Homeostasis and Stimulus and Response

A state of balance in the body

Whoa
Definition of Homeostasis

- Homeostasis is the term we use to describe the constant state of the internal environment.
- Homeostasis is a state of balance within the body.
Body As A Thermostat

- First response to a hot or cold condition is voluntary.
- Too Hot – Shed Clothes...
- Too Cold – Add Clothes...
- When these actions aren’t enough, the body’s endocrine and nervous system work closely together to regulate body temperature.
Body As A Thermostat

- When the body is too hot, the heat loss center in the brain is stimulated causing heat loss.

- When the body is too cold, the heat conservation center in the brain is stimulated causing the body to conserve heat.
### Body As A Thermostat

<table>
<thead>
<tr>
<th>Effector</th>
<th>Response: Low Temperature</th>
<th>Response: High Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Vessels in Skin</td>
<td>Muscles contract – Less heat carried from core to surface of body.</td>
<td>Muscles relax – More heat carried from core to surface. (Sweat)</td>
</tr>
<tr>
<td>Sweat Glands</td>
<td>No Sweat Produced</td>
<td>Glands secrete sweat onto surface of skin, where it evaporates.</td>
</tr>
<tr>
<td>Muscles in Skin</td>
<td>Muscles contract, raising skin hair – trapping heat.</td>
<td>Muscles relax, lowering skin hairs.</td>
</tr>
<tr>
<td>Skeletal Muscles</td>
<td>Shivering</td>
<td>No Shivering</td>
</tr>
</tbody>
</table>
Maintaining Homeostasis

**STIMULUS:** Increased body temperature (e.g., when exercising or in hot surroundings)

**Begin here**

**HOMEOSTASIS:** Body temperature

**High**

- Skin blood vessels dilate: Capillaries fill with warm blood; heat radiates from skin surface
- Sweat glands activated, increasing evaporative cooling
- Body temperature decreases: Thermostat shuts off cooling mechanisms
- Thermostat in hypothalamus activates warming mechanisms
- Skeletal muscles activated; shivering generates more heat
- Skin blood vessels constrict, diverting blood from skin to deeper tissues and reducing heat loss from skin surface
- Body temperature increases: Thermostat shuts off warming mechanisms

**Low**

- Thermostat in hypothalamus activates warming mechanisms
- STIMULUS: Decreased body temperature (e.g., due to cold surroundings)

- or Begin here
Stimulus/Response

- **Stimulus** – Something that can elicit or evoke a response in a cell, a tissue, or an organism. A stimulus can be internal or external.

- **Response** – A reaction to a specific stimulus.
A Fever...

- Chemicals released by white blood cells raise the body temperature by 2-3 degrees causing the temperature to elevate. This helps to kill bacteria and inhibit viruses.

- Internal Stimuli – Bacterial Infection

- Response - Fever
“Fight or Flight Response”

- A person has just been confronted with a grizzly bear on a narrow mountain trail.
- External Stimuli – Grizzly Bear
- Response – Fight or Flight Response
  - Heart rate increases, blood flow is shunted to the major muscle groups, digestive activity slows, blood pressure rises.
Stimuli/Response

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Internal/External</th>
<th>Response</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingest Poison</td>
<td>Internal</td>
<td>Vomit</td>
<td>Digestive</td>
</tr>
<tr>
<td>Strenuous Exercise</td>
<td>Internal</td>
<td>Breathing Increases</td>
<td>Excretory</td>
</tr>
<tr>
<td>Excessive CO2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Touching Hot Stove</td>
<td>External</td>
<td>Move Hand</td>
<td>Nervous</td>
</tr>
<tr>
<td>Football Thrown to Wide Receiver</td>
<td>External</td>
<td>Raise Hands to Catch Ball</td>
<td>Nervous/Muscular</td>
</tr>
</tbody>
</table>