

Coast to coast essay sample



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There are two ways in which the body achieves an internal stable environment, negative and positive feedback. However the body uses negative feedback on a daily bases while the positive feedback is for more drastic events such as readying the body for labour by¹ the body producing the hormone oxytocin. The diagram on the left shows how the negative feedback systems work for the starting stimulus until the ending response. ²If the stable state (Set point) is altered, a receptor recognises the change and sends information to the modulator which sends the information to the effector(s) which produce the response(s) until the set point is reached again; this then stops the feedback loop which allows for stabilising within the body. E. g. the weather outside is cool, the body receptor is the skin, which tells the brains its cool, the brain tells the Erector muscles underneath the skins hair and the response is that Erector muscles makes the hair stand up for insulation against the cold.

Thermoregulation is the process that allows the human body to maintain its core internal temperature. All thermoregulation mechanisms are designed to return the body to homeostasis. ⁴The hypothalamus is in the brain and is directly responsible for the core temperature and nerve impulses for the receptors in the skin. This allows the brain to get quick and direct information from the skin as the skin is the exposed tissue that will be able to feel the change in temperature due to wind or being placed in water or even the sun radiating down on to its surface.

The first stage of the Coast to Coast is unlikely to be the stage where the athletes will become at risk of ineffective thermoregulation. In the Coast to Coast example in the student resource it states that “ Stage one –

Temperature of 14°C, Wind Speed of 5km/h and No rain”. These conditions seem to be perfect for the activities of a 53km run followed by a 55km cycle on sealed roads, gaining 500m elevation over the distance, reaching the Aickens transition. At this stage in the event it would be expected that the athletes are performing the daily thermoregulation as they have fine weather conditions and are not over exerting energy to make themselves too hot and tired. Even though the human body can internally monitor the process of Homeostasis it can be pushed to the limit when the people place themselves in environments which aren't normal conditions, or expose themselves to unusual environments for long periods of time without the correct equipment.

An example of this would be the Coast to Coast, where people compete on different terrains over a short period of time with no rest and are continuously changing their temperatures rapidly. E. g. Stage two of the Coast to Coast when they are performing the 33km mountain run carrying a day pack, running along mountain tracks, through rivers, up riverbeds with some off-track running, cross Goat Pass at 1100m, and down into the Mingha riverbed, across Bealey River then running to the Klondyke Corner all in the expected time of between 3 to 8 hours. People are changing their temperature from hot while running up mountains to rapid cooling when crossing rivers which may have different water levels, meaning that the both legs are getting wet or just the ankles. This would change the amount of heat lost by each individual affecting the thermoregulation of each person, then they are running again. The body's response to heat loss is:

Thyroxine increases metabolic rate

Erector muscles of hairs contract

Muscle Activity

Vasoconstriction

The thyroxine is a gland that controls the metabolic rate in the body. The metabolic rate is the metabolism in the body. In simple terms how fast the body can digest food to create energy and use the sugars and starch effectively. The Erector muscles are under the skin and hairs; they create Goosebumps on the skin and the raising of the hair around the body creates an insulation layer for the body against the air. The muscle activity such as shivering is to produce internal heat; it is a natural defence against the cold. Vasoconstriction is the blood vessels moving away from the skin and moving the blood closer to the core so that the vital organs are kept warm. The body's response to gaining heat is:

Sweating Increase

Muscle tone and metabolic rate decrease

Vasodilation

Erector muscles of hair relax

Sweating increases so that the body can cool down by evaporation. The muscle activity and metabolic rate decrease so that the body begins to reduce its heat output, the muscle activity creates an internal heat and the metabolic rate is increasing energy which isn't not needed in the cooling down phases. Vasodilation is the blood vessels opening up so that more blood is able to move to the skins surface to the environmental elements is a fast way to cool down the blood moving around the body, erector muscles of

the hair relax because flattening of the hairs decreases the insulation. The examples of the body cooling down and heating up above are daily changes that come about due to going outside for a walk or after you have been on a run.

The daily thermoregulation is unlikely to be the type that those competing in the Coast to Coast will be performing, theirs will be more on the extreme side such as preventing the first two out of the three stages of hypothermia. Hypothermia isn't the daily route of thermoregulation but would be a side effect of these athletes competing in their conditions. The second stage is hypothermia first one or two stages would set in as the conditions have rapidly decreased “ Stage Two – Temperature drops to 3°C at Goats Pass, wind speeds 30km/h, hail and rain”. Activities to complete “ 33km mountain run with day pack, along mountain tracks, through rivers, up riverbeds with some off-track running, cross the Goats Pass at 1100m (above sea level) and down into Mingha riverbed, across Beagley River and run to Klondyke Coner”.

This stage would be dangerous for the athlete's thermoregulation as they have gone from warm temperatures into very cold. The decreasing temperatures would then decrease more as the athletes had to run into water, even though the body would be warm from the mountain running going in water can increase the chances of hypothermia much faster than being in an environment with cold winds. As the athletes continued on their river running they would be getting colder if they hadn't changed their clothes or attempted to dry themselves as the wind speed would be making

their core body temperature drop lower than just the cold water temperature alone.

The river crossing could be waist high, or it could be ankle high, but both of these situations would decrease the temperature, as the elements are at 3°C the water would be lower in temperature than that making it a large risk to place an already cold body into a colder environmental element. 8Exposure to cold water (even slightly cold) will produce symptoms of hypothermia far more quickly than exposure to the same temperature of the air. This statement shows that when the athletes went into the river run they were exposing themselves to a higher risk than just competing in cold temperature. However different body types can survive in the elements longer than other but, any athlete that was in the water for over an hour would have been experiencing moderate hypothermia. 9Moderate Hypothermia is when muscle co-ordination becomes difficult.

Movements are slow or laboured. Blood vessels in ears, nose, fingers and toes constrict further resulting in these turning a blue colour. Mental confusion sets in. Not all of these symptoms may have occurred, and not all athletes would have had to have been in the water for a long time for them to have these symptoms occur. An athlete who was in the water for 10 minutes, got wet but kept running instead of getting dry would have a high chance of hypothermia as they would be cold from the water. They would have the wind chill factor from the 30km/h wind gusts and also the constant hail and rain that would be slowing them down also making it hard for them and hard for them to get grip on the off-track paths which may become

muddy. All of these elements would prolong their exposure to the elements and decreasing their thermoregulation.

The athletes don't get hypothermia as they are continuing to create energy within their bodies, athletes have a continuous movement throughout the race, even when the athletic are running they are An advantage of human beings being organisms that perform thermoregulation is that we don't have to compete for an external environments in which we can get heat sources from. Organisms that are Ectothermic (normally cold blooded animals) have to maintain their body temperatures through environmental stimulus, such as a lizard sitting on a sunny rock or a fish constantly swimming in the same area, because the water temperature is reality constant for their niche. If there were homeostasis animals and ectothermic animals competing for the same areas it would be much harder to survive.

Another advantage of the human being a homeostasis organism is that when the body is being affected by the elements or another environmental stimulus, the body takes control naturally to prevent death or danger.

However when the body isn't able to use the negative feedback system to fix the problem, the negative feedback has already shown externally that there needs to be a change in the internal pressures, e. g. when the skin gets Goosebumps it signals externally that the body is cold and then the person can take themselves out of the cold environment or place on another layer of clothing. These are behavioural adaptations to the homeostasis organism.

Endothermic animals are warm blooded animals, 10 endothermy enables animals to be active in wide range of environmental temperature, so that it

can remain active at night and, provide there is adequate food, in all seasons.

Despite this there is a heavy cost. Endothermy uses a lot of energy, requiring the rapid intake and distribution of food and oxygen round the body.

Indirectly, a high metabolic heat production in mammals also costs water if the diet is rich in protein, such the high urea production requires more water to excrete. Keeping cool has a negative impact as there is a loss in water from the body in the form of sweating and this is also a loss of salts as well.

11 Birds and mammals all lose heat by evaporation from the lining of the lungs. Most land mammals also keep cool by the evaporation of sweat. Birds and some mammals such as dogs keep cool by panting, losing the latent heat in the evaporation of water from the breathing passages.

Exothermic animals are those that gain their heat energy not internally but externally by placing themselves in environments in which heat energy is easily available, such as a snake in the desert has access to the sun's energy through the straight sun exposure and also the sand itself as it can contain the sun's energy, however if the snake needs to cool down it can bury itself deep into the sand to escape the hot sun. The snake and other exothermic animals are often cold blooded animals which is opposite of an endothermic animal. When the human body isn't able to produce effective thermoregulation it isn't just hypothermia that can happen (when the body gets too cold and starts to shut down) the body can also go into hyperthermia where the body gets too hot. Hyperthermia is often a result of a hot environment, exercise, dehydration and some drugs, three of these four causes could happen during the Coast to Coast and if they were to

happen, it would be during the fourth stage of the event. 12Stage four – temperatures rising to 35°C, wind speed gusts of 60km/h, no rain and clear skies.

Activities – Cycle 70km from Waimakariri Gorge to Sumner beach on road (road falls 250m over this section) These conditions could create hyperthermia as the fourth stage is the final stage in the race and the athlete will be tired. If they haven't drunk the recommended amount of water for each stage they will be dehydrated. They have been exercising in different conditions over a 11 to 17 hour period with only stopping for short periods of time, or not at all. They are now being exposed to hot conditions while still exercising. All of these aspects could create the body doing into a hyperthermic condition. There are three phases of hyperthermia but is likely that the athletes will only react phase two 1. Overexertion: Normally seen as a flushed red face and rapid short breaths. Best course of treatment is water and shade.

2. Heat exhaustion: A more serious illness, looks like lots of sweating, dryness in the mouth, cramps and redness over body as blood is going to the surface to cool down. Best course of treatment is ice packs and cool drinks.

13Homeostasis requires co-ordination of the hormonal (endocrine) and nervous system, which together regulate the activity of the body's organ system. Enzymes are an organism within the body that works as a catalyst they work best at the normal body temperature when Enzymes get too cold or too hot then they become ineffective and denature. At low temperatures the enzymes will slow down and if it gets cold enough they will stop working all together enzymes and what makes the body work. What are the enzymes

role in the body, what is the blood's role in the body? What will happen when these processes stop and how that will affect the human body's behaviour? How does the body avoid this? What happens if it can't?

In conclusion, the Coast to Coast places extreme pressures on the body and is only an activity that people with correct training and ideal fitness should complete. If someone who wasn't in the best fitness completed this event, then they are placing their thermoregulation system under extreme stress and will only result in themselves being hurt, both physically on the course and internally being hurt as the body fights to stay in its normal thermoregulation way. The body is a delicate structure and people who complete the Coast to Coast have trained in all types of conditions to ready their bodies for the challenge. I wouldn't recommend the Coast to Coast to beginners and only under the correct training and understanding of what may happen to your body would I suggest to physical athletes that they were capable to complete the course safely.