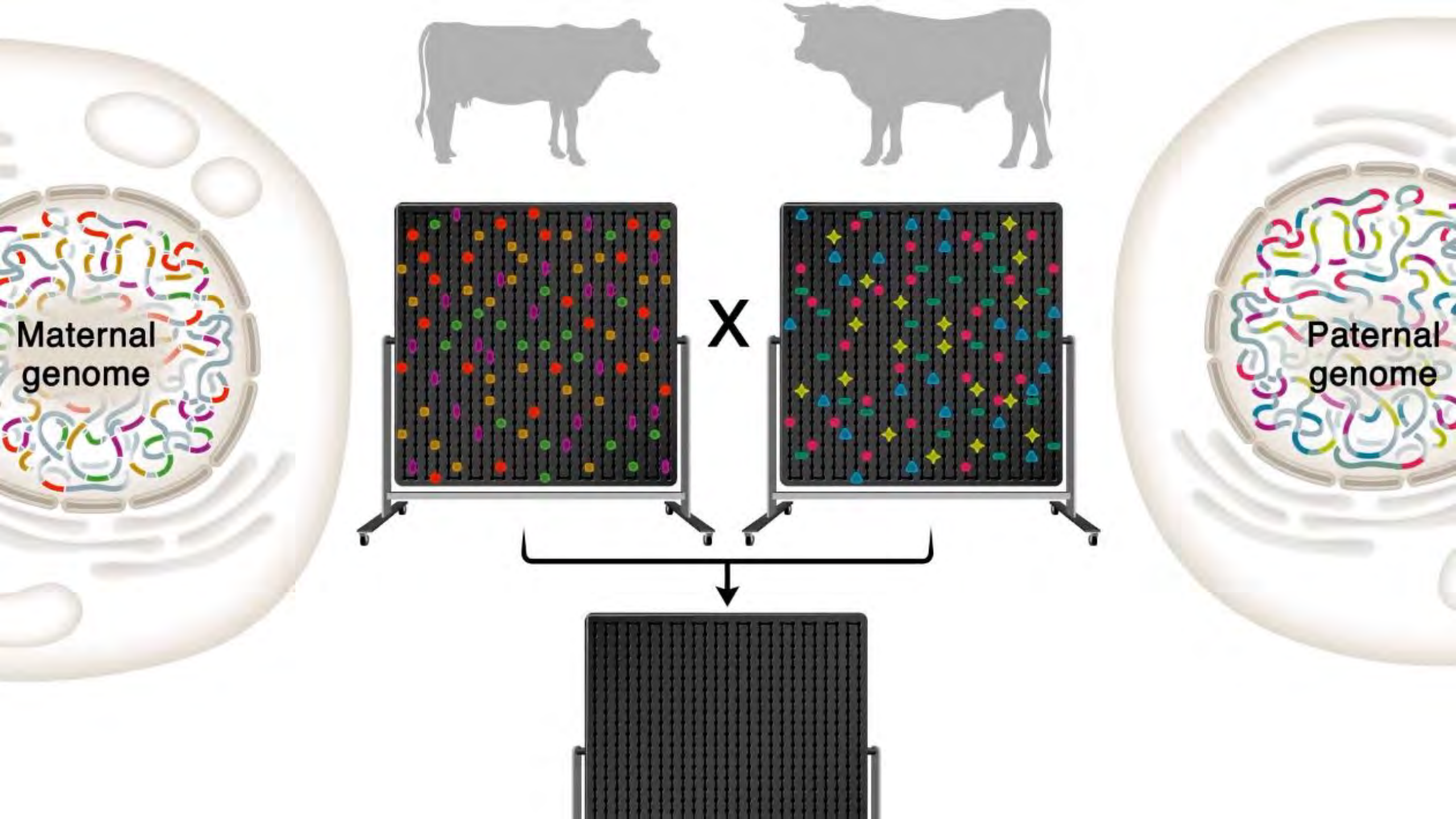
GROWTH

MATURITY

MIDLIFE







External factors which affect gene expression

Growth factors

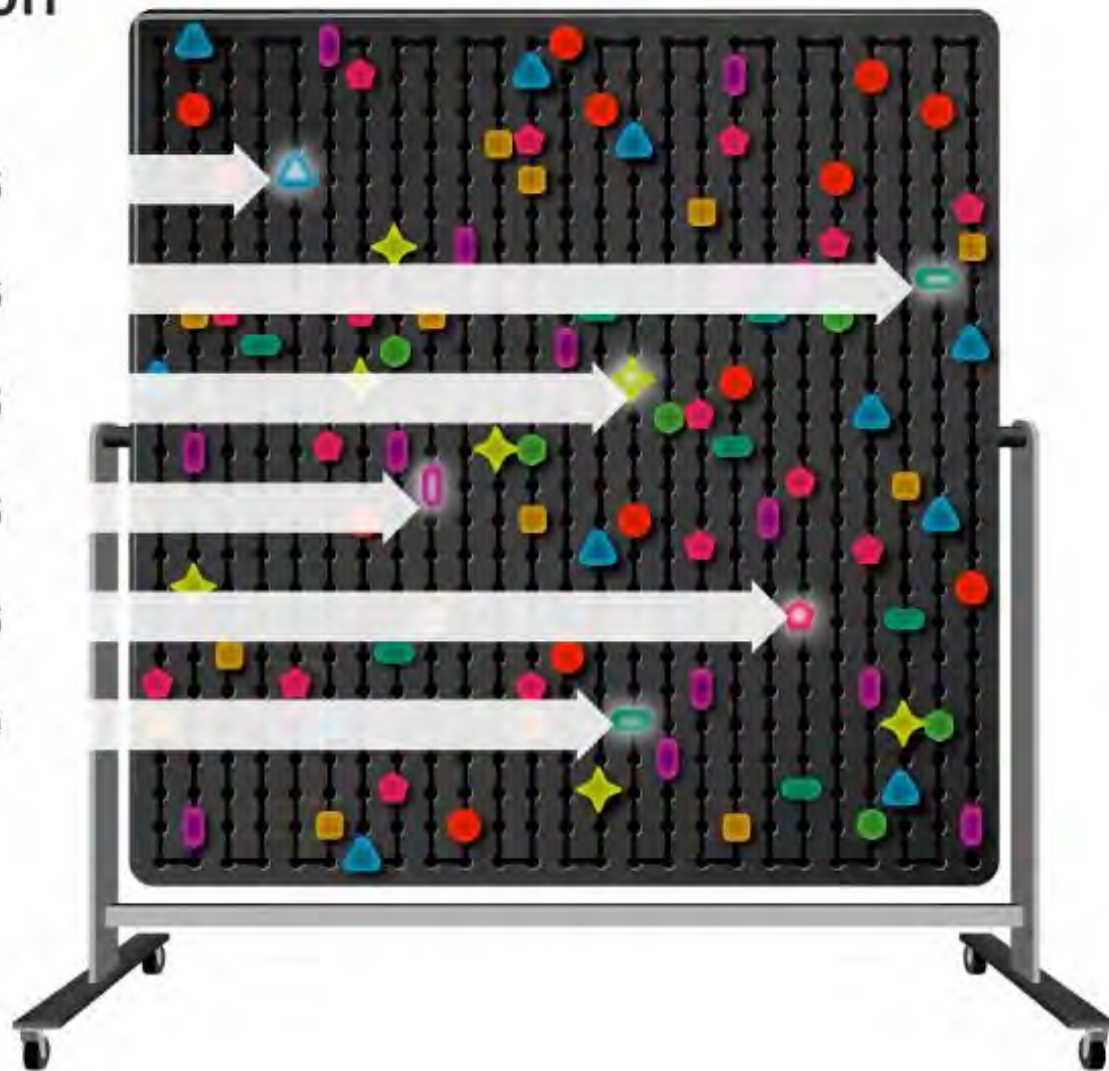
Antigens

Hormones

Drugs

Chemicals

Temperature



Offspring genome



External factors which affect gene expression

Growth factors

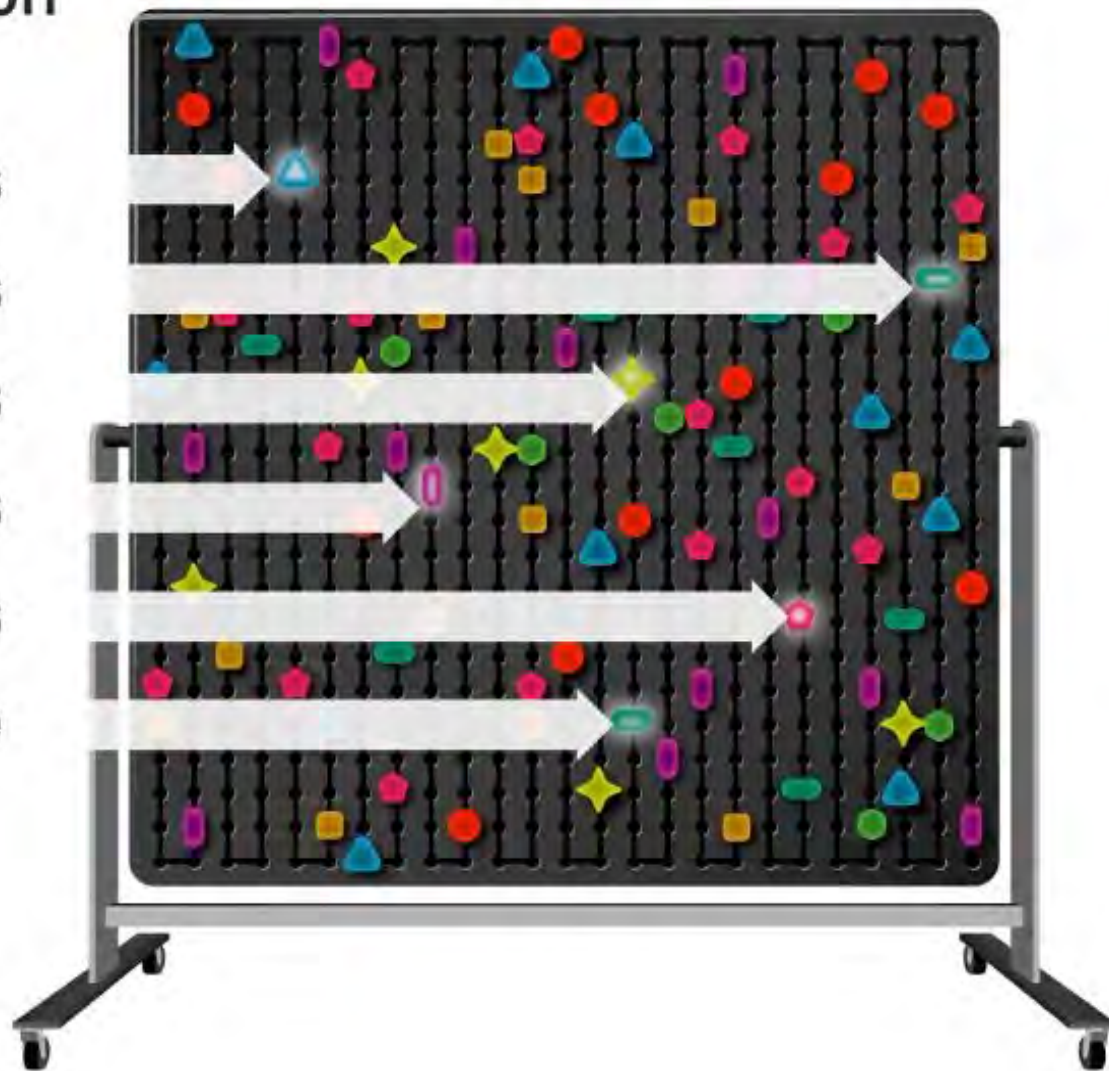
Antigens

Hormones

Drugs

Chemicals

Temperature



Offspring genome



Resistant Phenotype

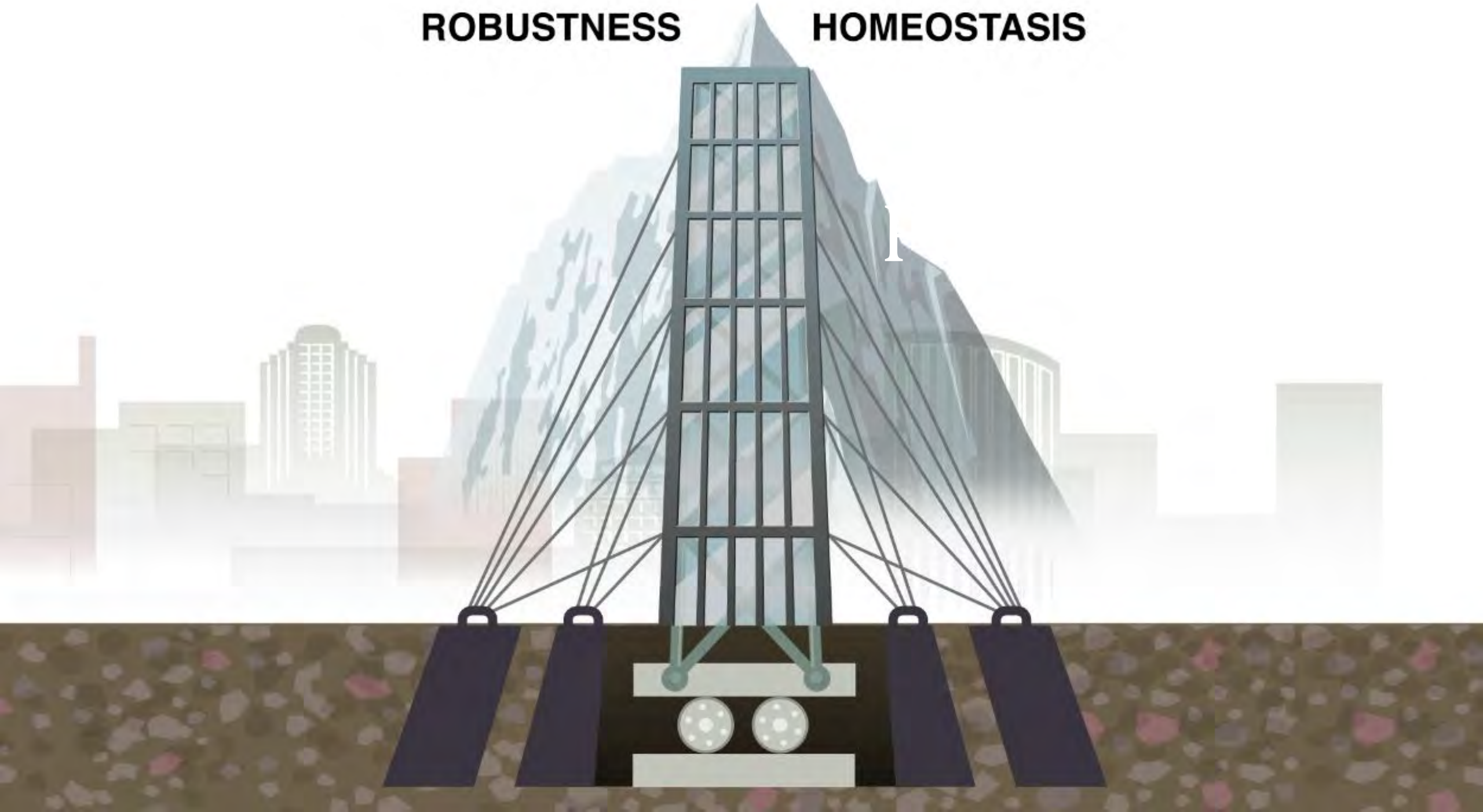


Robust

Responsive

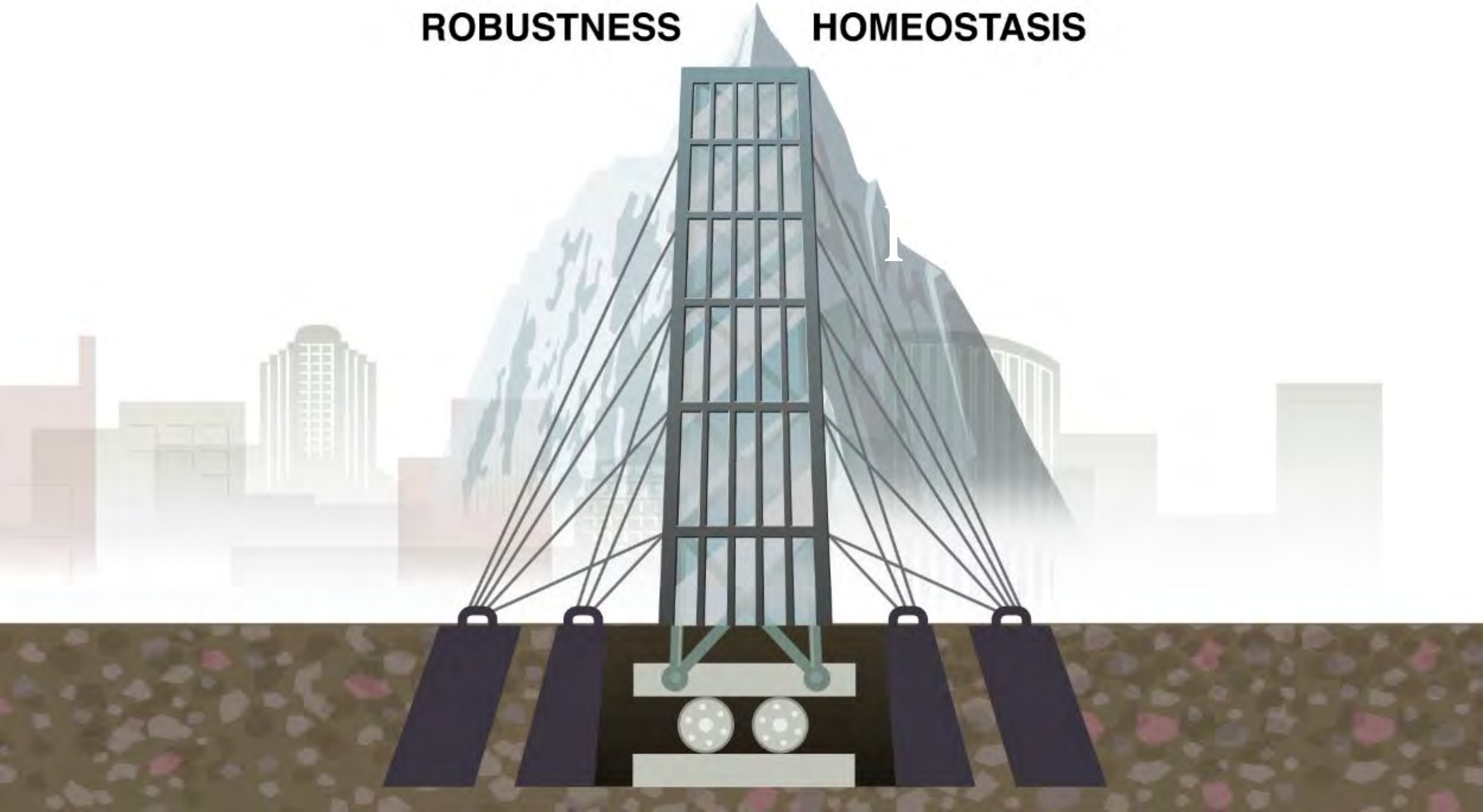
ROBUSTNESS


HOMEOSTASIS



ROBUSTNESS

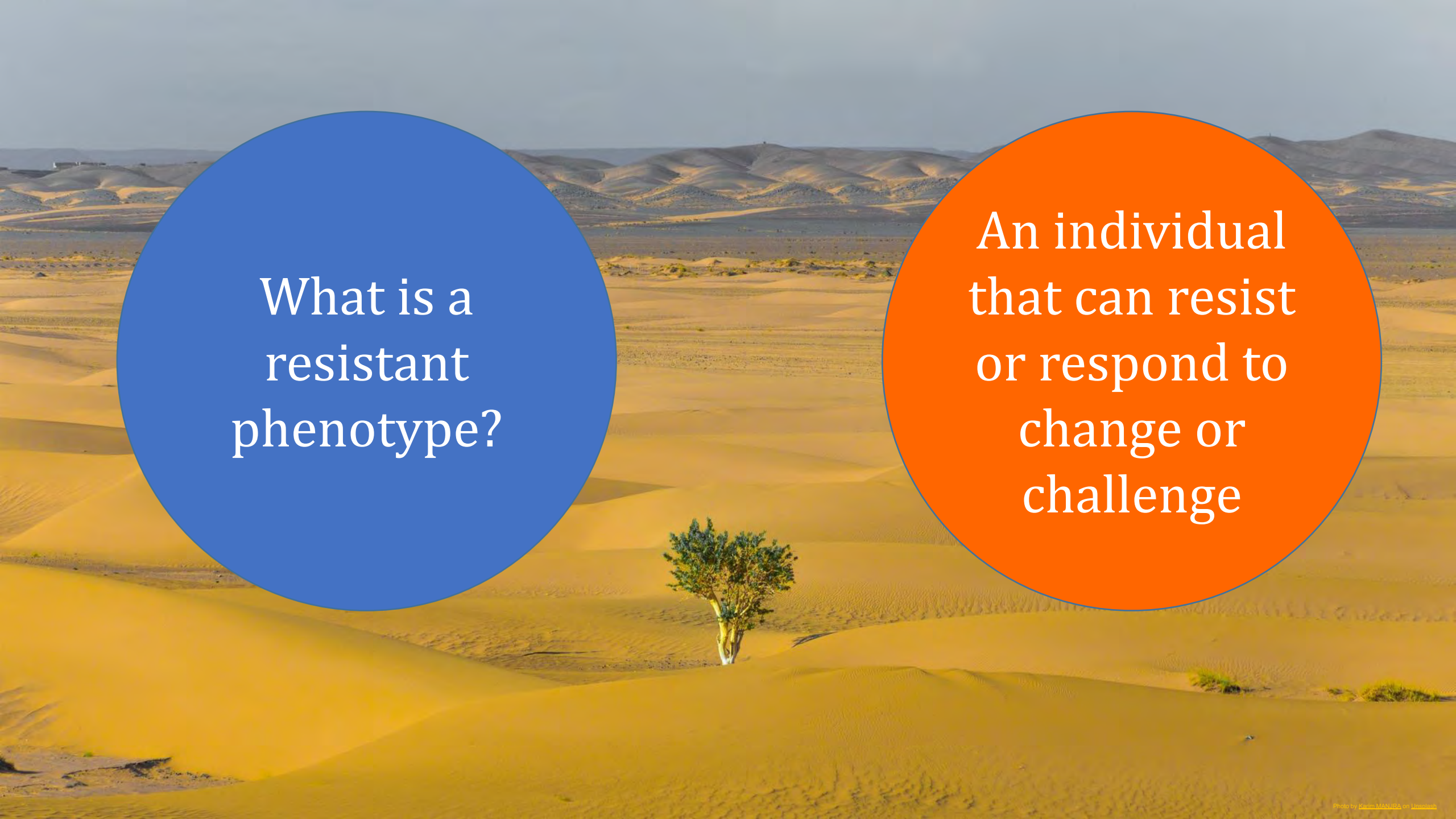
HOMEOSTASIS





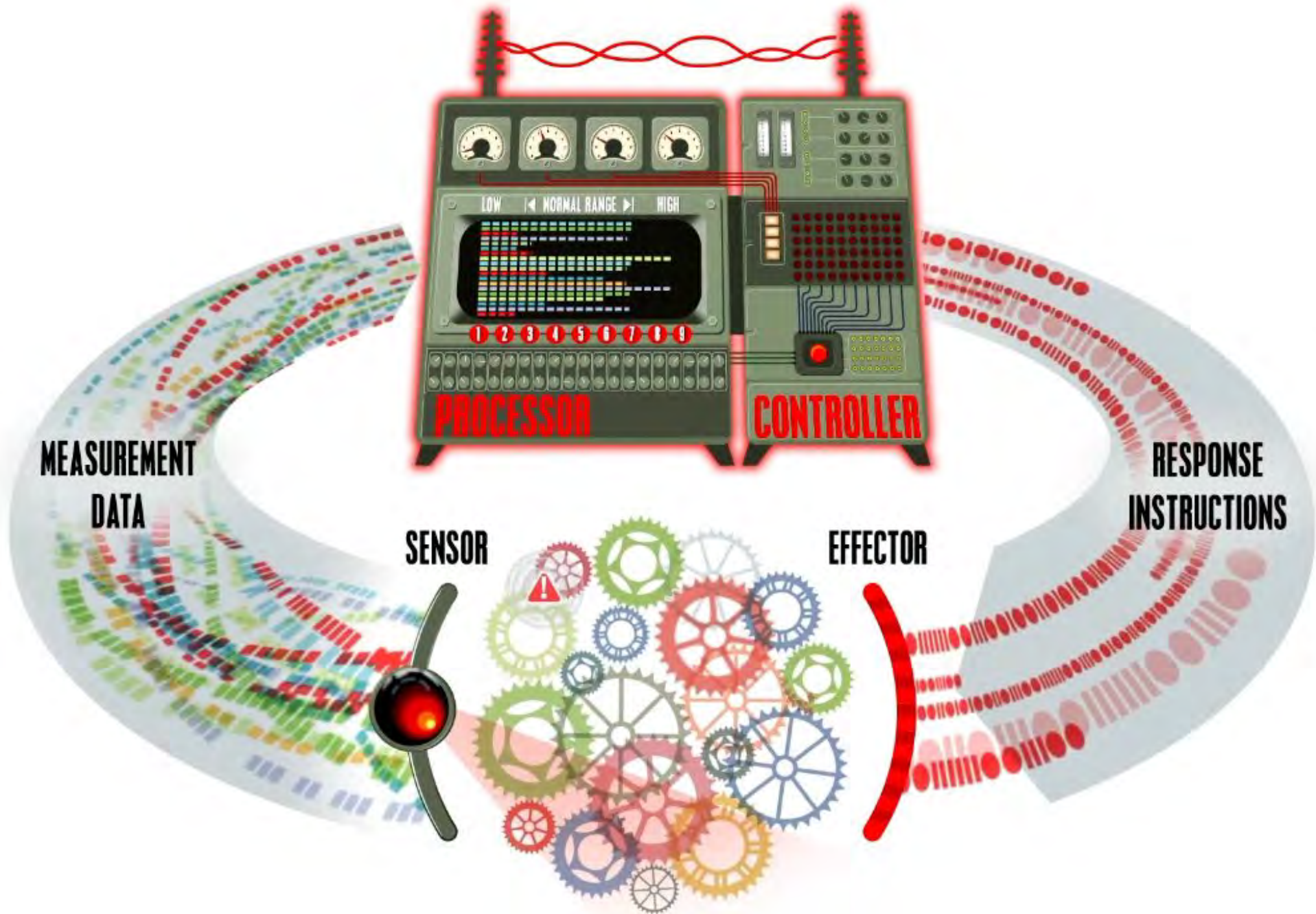
Individual animals exhibit
a 'dynamic' health
phenotype

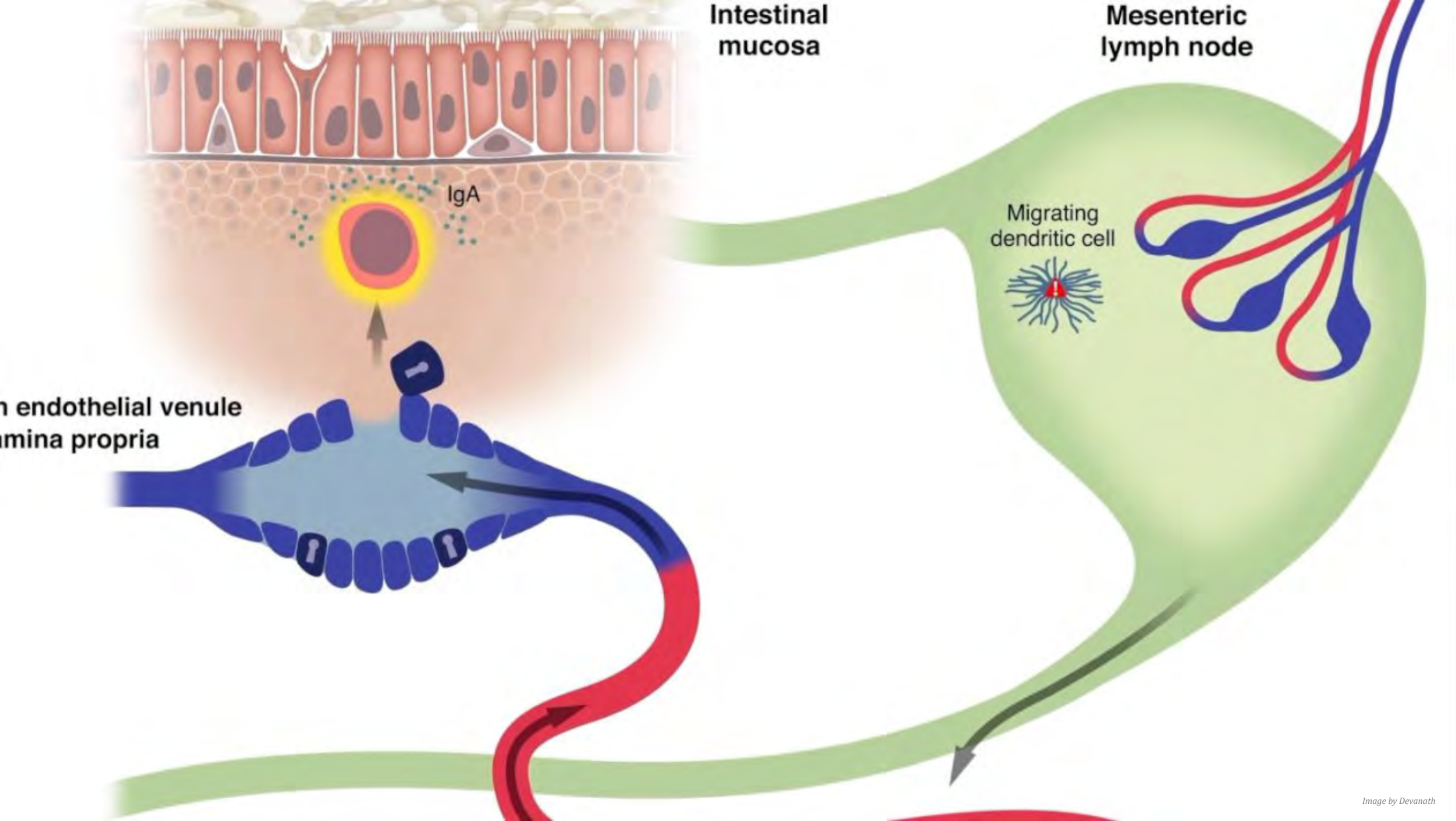
Management
practices
determine
health
phenotype

A wide-angle photograph of a desert landscape featuring rolling sand dunes under a clear sky. A single, small tree stands prominently in the middle ground, casting a shadow on the sand. The dunes are golden-brown, and the horizon is marked by distant, low hills.

What is a
resistant
phenotype?

An individual
that can resist
or respond to
change or
challenge
















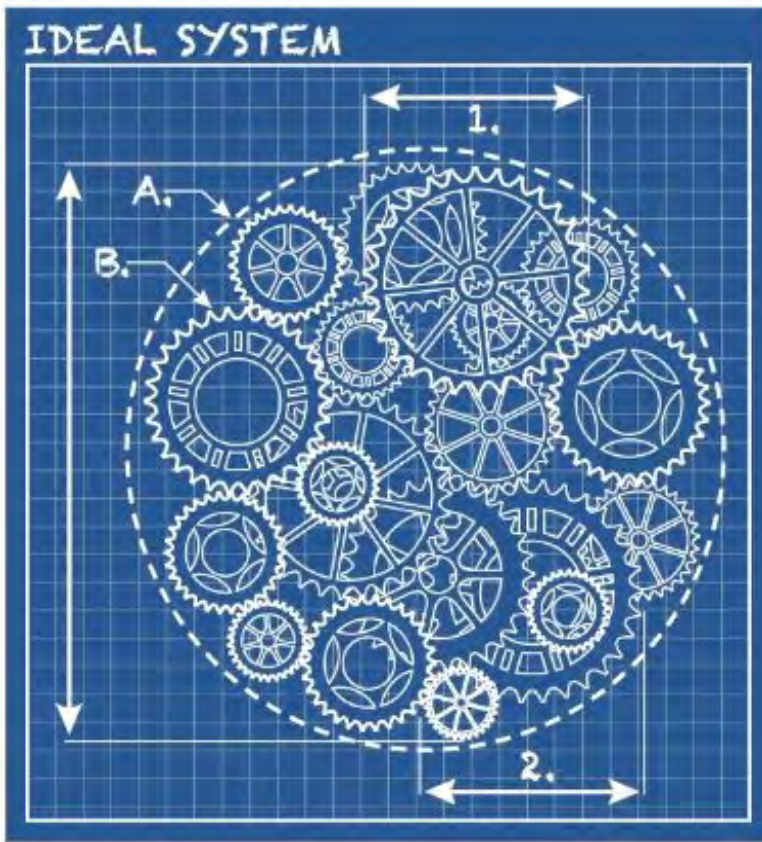
The immune system is primarily
an organ of homeostasis





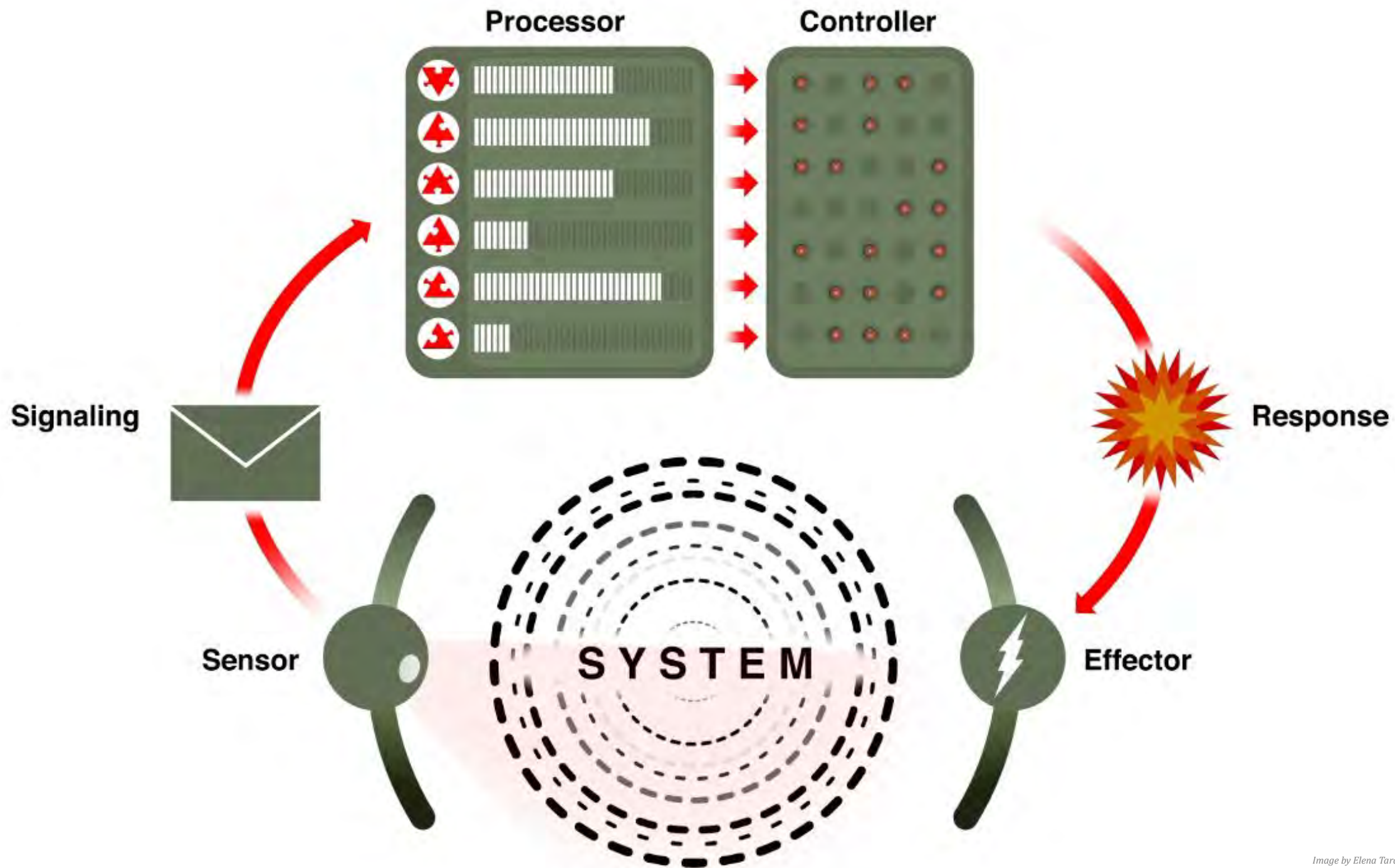
The immune system works
as a SYSTEM

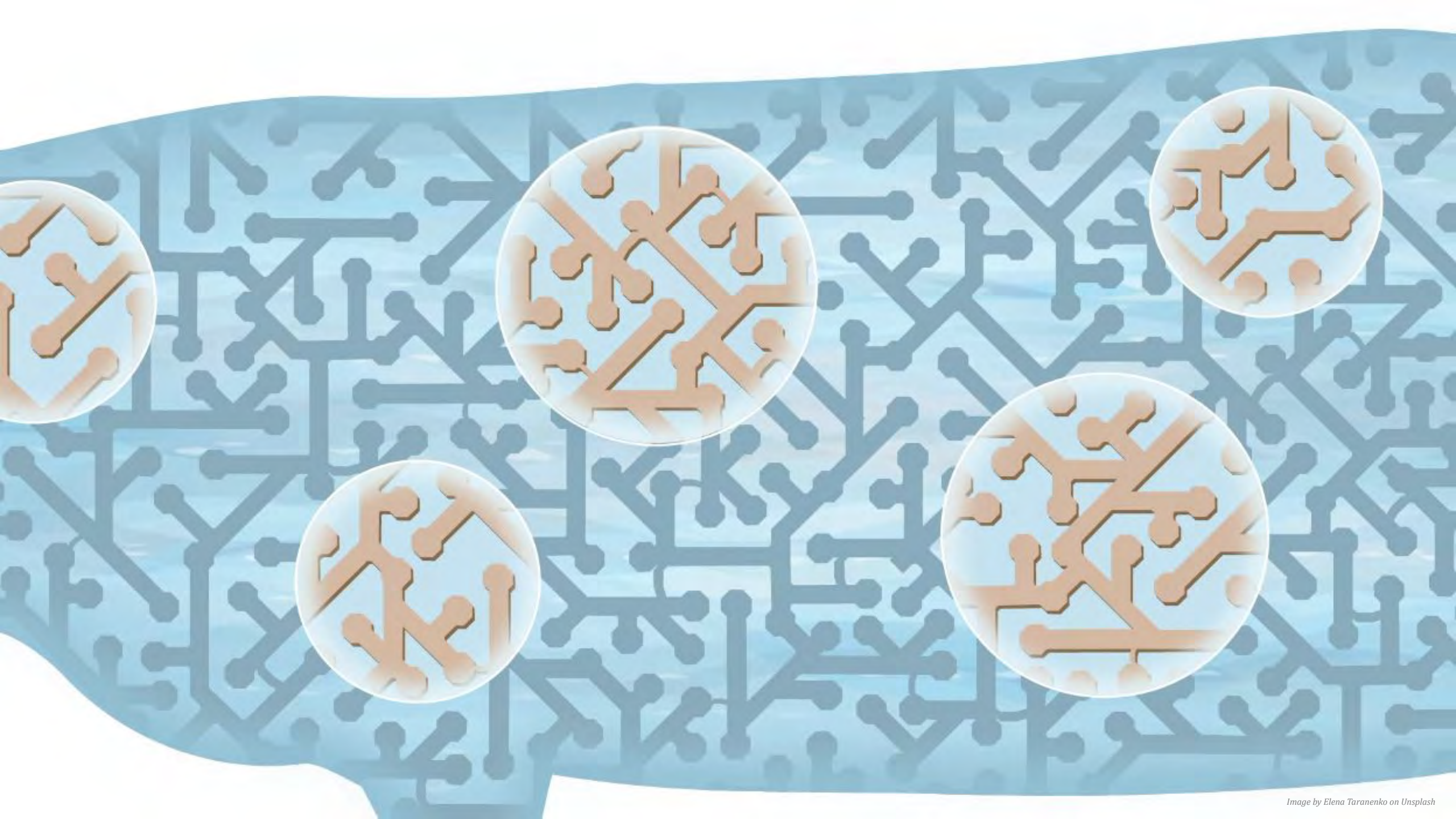




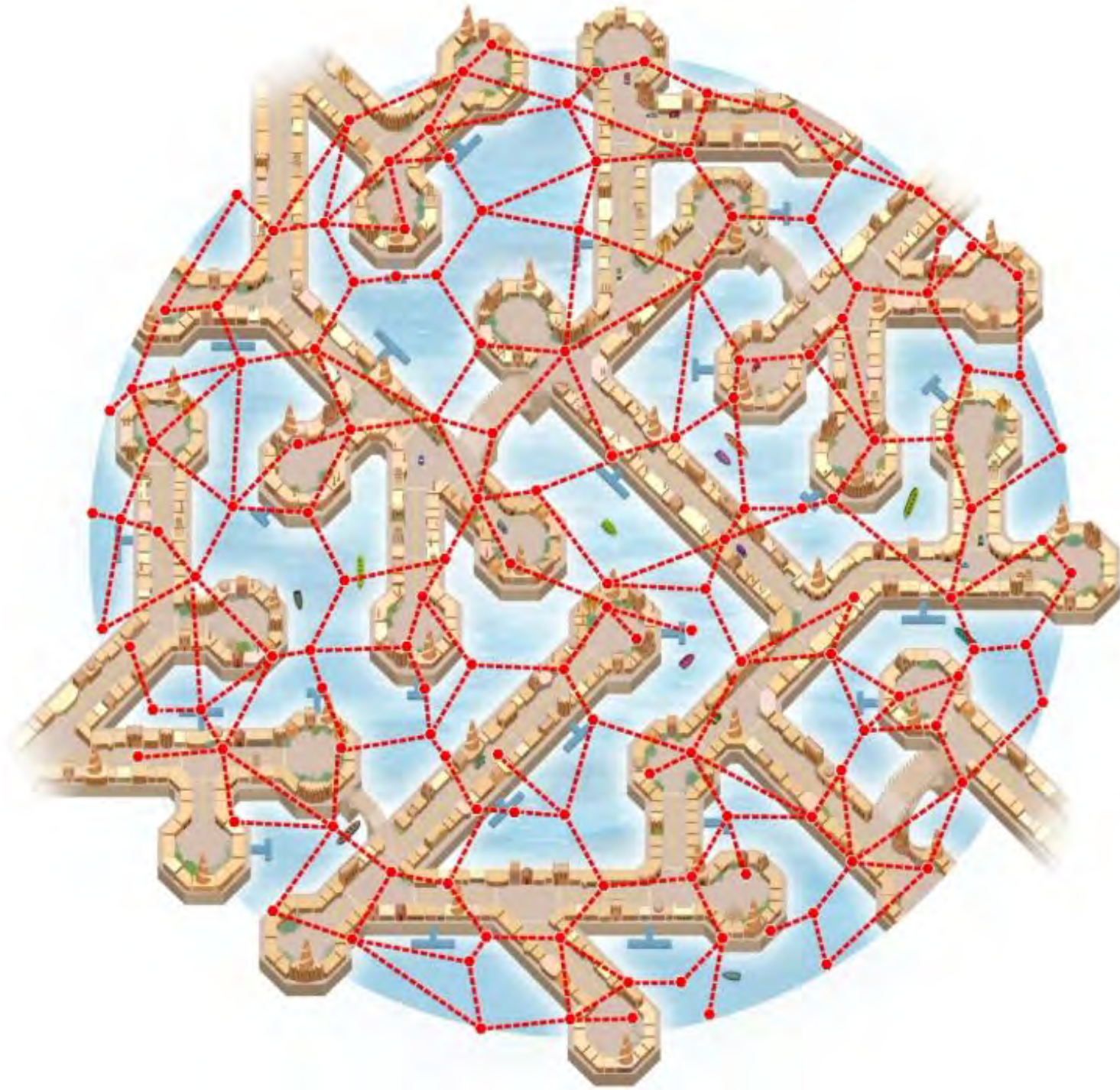
Real-world system











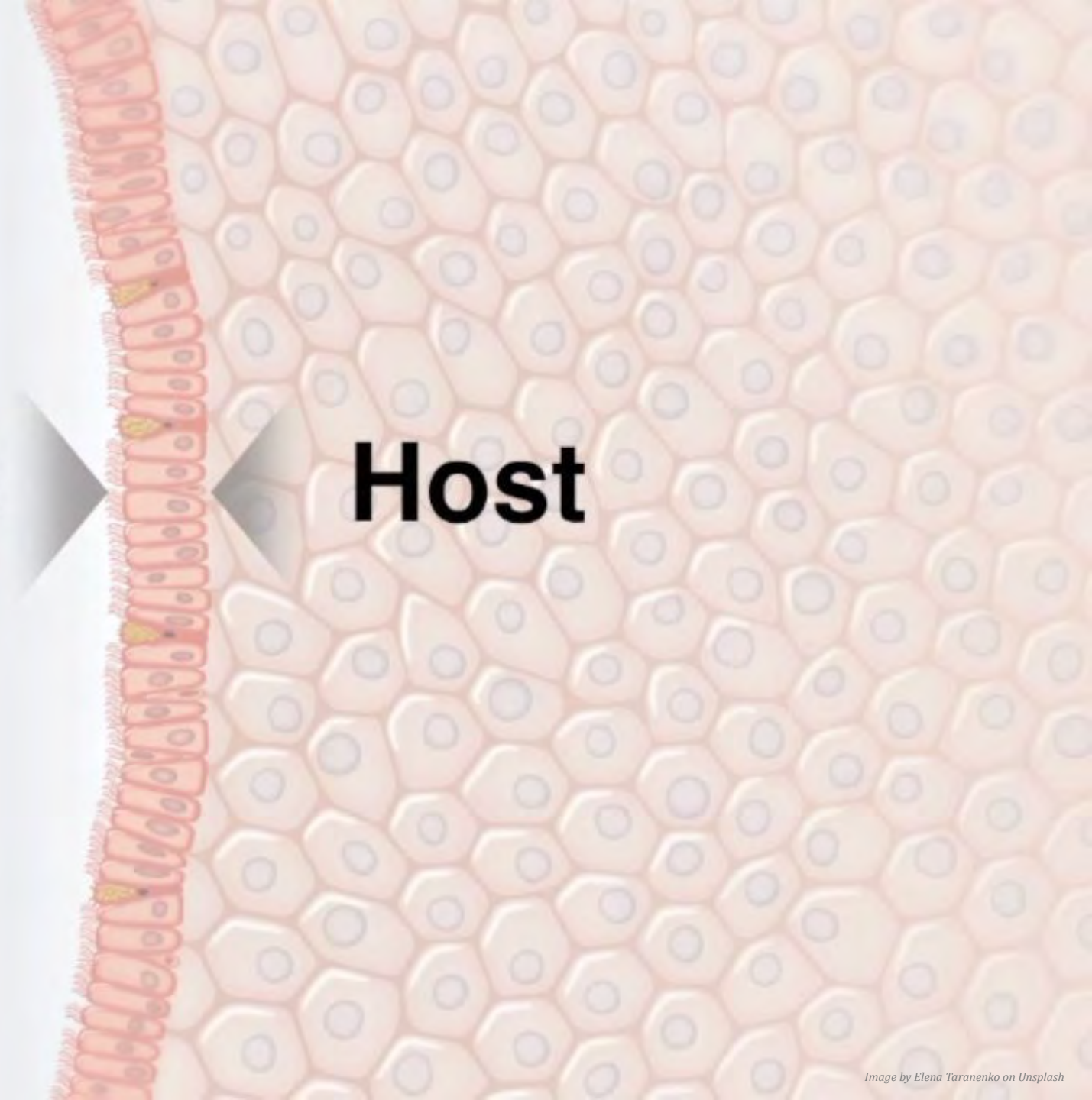




Environment



Host







Physical



Innate

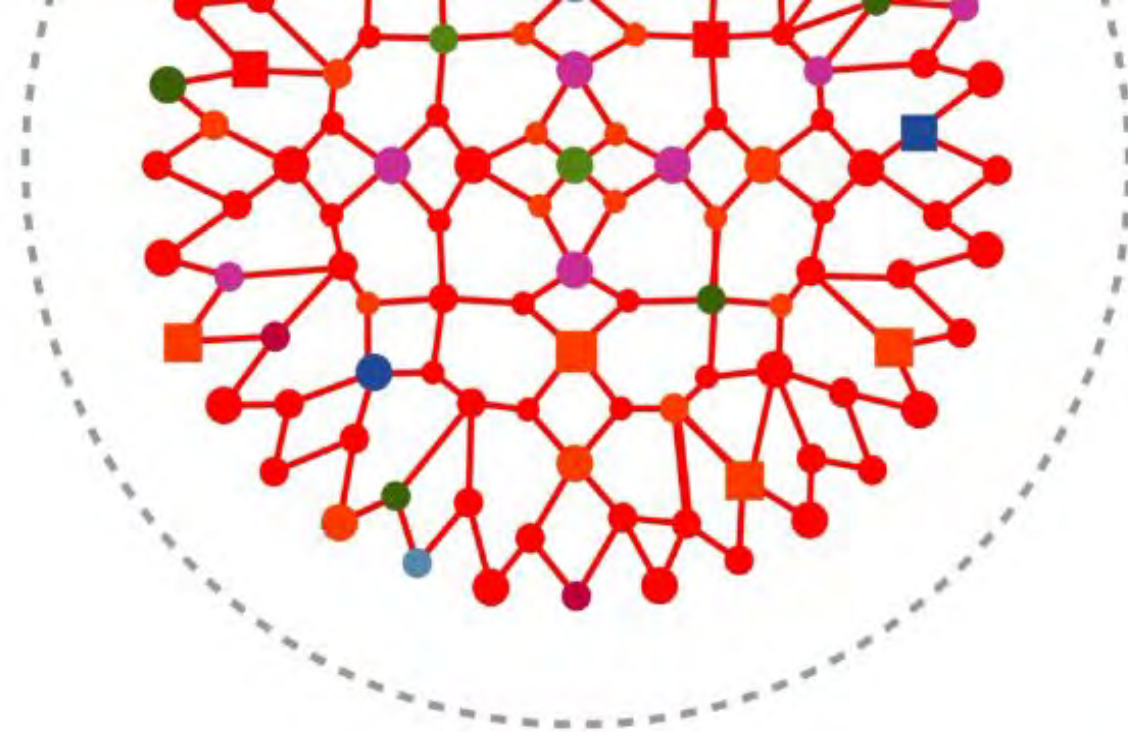
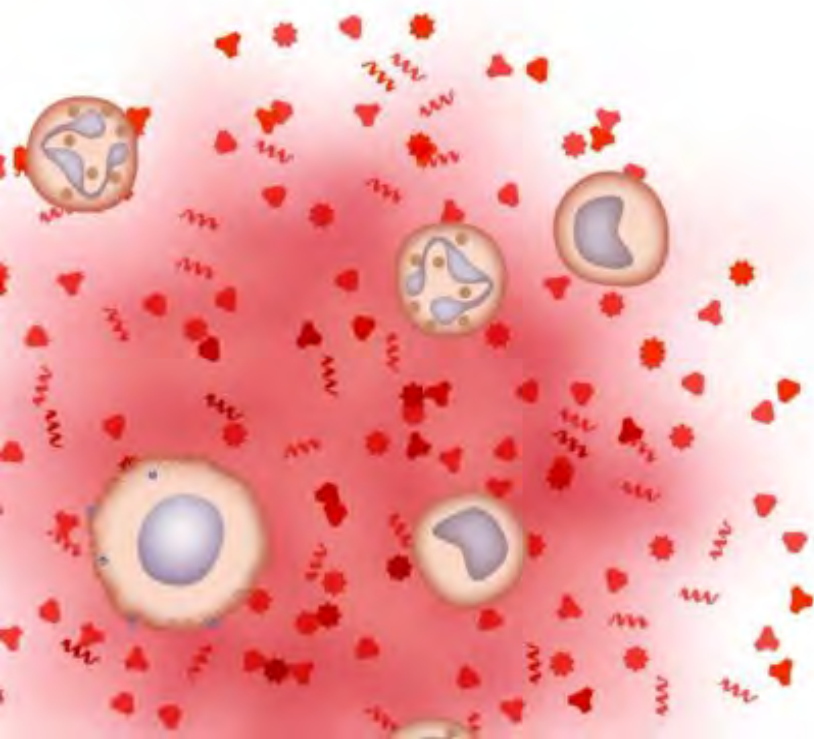


Adaptive



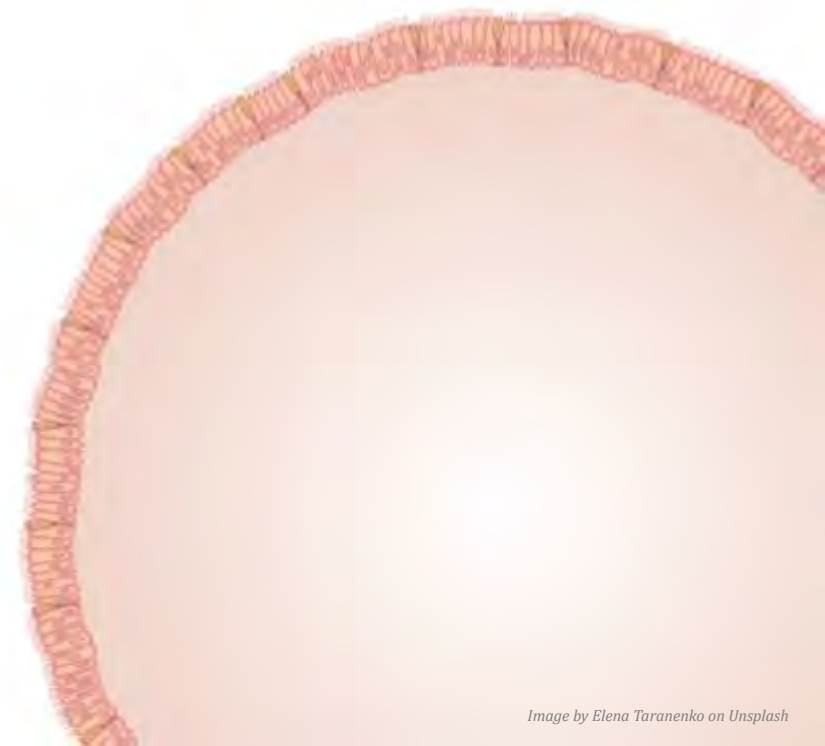


Immune system



Microbiome

Epithelium

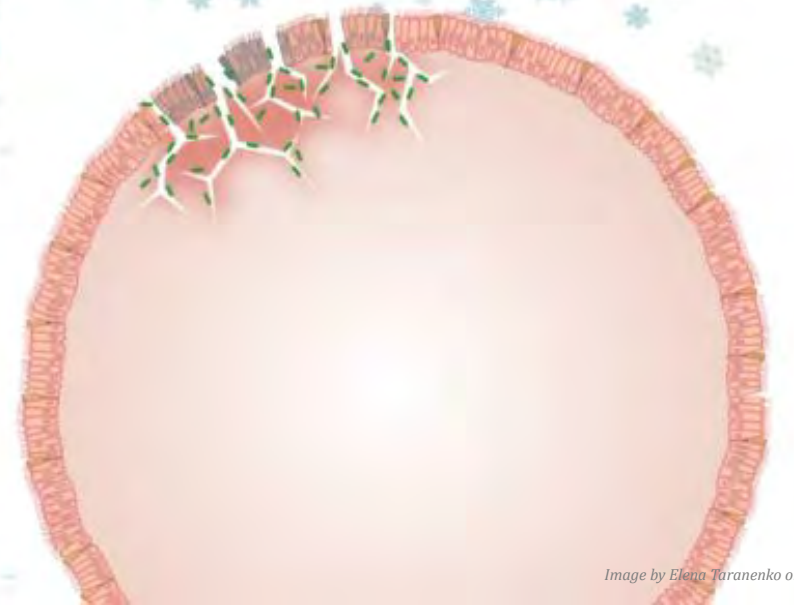


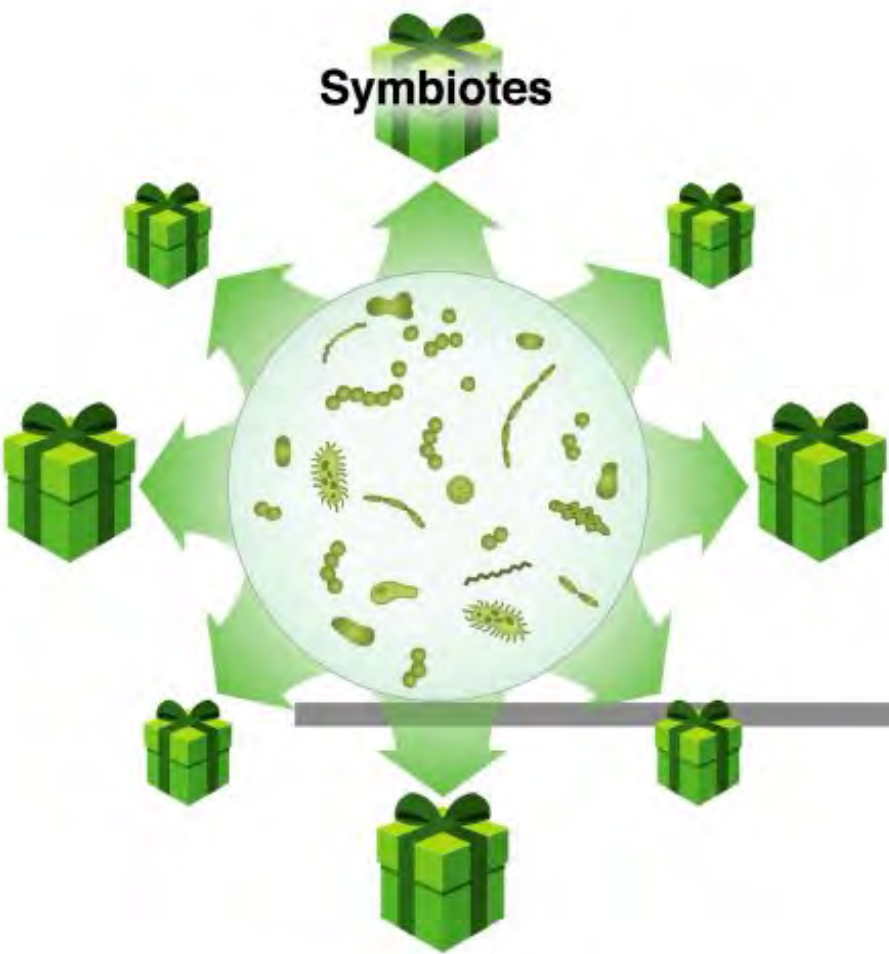
Microbiome



Cold, dry air

**Immune
system**





Symbiotes

Benefits to host,
including regulation



Commensals

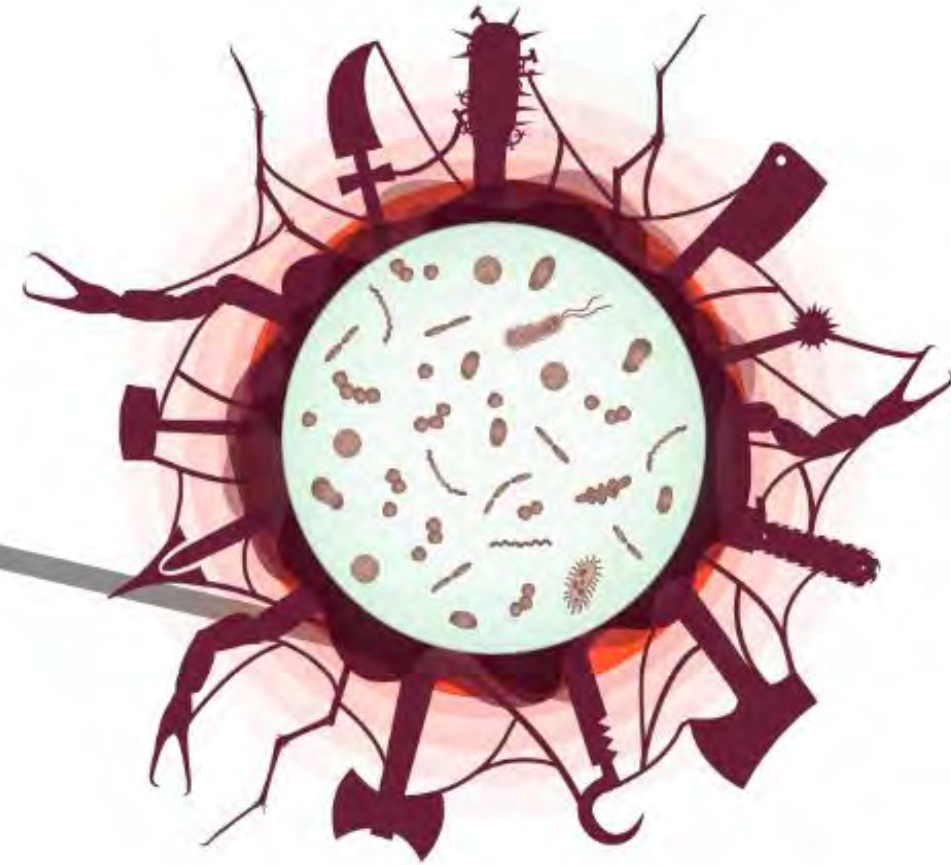


Symbiotes

Commensals

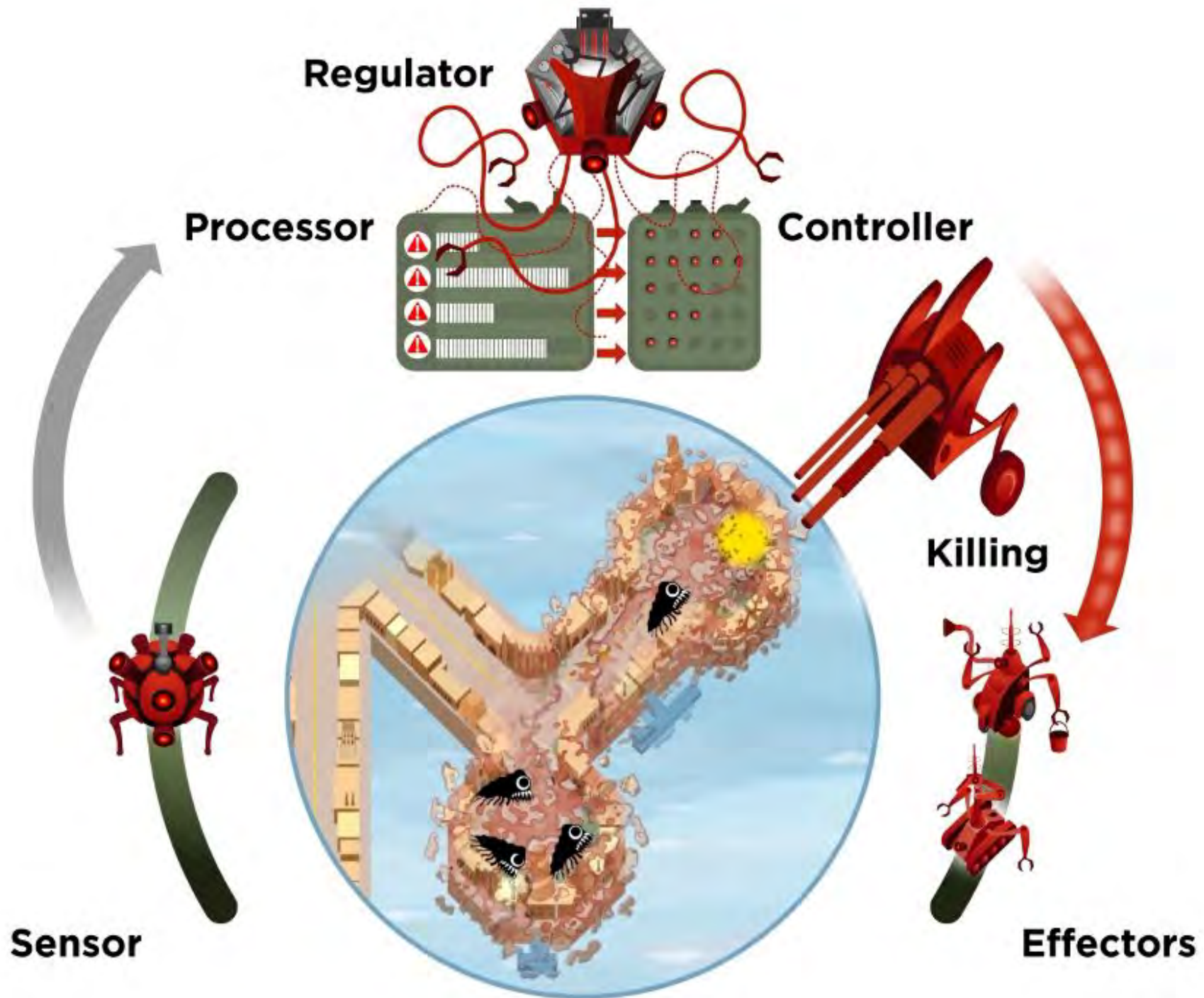
Pathobiotics

Inflammation and
serious disease



Benefits to host,
including regulation







Inflammation is the key
immune response in
health defense

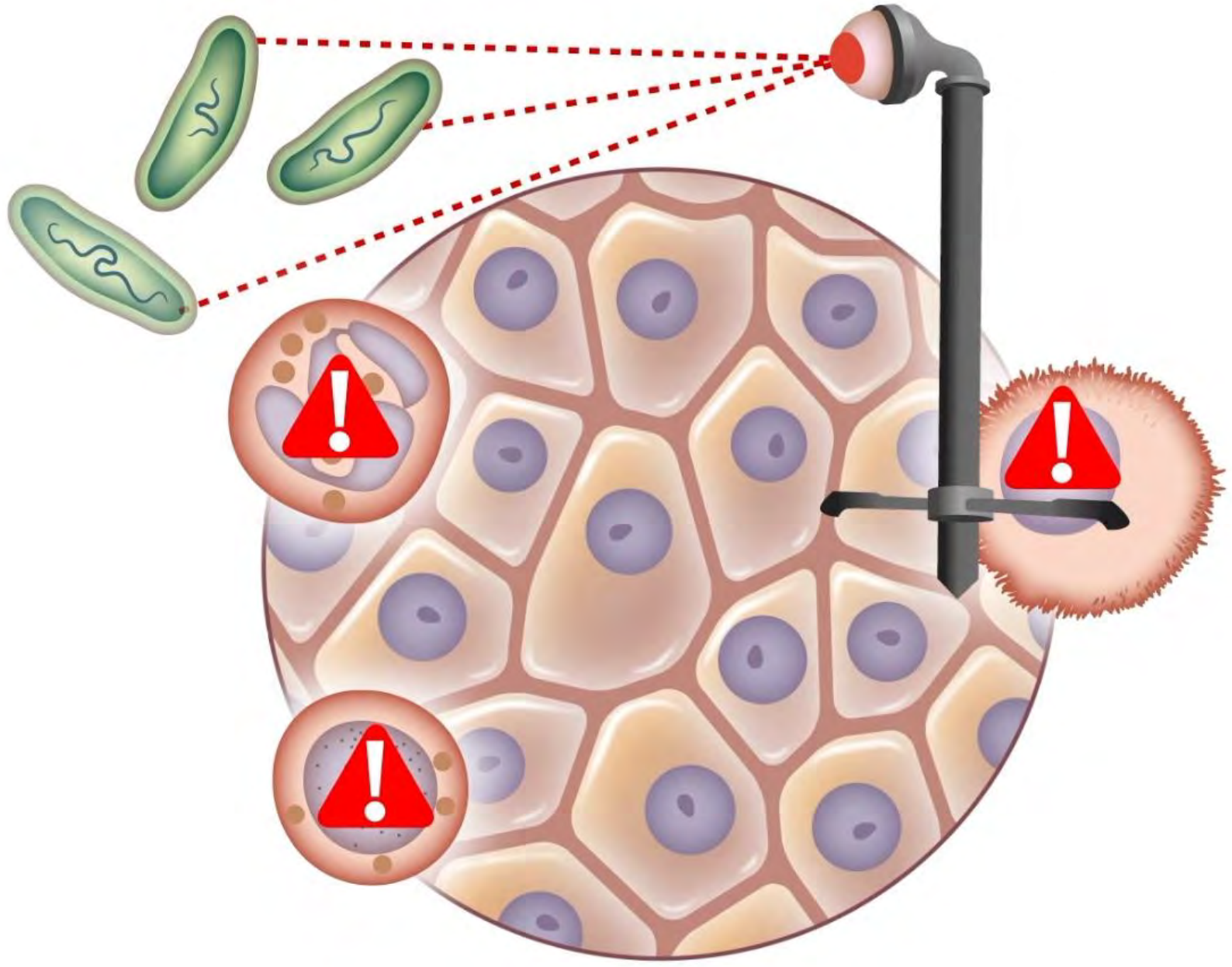


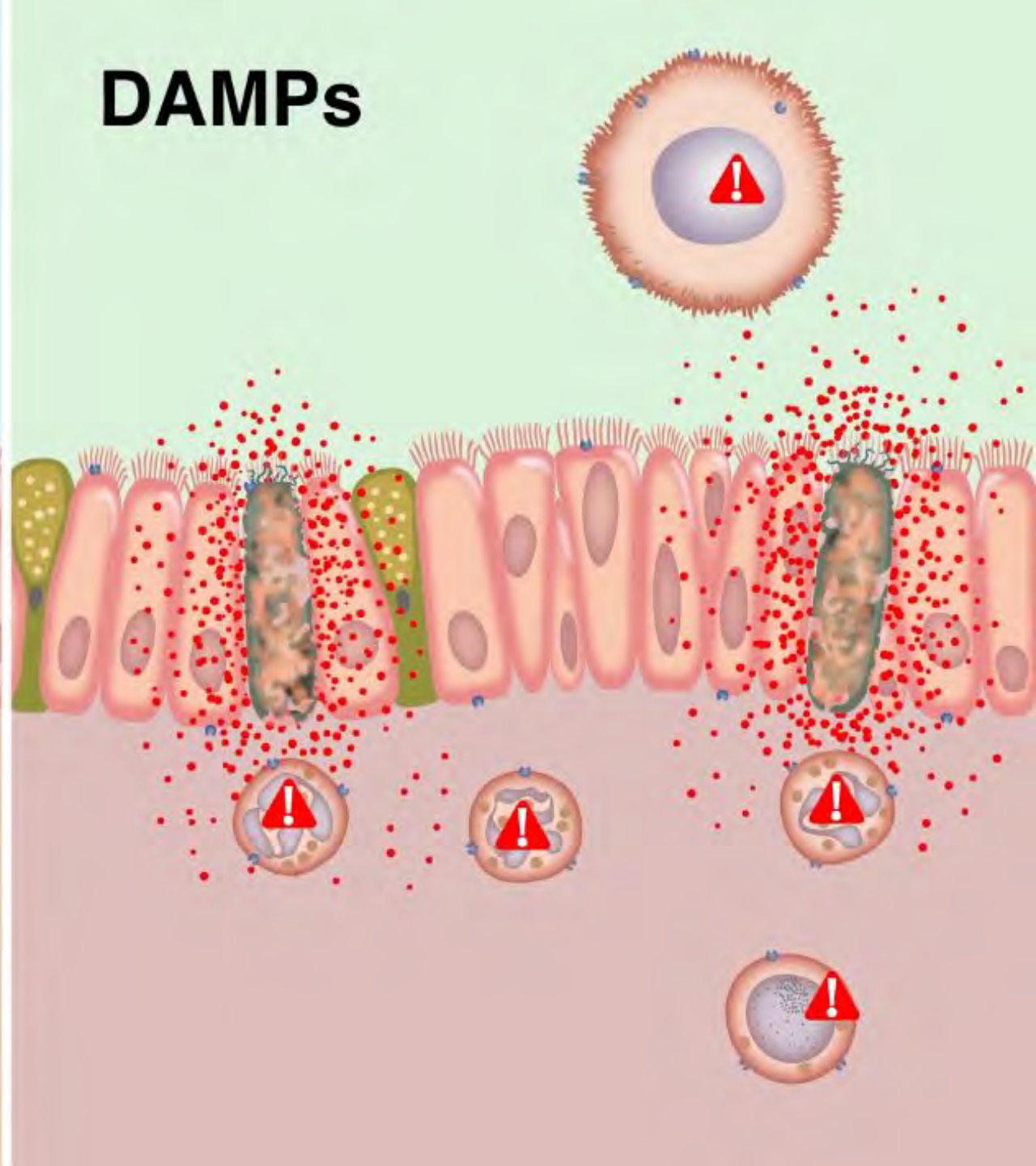
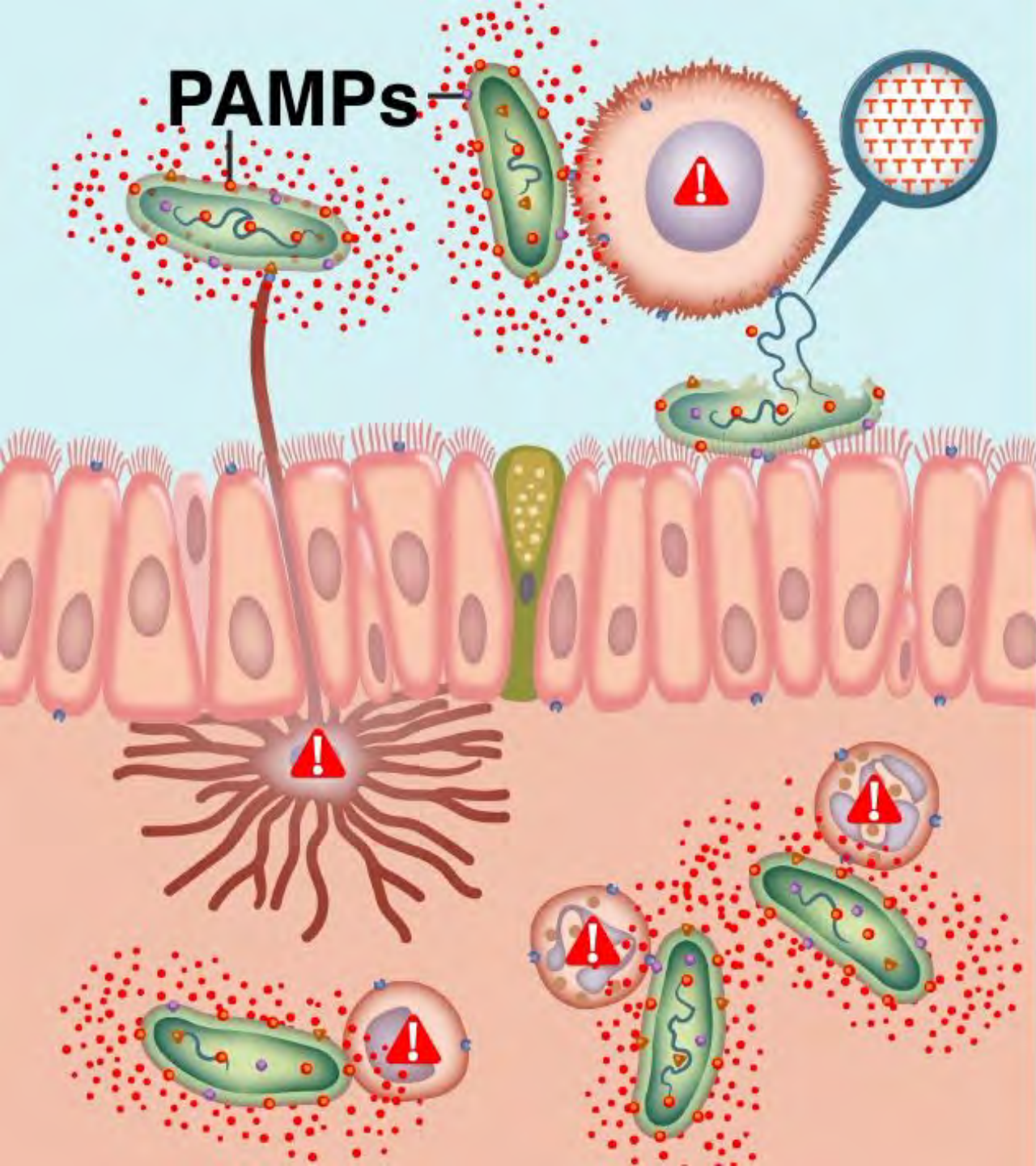
The adaptive
immune system
augments
inflammation



A low-angle photograph of a modern staircase with a red wall and a blue circular graphic containing text. The staircase is made of light-colored wood or stone and is set against a bright red wall. The blue circle is positioned on the right side of the image, containing the text "Inflammation has SIX key steps".

Inflammation
has SIX key
steps





1
RECOGNITION

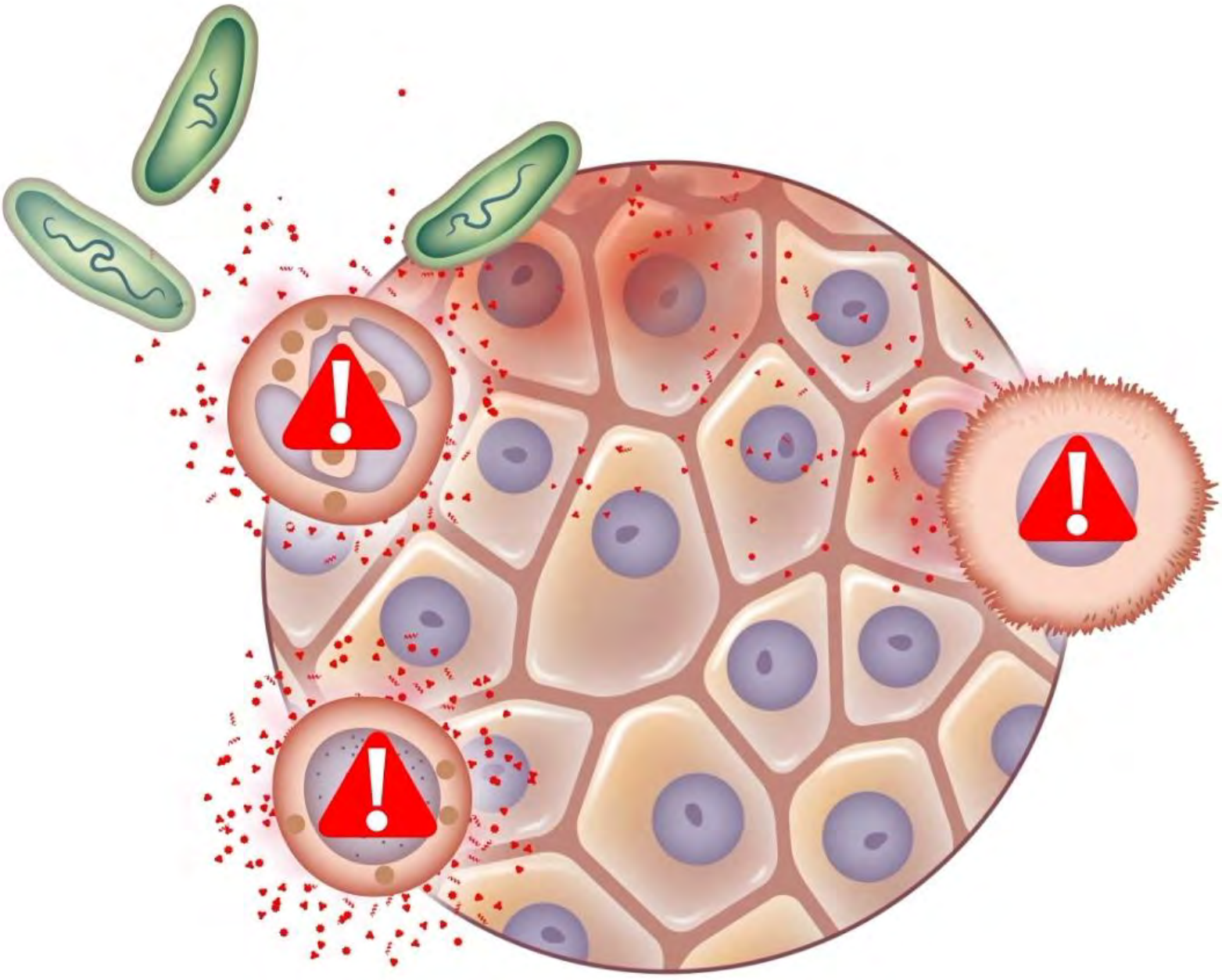
2
NEUTRALIZATION

3
AMPLIFICATION

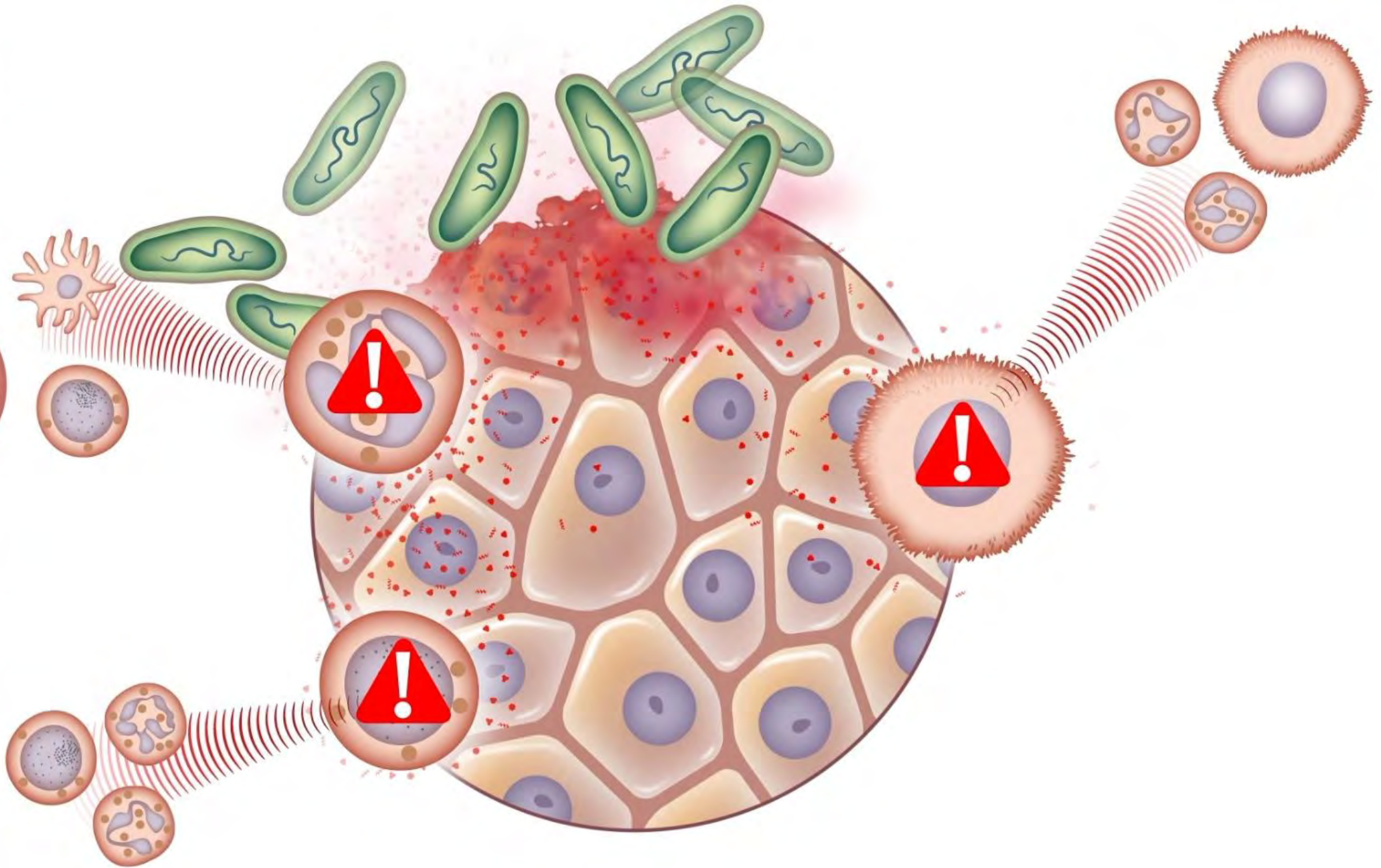
4
KILLING

5
CLEARANCE

6
HEALING



- 1 RECOGNITION
- 2 NEUTRALIZATION
- AMPLIFICATION
- 4 KILLING
- 5 CLEARANCE
- 6 HEALING



1
RECOGNITION

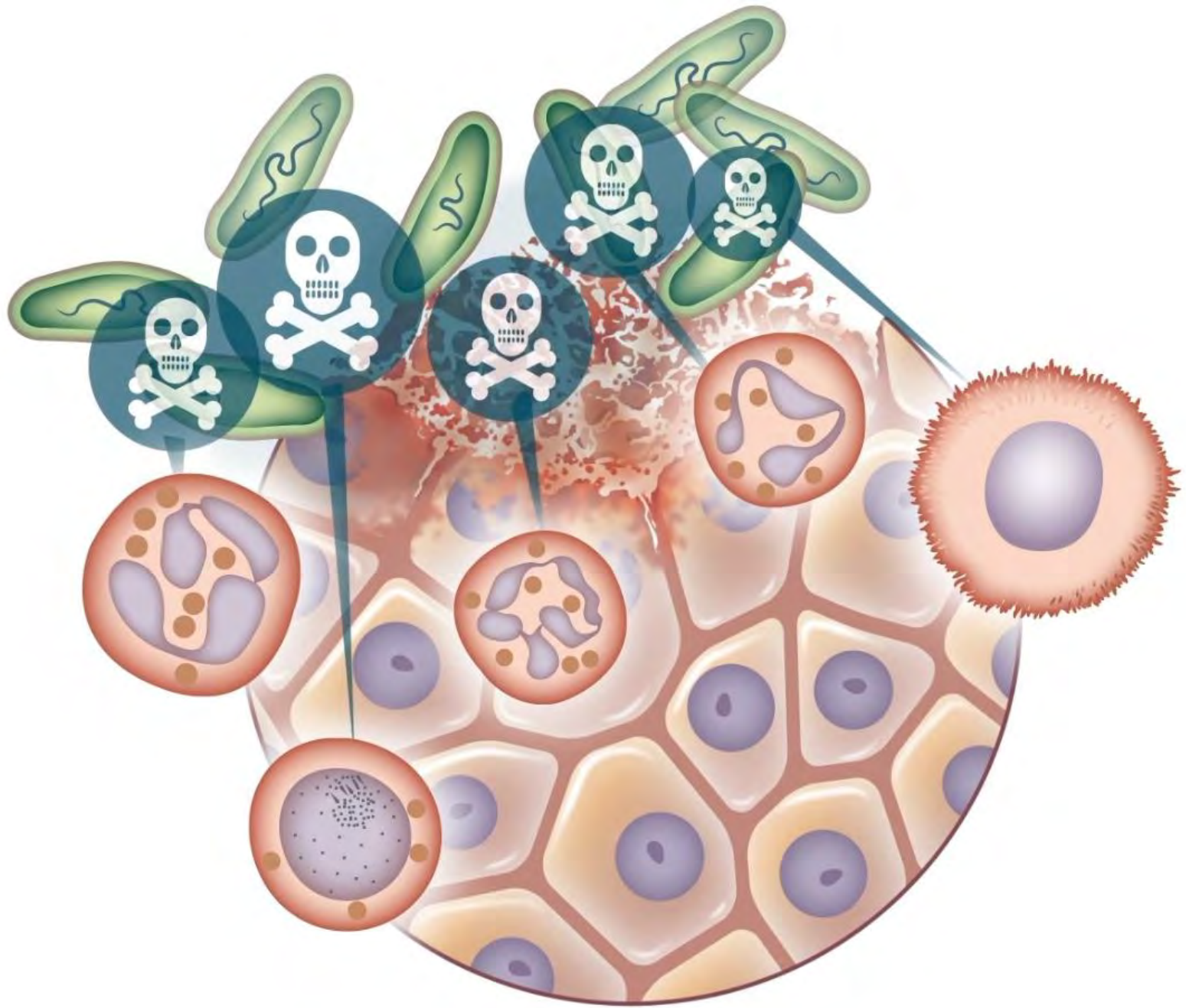
2
NEUTRALIZATION

3
AMPLIFICATION

4
KILLING

5
CLEARANCE

6
HEALING



1
RECOGNITION

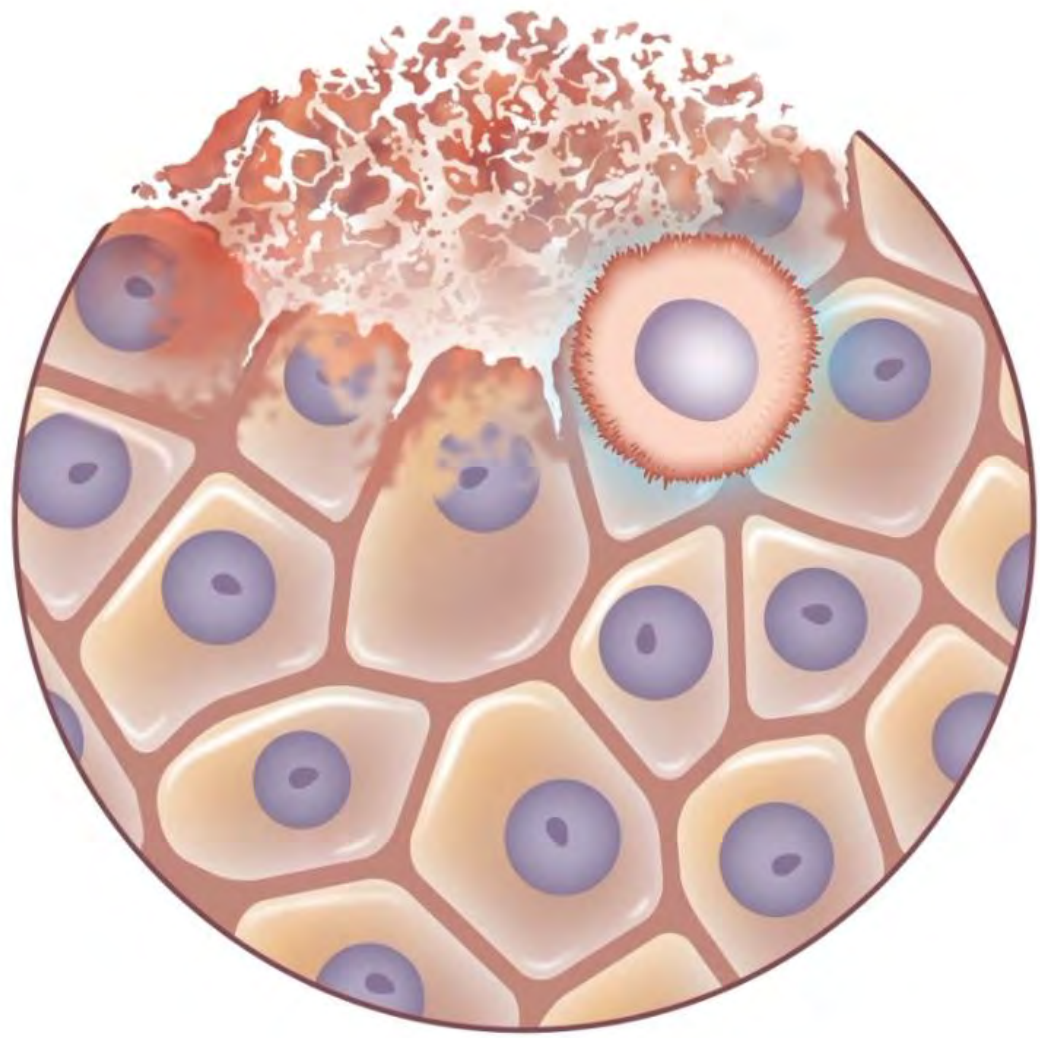
2
NEUTRALIZATION

3
AMPLIFICATION

4
KILLING

5
CLEARANCE

6
HEALING



1
RECOGNITION

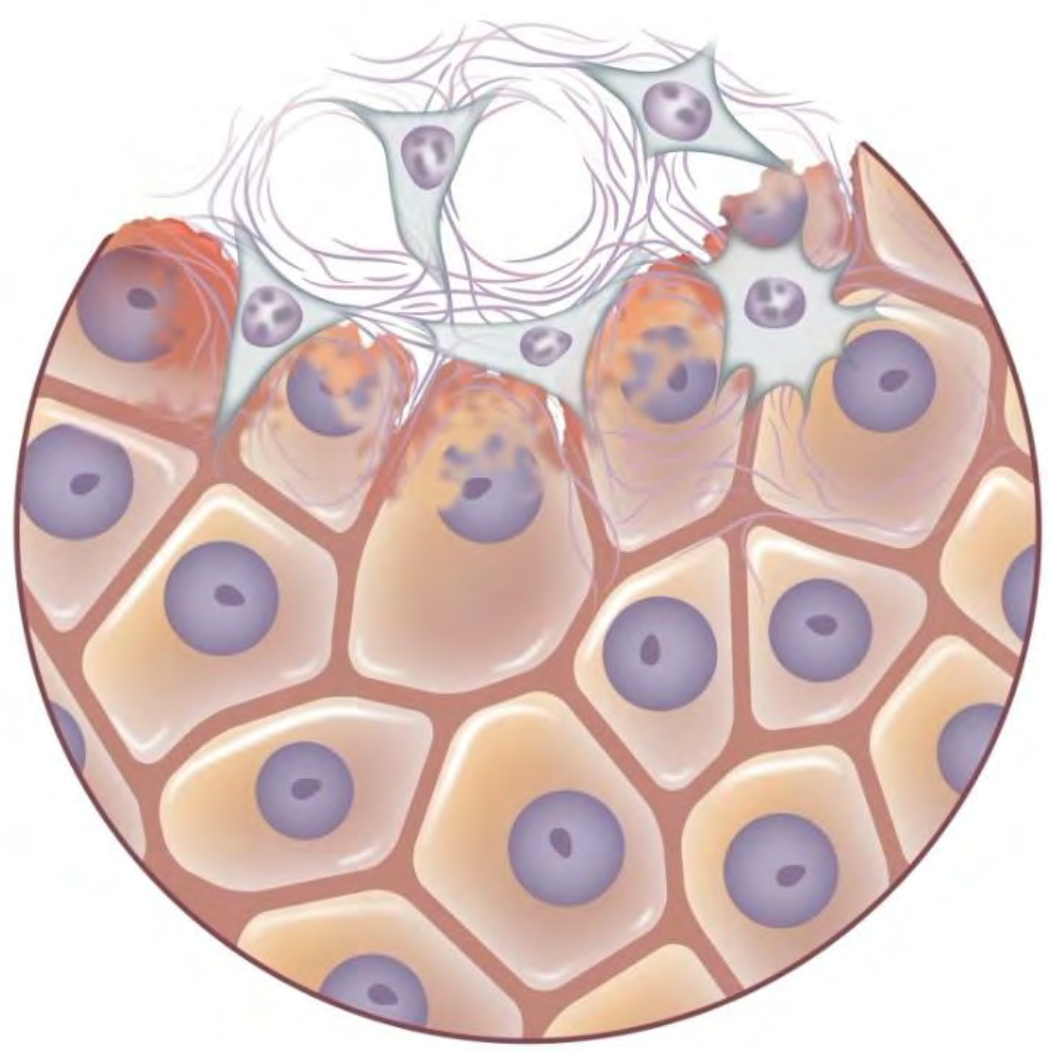
2
NEUTRALIZATION

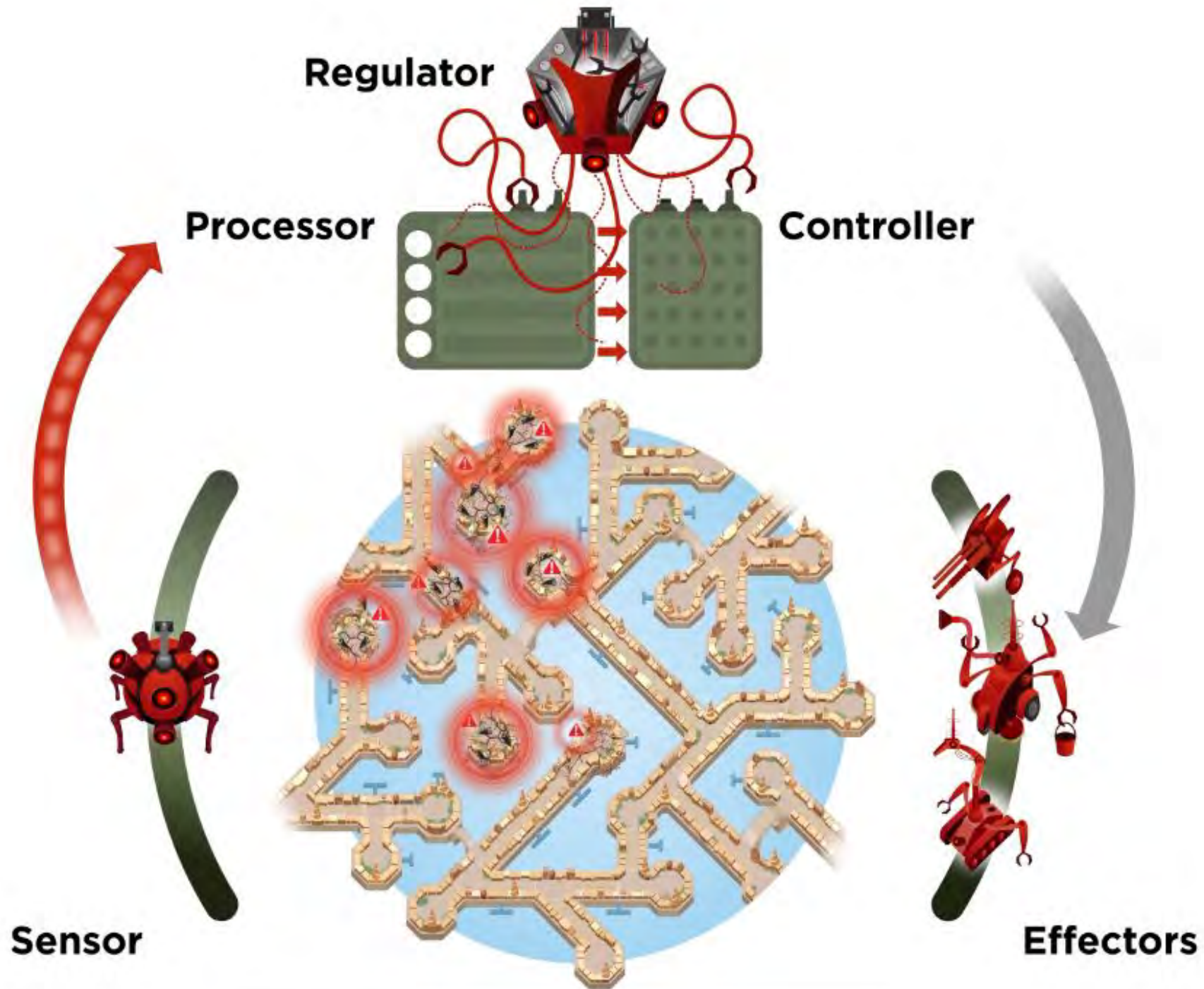
3
AMPLIFICATION

4
KILLING

5
CLEARANCE

6
HEALING









The adaptive
immune system
augments
inflammation



Specificity

Memory



A long-exposure photograph of a highway at night, showing light trails from vehicles. The trails are curved, following the path of the road. The colors range from bright white and yellow to deep red and blue. The background is dark, making the light trails stand out prominently. The word "Speed?" is written in white text in the upper right corner.

Speed?



How can we help our clients foster and sustain the resistant phenotype?



The trajectory for health,
performance and well being is
defined early in life



Early Life Adversity



Decreased cell mediated immunity

Increased PMN senescence

Pro-inflammation





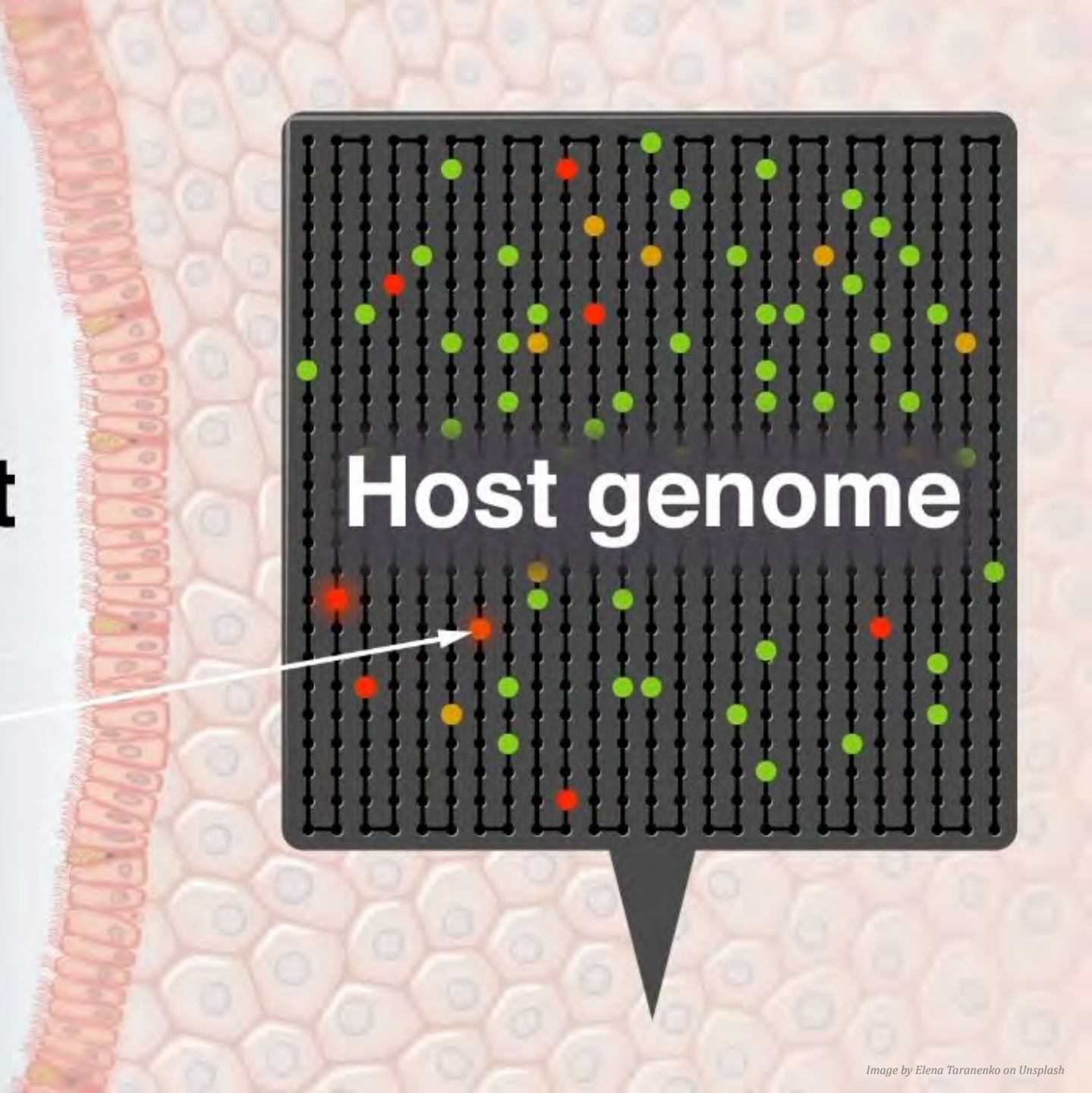
Mental

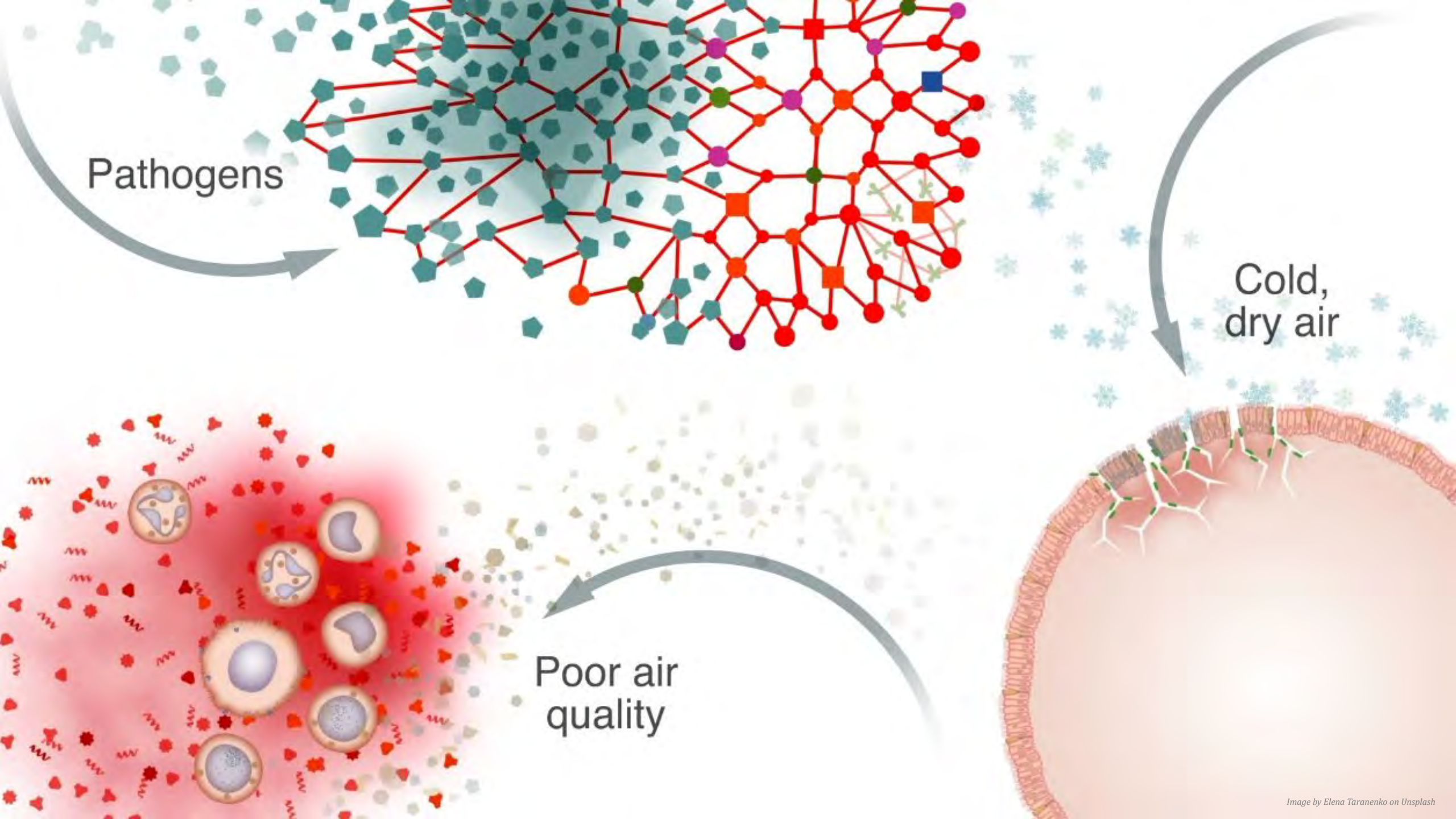
Microbial

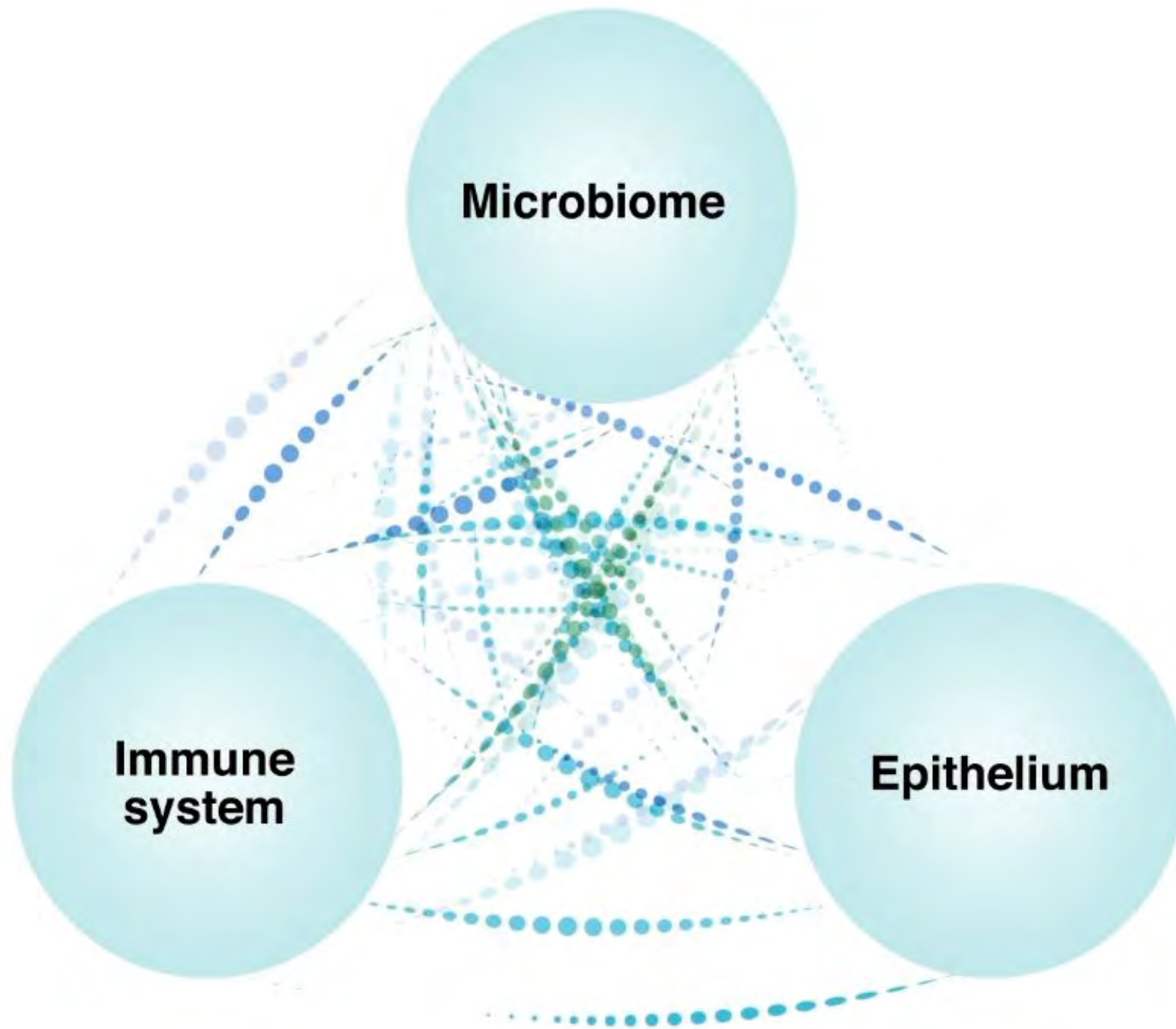
Mucosal

Metabolic

Environment



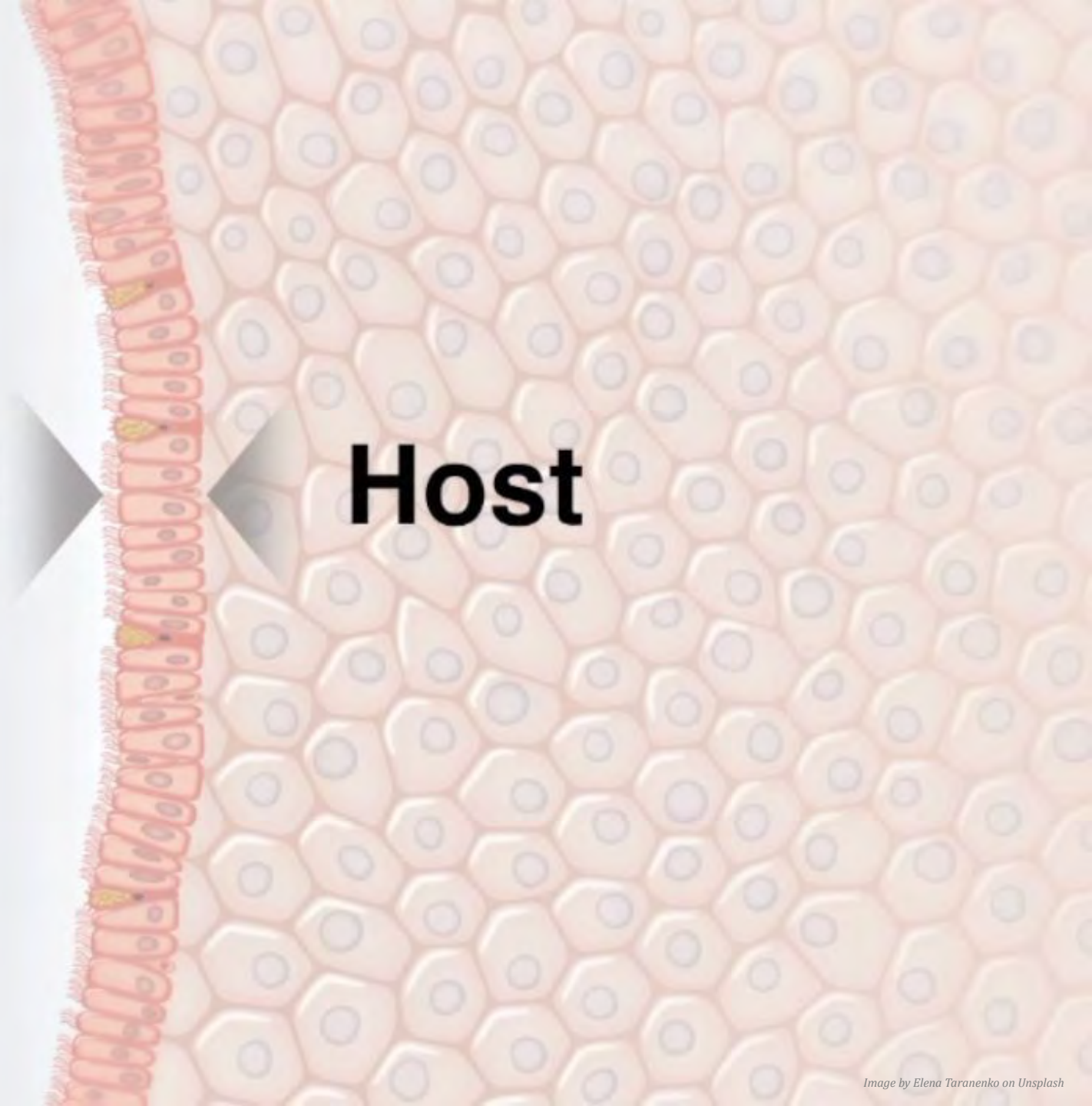




Environment



Host



Environmental conditions at respiratory epithelium

Homeostatic healthy state

Pre-disease state

Disease exacerbation state

Temperature

Humidity

Particles

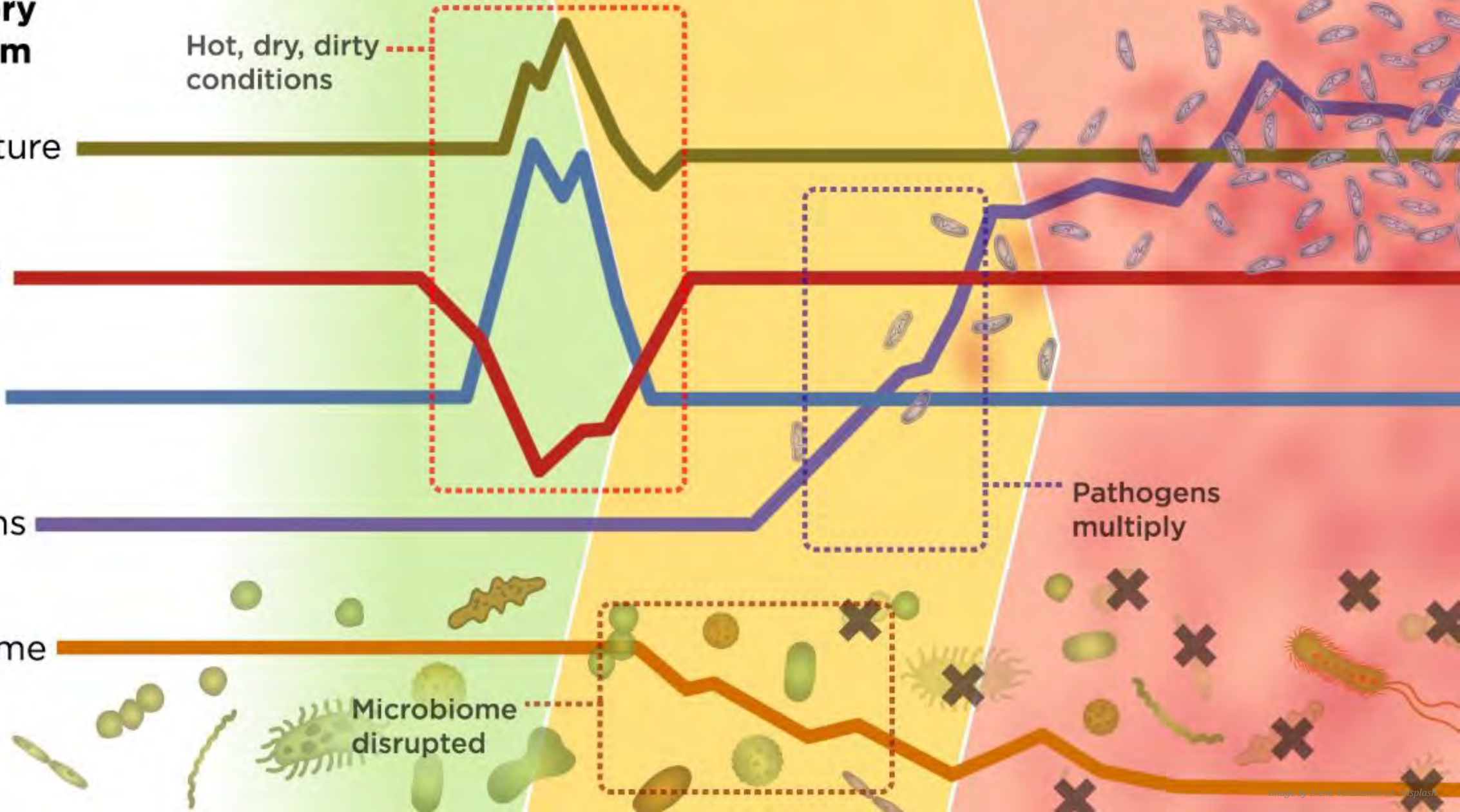
Pathogens

Microbiome

Hot, dry, dirty conditions

Pathogens multiply

Microbiome disrupted

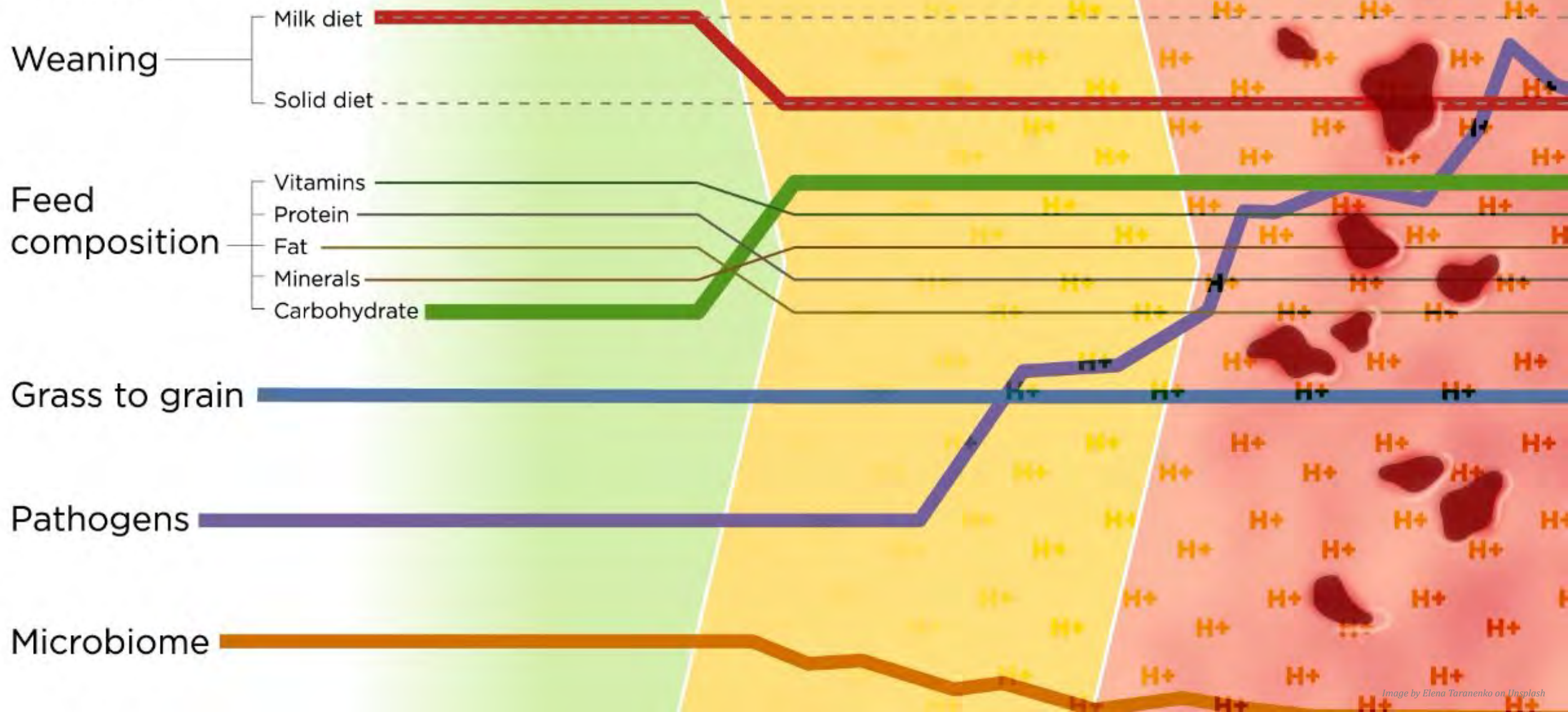


Environmental conditions at digestive epithelium

Homeostatic healthy state

Pre-disease state

Disease exacerbation state



Environmental conditions at reproductive epithelium

Homeostatic healthy state

Pre-disease state

Disease exacerbation state

Estrus

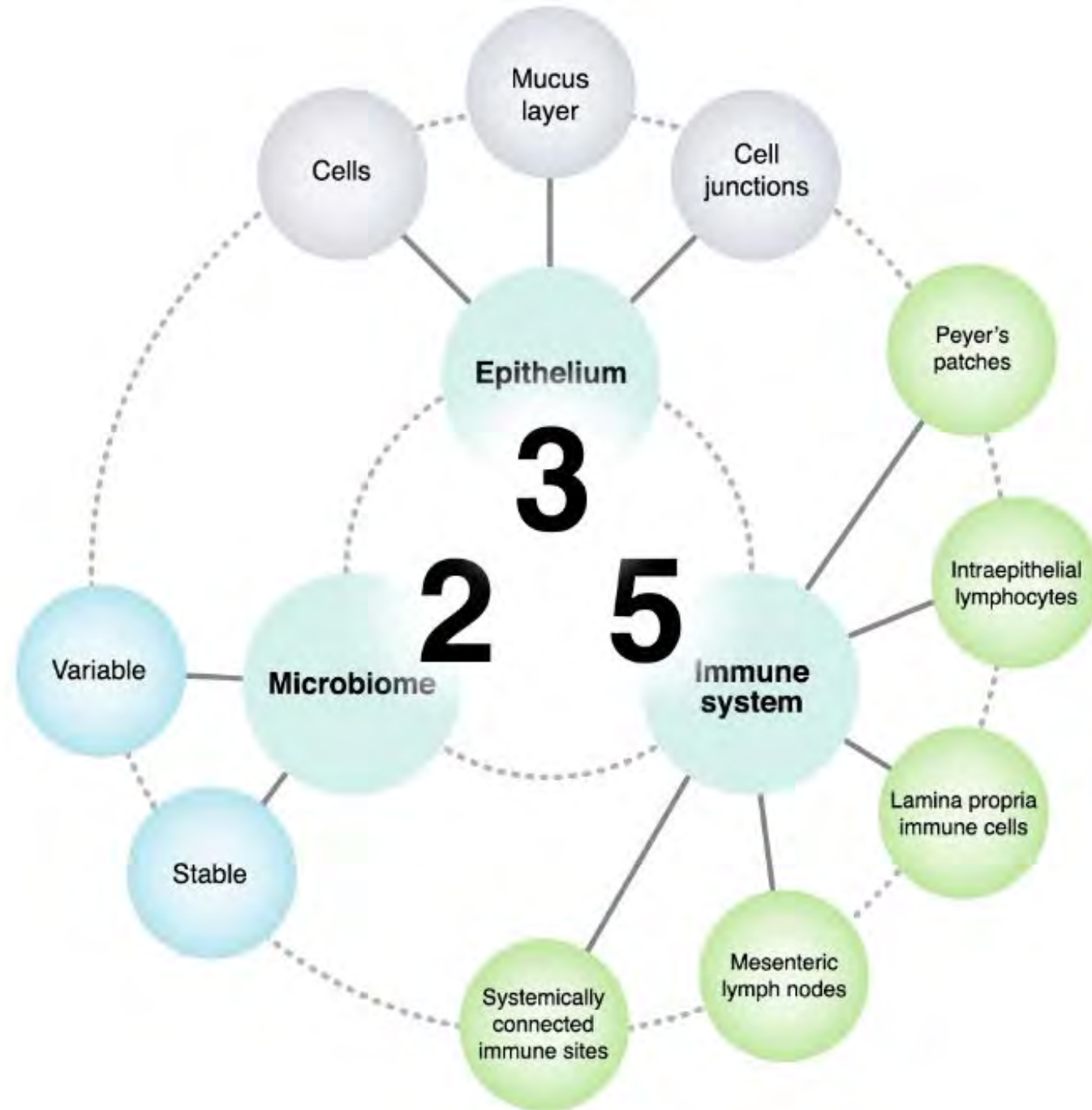
Semen

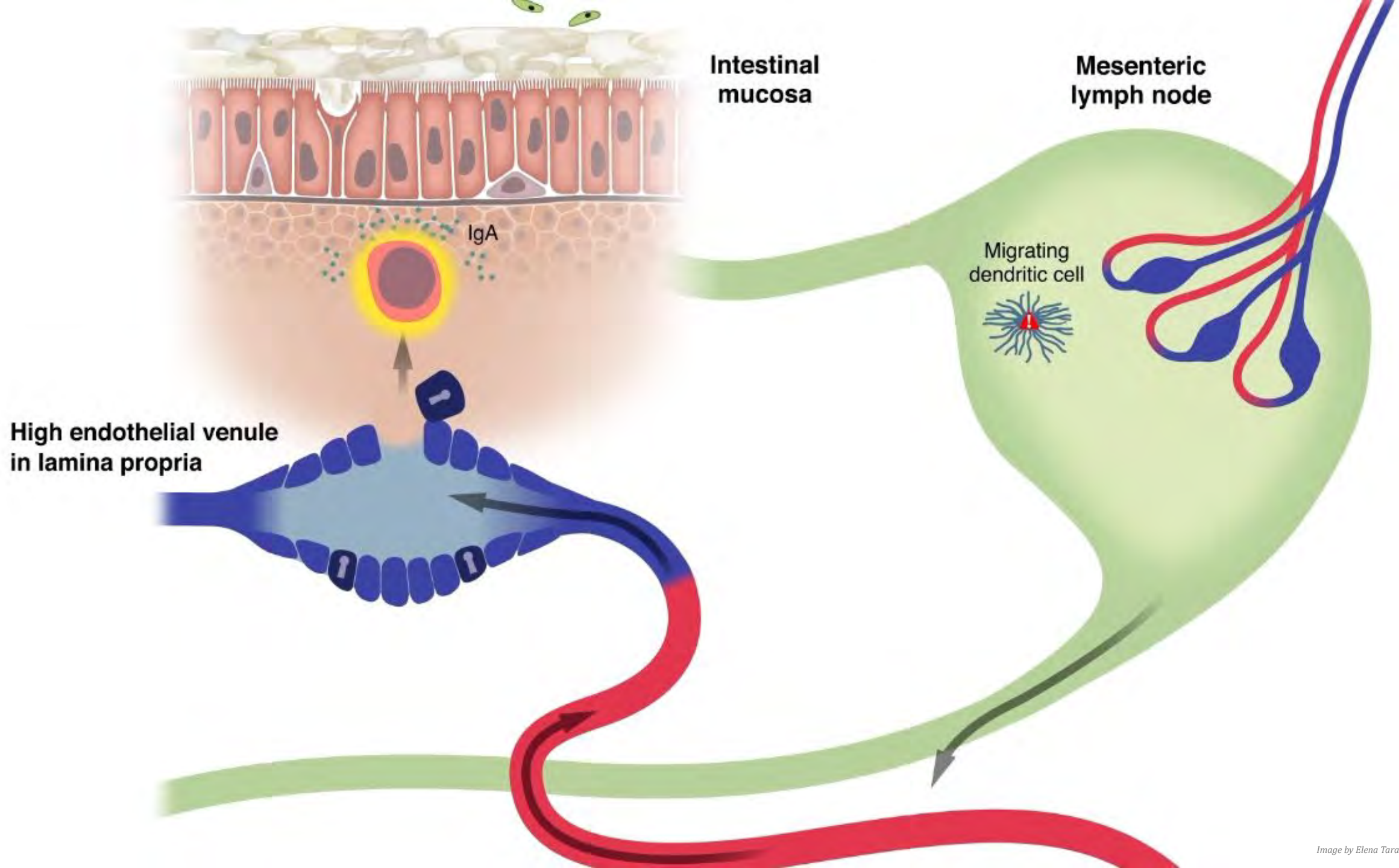
Pregnancy

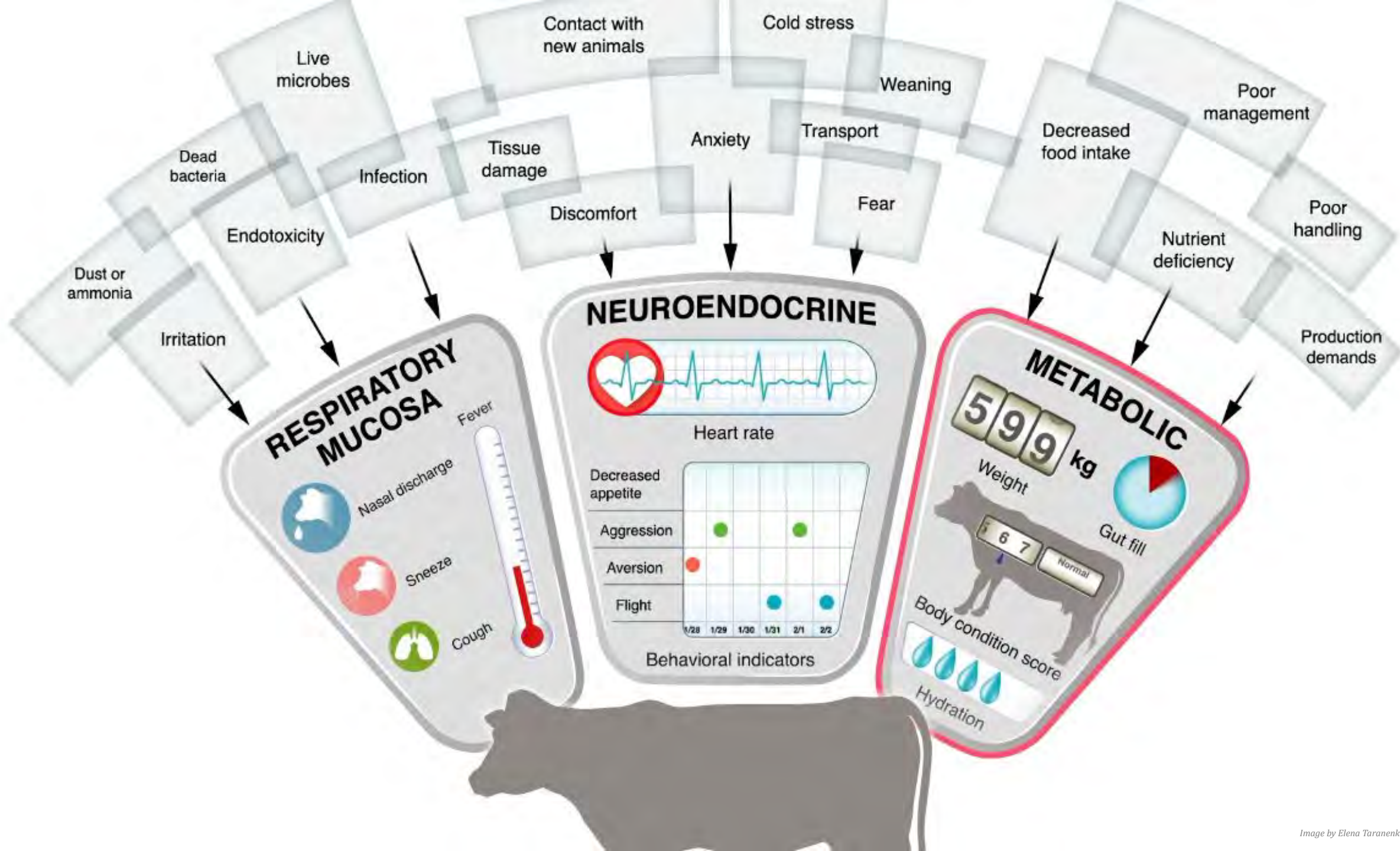
Pathogens

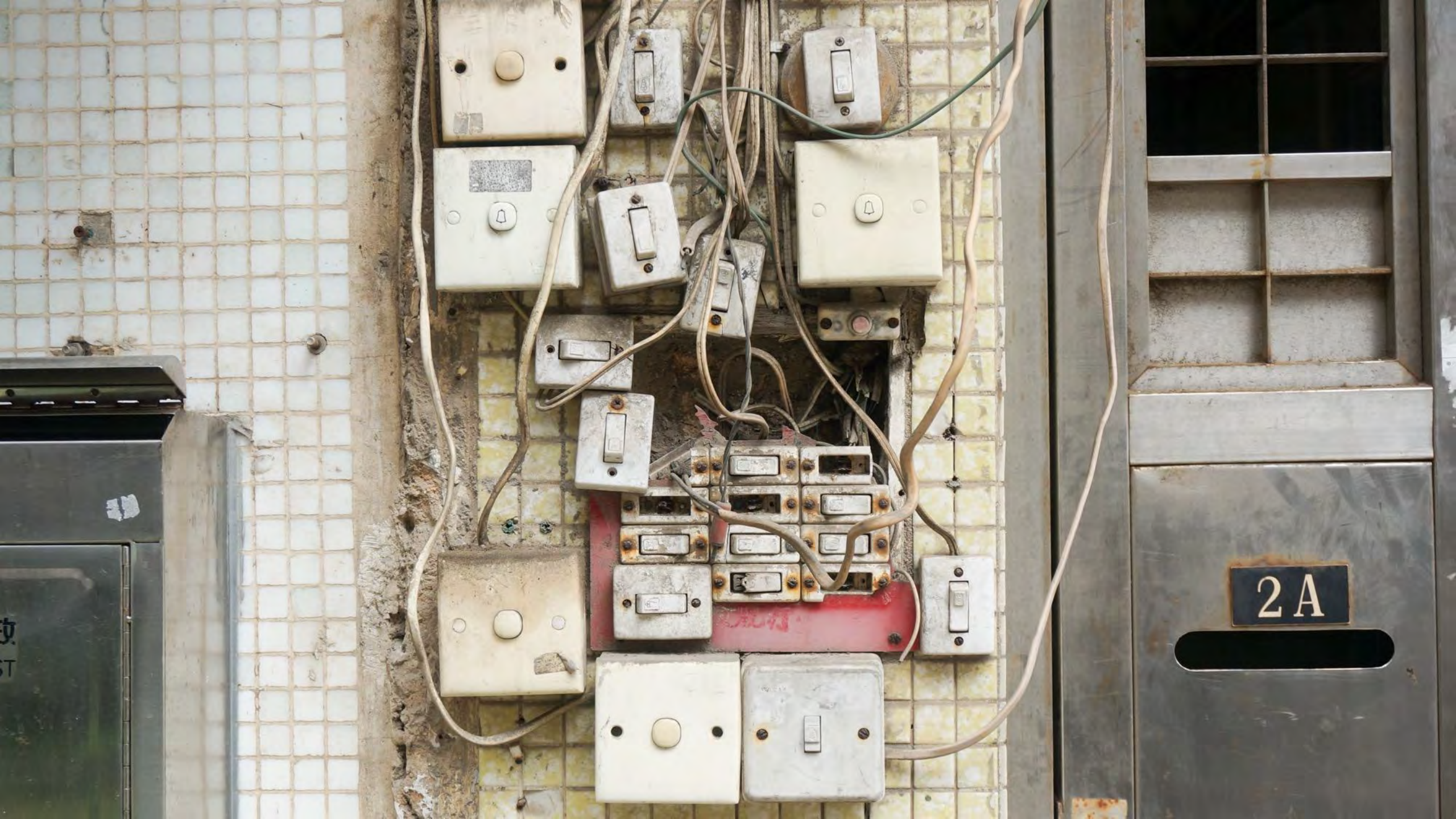
Microbiome









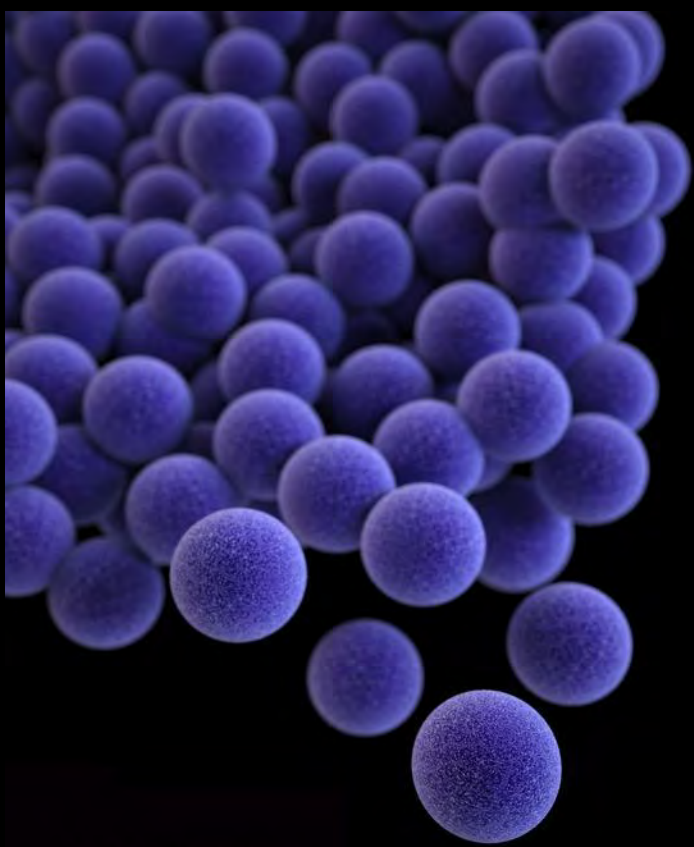


2A

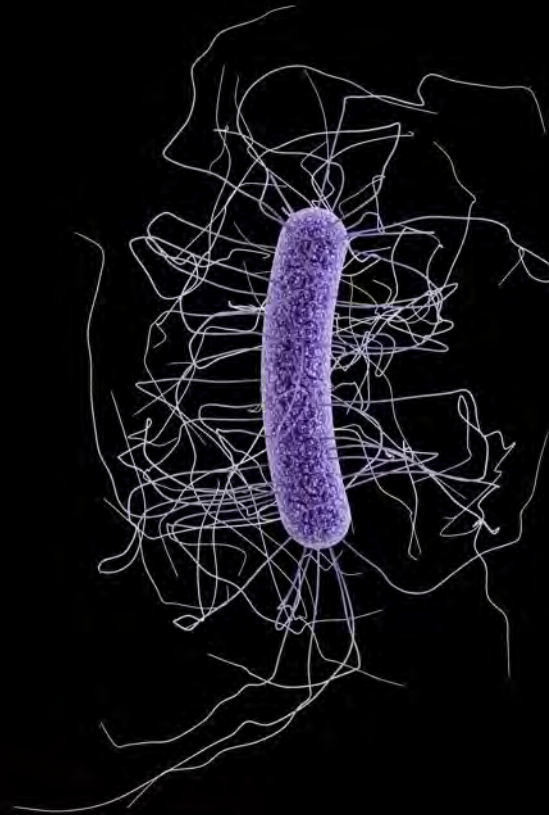
ST



Immune responses are tightly regulated



Centers for Disease Control and Prevention



Centers for Disease Control and Prevention

Centers for Disease Control and Prevention



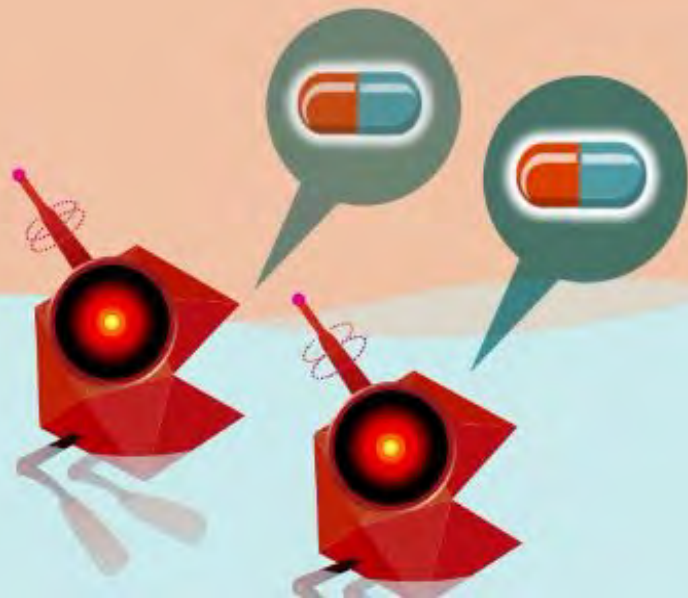
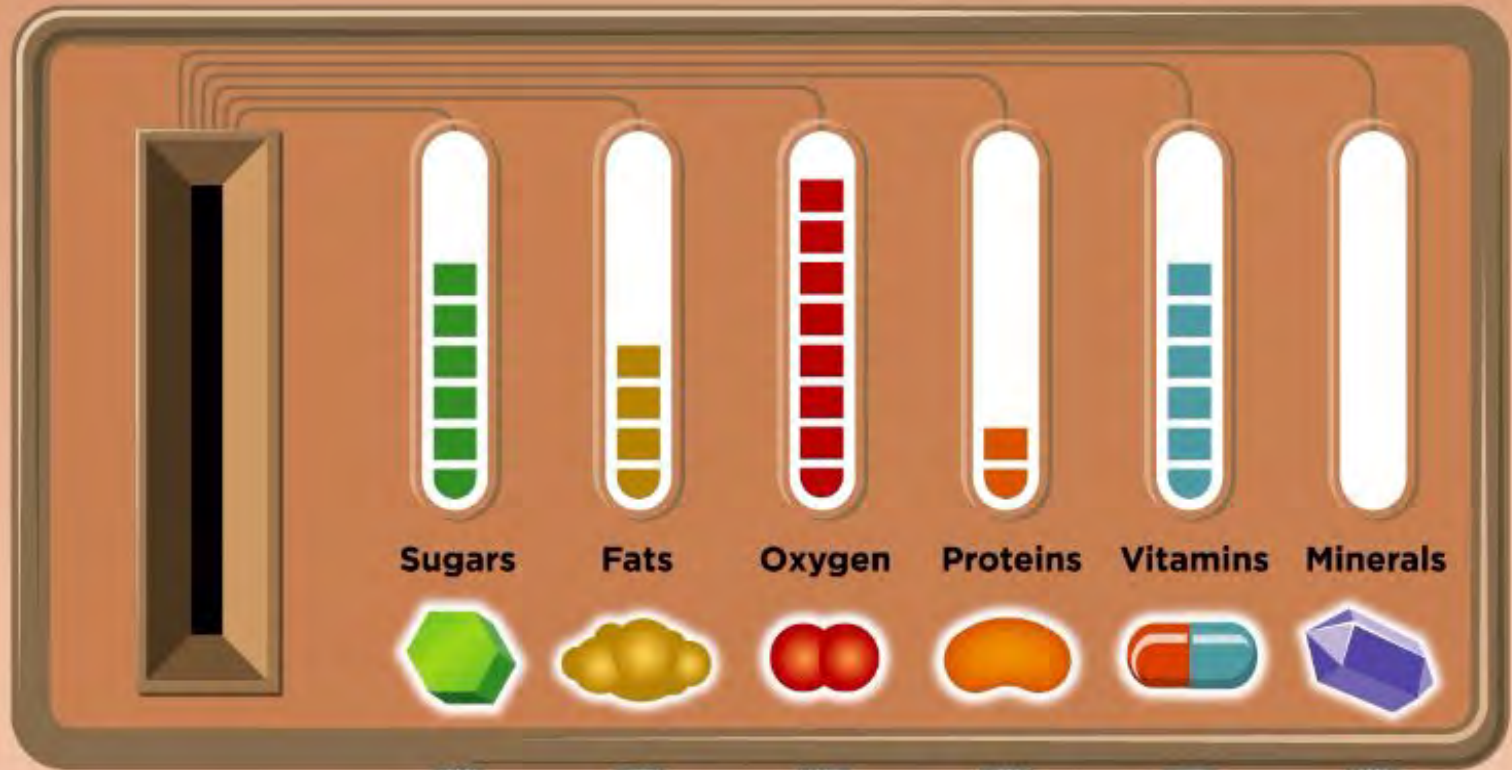
Pro-Inflammatory

A night-time photograph of a city skyline with numerous lit-up buildings. Two large, bright orange and red fireworks are exploding in the dark sky above the city. The word "Stress" is written in white text in the upper right corner.

Stress


Metabolism is a
guiding force in
immunity









A photograph of a fast-food meal on a red tray. The meal includes a burger wrapped in white paper, a portion of golden-brown french fries, and a clear plastic cup with a brown beverage and a white straw. A white paper bag is partially visible in the foreground. Overlaid on the bag is the text "Dysmetabolism = pro-inflammatory".

**Dysmetabolism =
pro-inflammatory**

Immune
dysregulation is
a wellspring of
pathology





Outdoor conditions

	SUNRISE	NOW	SUNSET
Temperature	40°	48°	45°
Time	7:00 AM	11:00 AM	6:00 PM
Humidity	48%	49%	51%
Wind speed	0 mph	4 mph	12 mph
Chance of precipitation	0%	5%	20%

Zone 2 schedule

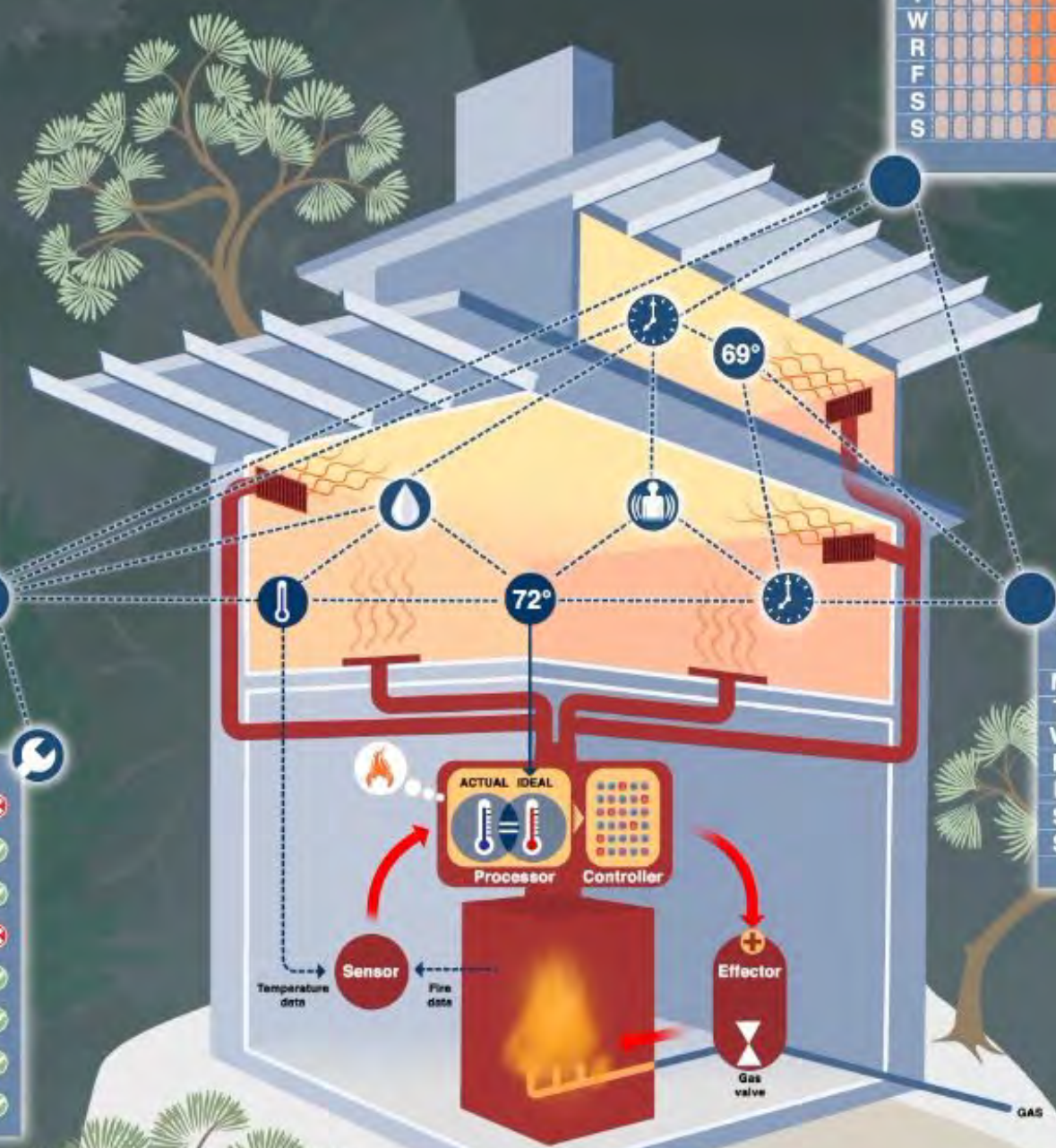
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M																								
T																								
W																								
R																								
F																								
S																								
S																								

Furnace maintenance data

Filter life	REPLACE ❌
Pilot	✅
Igniter	✅
Blower speed	LOW ❌
Condensate trap	✅
Venting leaks	✅
Fuel leaks	✅
Thermocouple	✅

Zone 1 schedule

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
M																								
T																								
W																								
R																								
F																								
S																								
S																								







Thank You

