



Activity – Heat generation by brown adipose tissue

Brown adipose tissue is an organ specialized for **thermogenesis**, or making heat. Brown adipose tissue plays a role in the overall regulation of body temperature, which is coordinated by the brain and involves many other organs and tissues.

Regulating body temperature

Check out: <https://www.youtube.com/watch?v=HfXqyPS5bRo>

1. What part of the body receives information about feeling hot or cold, and controls the body's response?
2. How can blood flow regulation control body temperature?
3. How does skeletal muscle contraction alter body temperature?

When skeletal muscles are used to make heat, this is called **shivering thermogenesis**, because heat production is associated with skeletal muscle contraction. When brown adipose tissue is used to make heat (not part of that video!), this is called **non shivering thermogenesis**, because heat is produced without skeletal muscle contraction.

How brown adipose tissue makes heat

To understand how brown adipose tissue makes heat, we need to first understand how **mitochondria** make adenosine triphosphate (**ATP**).

Find out how ATP is made from food: http://cte.sfasu.edu/wp-content/uploads/2012/01/2_Principles_of_Digestion_and_Metabolism.html

4. What is the role of hydrogen ions in the mitochondria in ATP production?

See how **mitochondrial uncouplers** change how mitochondria work in brown adipose tissue here: <https://www.youtube.com/watch?v=x0NHKI7AR00>

5. How does **uncoupling protein 1** (UCP1) make mitochondria into heat-producing rather than ATP-producing organelles?

An important point here is that brown adipose tissue thermogenesis uses up lots of energy, as the mitochondria in brown adipose tissue use food energy to generate heat with the help of UCP1.