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21.0.B Discussion Animal Adaptations

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RECORDER REPORT, Chem 444A “Fire & Ice”

Group Member Name | Role | Date: April 9th
-------------------|------|------------------
Kyle               | Reflector |                
Jim                | Manager |                
Samantha           | Recorder |                
Sean               | Speaker |                

**Pro cess q uestion**

It is important for organisms to maintain a certain range of internal temperature and to exchange heat with their environment to maintain homeostasis. They have to either increase or decrease their core temperature through conduction, convection, or radiation. The ability for an animal to regulate its temperature is vital for that animal’s function. Ectotherms absorb heat from their environment, while endotherms eat from within, and heterotherms have the ability to shift their core temperature needs.

**Ch allenge q uestion**

The ability of the fiddler crab to control its color is an extremely key function to the transport of heat. When the external temperature is higher, the crab changes its color to be lighter to absorb less light. When the external temperature is colder, the crab turns to be a darker color to absorb more light from radiation. This adaptability of the crab allows it to be able to survive in a large range of temperatures.
Group Member Name | Role
--- | ---
Emma Addison | Recorder
Emily Koeber | Reflecter
Heather Price | Spokesperson
Cale Frost | Manager
Date: 4-9-15

Heather: Need a balance in order for body to work.
Emily: Heat cause destruction of enzymes and tissues.
Cale: Animals have to receive heat in different process or give it out in different ways in order to stay cool.
Emma: Animals have different adaptations due to where they live. WARMER: more terrestrial, larger, less fur. COLDER: more compact, more fur, dense.

General: Animals can alter how their blood flows through the body in order to release or keep heat. Due to changes in temperatures animals change their behavior and actions in order to keep a regular temperature (i.e.: spid on tree, burrowing in ground)

Challenge Question: The petrel's feet may be a way to release heat if the core temperature is raised to an uncomfortable high temperature. When the petrel is in cold, what the blood flow is decreased therefore less able to escape the body. The feet aid in heat control by conduction.

Blanket Statement: The role of the feet in maintaining body temperature is to release or contain heat based on the blood flow it receives.

Examples of how organisms handle heat:

- Sweat + panting → evaporative cooling
- Changes in covering (fur) or gaining weight (insulation)
- Ability to retain water, reducing or "expanding" surface area
Challenge:

Researchers have found differences in the freezing rates of the blood of the fishes. It is seen that higher concentrations of proteins in the plasma of the blood is correlated with a lower freezing point. If the blood is able to be kept from freezing, the convection found in the flow of the blood as well as the conduction that occurs when blood molecules collide with tissues keeps the surrounding tissue from freezing.

On a chemical level, as liquid molecules slow and begin to come together and freeze, if other solid things are in the way, like proteins, it would be more difficult for the blood to form a structured solid.

If ice starts to form, consequences are deadly to the fish:

- cells can burst upon freezing
- blood may cease flowing
- enzymes and metabolic processes can't function

How do other animals deal with heat:

- migration - just move away from the cold
- adaptations - thicker fur/blubber

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RECORER REPORT, Chem 444A “Fire & Ice”

Group Member Name | Role | Date: 4/9/15
---|---|---
Marisa | Spokesperson |
Nick | Manager |
Eliza | Recorder |
Kaleigh | Reflector |

Discussion on Readings:
- even the smallest change can have a big effect on an organism's life
- heat is good in moderation
- dependent on environment for different species
- consequences vary: some animals can handle a range of temps (humans), but others (like snakes) are very sensitive to temp change

Challenge Question:
Yes, by living in that close of a proximity there is a transfer of heat and the inner area is protected by the elements of the environment (like penguins). If the heat does escape, it transfers to another body instead of escaping into the air. On the graph, it shows that the inner area maintains a higher temperature.

Because of conduction, heat is transferred directly from body to body. The outer edge is not that much colder than the inner circle because of convection. Radiation also plays a part in gaining heat from solar energy. Because the snails are huddled together, the transfer of heat, primarily through convection, is somewhat contained within the air pockets between each individual snail.
Notes from pre-class assignment:

- Squirrels: both coincide and work off each other.
- Two internal factors: range of the body temps in which it can function effectively and the rate at which it can produce body heat.
- Radiation, convection + conduction are all possible ways to alter body temp.
- Metabolic burning of fuel + insulation.
- Fur to insulate body but specific areas to release heat.
- Endothermic = heat from outside; Exothermic = heat from inside.
- 32.164 degrees Fahrenheit are when enzymes within a living organism can function.
- Evaporative -> sweating.

Challenge:

For the Fennec Fox his vessels are dilated and therefore giving off heat. The surface area is also greater because his ears are bigger. For the Arctic Fox, his vessels are constricting and therefore trying to keep in the heat, and are also a smaller surface area. The ears of the Fennec and Arctic Fox are different because they have been able to adapt to their environment in order to survive. The heat is being transferred from vessels to skin by conduction and then back up to air also by conduction. The ears...
also use their surface area to radiate heat away from the body.

Examples:
- sweat
- panting
- shade (looking for cooler area)
- searching for warmth
- heat lamps
- fires
- shivering
- cooler bodies of water
- rubbing saliva on face
How Polar Fishes Avoid Freezing

Keeping the blood flowing keeps the fish warm.

Convection
flow of blood
- the flow carries heat throughout the fish

How do they keep the blood from freezing?
- added protein in the blood pushes down the freezing point, like adding salt does to water

Shallow water fishes

Deep water fishes

Temperature of initial ice propagation (°C)

Protein concentration (g/L)

-20 to -10

80

60

40

20

Taylor
Mandy
Jake
Ear Size vs. Heat Loss

**Fennec Fox**

- Greater surface area to give off heat
- Blood vessels dilate over the large surface area to give off more heat through conduction.
  - Greater surface area to give off heat through radiation

**Arctic Fox**

- Smaller surface area to retain more heat.
- Less surface area and less vasodilation allows for greater heat retention to maintain body temp in the cold.
  (less heat loss through conduction from vessels, to skin, to air)
Snail Aggregation and Heat Transfer

- Radiation to the air
- Heat transfer among the snails by convection
- Aggregation provides protection from the elements
- The air pockets between the snails are heated quickly
- Most of the heat loss occurs at the outer edge

Nick
Eliza
Kaleigh
Marisa

Christopher F. Bauer, Principal Investigator.
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How the Petrel Maintains Body Temp

Heat released by conduction

The countercurrent system

The role of the foot in maintaining body temp is to release or contain heat based on the blood flow it receives.