

# 3. Temperature

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## Pre-class materials

**i** Read ahead

**Before class, you can prepare by reading the following materials:**

1. Withers chapter 5. Look over the homework, handout, and discussion questions and skim the chapter, reading anything that you need to know.
2. [Discussion Questions]
3. [Slide Deck] - for your reference as we go through the material

## Announcements/Reminders

- We are back in the lab this week. Read [Lab 3]. Watch the podcast on peripheral circulation. Read Do prelab quiz and the prelab, focusing on the hypotheses that you will design.
- We will finish Metabolism and begin Temperature.
- HW1 due Tuesday in class, hand-written (you may submit as a group - week 2 if you wish).
- HW2 due next Tuesday in class (individual).

## Week 3 Discussion Groups

| Group | Partner 1 | Partner 2 | Partner 3 |
|-------|-----------|-----------|-----------|
| 1     | Abby      | James     | Johsua    |
| 2     | Veronica  | Ilan      | Kylee     |
| 3     | Vivian    | Hao       | Mohamad   |

| Group | Partner 1 | Partner 2 | Partner 3 |
|-------|-----------|-----------|-----------|
| 4     | Adam      | Christian | Sean      |
| 5     | Ashton    | Tamako    |           |

### 💡 Thought for the day

Physiology is the story of evolution's struggle to maintain an appropriate SA/D ratio in relation to the volume of an animal – *Haldane*

## 3. Temperature

### Modes of Heat Transfer

- **Conduction**
- **Convection**
- **Evaporative**
- **Radiative**

Animals also generate heat through **Metabolism**.

<https://youtu.be/BHchDrboqEo>

Flux = C \*  $\nabla$  (Mass or Energy)

Q = C \* M  $\nabla$  T

Where: - Flux is the transfer of mass or energy -  $\nabla$  is the gradient symbol - Q is heat - C is a material property (resistance or insulation value) - T is temperature

### Heat Balance

Metabolic heat production is balanced by all mechanisms for heat exchange:

$$\Delta H_s = H_m \pm H_c \pm H_r \pm H_e$$

Where:

$\Delta H_s$  = heat of storage

$H_m$  = heat of metabolism

$H_c$  = heat of conduction and convection

$H_r$  = heat of radiation

$H_e$  = heat of evaporation

If an animal is in heat balance,  $T_b$  (body temperature) is stable.

If  $\Delta H_s$  is positive, (Gains > Losses), then  $T_b$  increases.

If  $\Delta H_s$  is negative, (Gains < Losses), then  $T_b$  decreases.

## Body Temperature

### Q10

[https://youtu.be/T5O9UvSZ\\_-g](https://youtu.be/T5O9UvSZ_-g)

## Iterative Method

<https://youtu.be/pEzcZCTYPyE>

## For Next Time

1. [HW2] due on Tuesday in class. (Individual)
2. Finish temperature, begin [Cardiac Function]
3. Start working on design 1 calculations with your partner. See me for help [Office hours]
4. Next Lab: [Human ECG]
5. Please fill out the TEAMMATES for both discussion week 3 and Lab 2 group lab by MONDAY. (check your email)