Science Coursework

Plan.

In this experiment I will be investigating and comparing the temperature of a single animal, and an animal huddled into a pack. I will be recording the temperature of the animal in the middle. These animals will be symbolised as test tubes. Animals need to stay warm because enzymes work best at 37 degrees Celsius. If the enzymes do not work, the animal will die of hypothermia.

Safety

Be careful with hot water and test tubes.

Preliminary Work

Time in seconds	1 Test tube surrounded by 0	1 Test tube surrounded by 2	1 Test tube surrounded by 4	1 Test tube surrounded by 6	1 Test tube surrounded by 8	1 Test tube surrounded by 10
Starting temp	60	60	60	60	60	60
60secs	55	56	57	58	59	60
120secs	50	52	54	56	58	59
180secs	45	48	51	54	57	58
240secs	40	46	48	52	56	57
300secs	35	42	45	50	55	56

Prediction

When I change the amount of animals I think the temperature of the centre animal is going to rise. My scientific knowledge tells me that this is due to convection, conduction and radiation in which the outer animals give of. Heat radiation is electromagnetic radiation emitted from an object on account of its temp. So if the animal is too hot it will give heat off allowing other animals to warm up. This heat is given off by respiration when cells respire. Convection is caused by the expansion of the medium as its temp rises above colder and denser material. This convection current is then spread round the huddle. Conduction is the transfer of heat through a substance without bulk movement, e.g. a huddle of animals!

Apparatus

11 test tubes.
Thermometer
Measuring cylinder
Beaker for test tubes to sit in
Elastic bands
Kettle
Stopwatch

In order for it to be a fair test I must . . .

Keep certain things the same. These are:-

Temperature of water
Amount of water
Size of test tubes (surface: Volume ratio)
Test tube in the middle.

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The factors that I could change

The factors that I could change could be, the amount of animals in the huddle as this will determine the temperature of the animals in the middle.

The size of the animals determines how many animals are needed to keep the animal(s) in the middle at 37 degrees Celsius that is the temperature that enzymes work best at.

Coating (fur etc). The amount of insulation depends on keeping it warm. This is why animals in cold countries e.g. polar bears have very thick insulation, this is to keep it warm. Sort of like a tea cosy on a teapot.

The outside temp is a factor, which very much makes a difference in this investigation; this factor when doing the experiment will have to be kept fair.

I will be changing . . .

The amount of animals. I have opted for this because it works best with my experiment and the apparatus that I will be using. In order to do this successfully I will start with one animal first as represented by a test tube. Then I will surround this one by 2, 4, 6, 8, 10 animals to make a realistic and varied experiment.

I will measure/observe & compare . . .

The temperature of the first number one animal in degrees C. this is my dependent. I will record all the results in a table and then plot them on a graph to compare and contrast.

My question is . . .

DOES AN ANIMAL IN A HUDDLE HAVE A HIGHER TEMPERATURE THAN AN ANIMAL STOOD ON ITS OWN?

Method

Boil the kettle with water in. Then wait until the temperature drops to 60 degrees C, (I have chosen this because it will give enough time to put the water into the test tubes) and pour it into the 1st test tube. Once the temperature is to 60 degrees C I will start the clock and measure and record the thermometer readings every minute until five minutes. Once this is done I will empty the test tube's water and put two test tubes around it fastening it with an elastic band. Once again I will put water in at 60 degrees C and start the clock. This method will be followed through to 4, 6, 8, 10 test tubes surrounding the one centre test tube.

Results

Time in seconds	1 Test tube surrounded by 0	1 Test tube surrounded by 2	1 Test tube surrounded by 4	1 Test tube surrounded by 6	1 Test tube surrounded by 8	1 Test tube surrounded by 10
Starting temp	60	60	60	60	60	60
60secs	55	55	59	59	59	60
120secs	51	51	58	58	58	59
180secs	48	48	56	57	57	58
240secs	45	46	55	56	56	57
300secs	42	45	53	55	56	57

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Analysis

The graph below shows the accuracy and inaccuracy of my results.

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I have discovered that the more test tubes which surround the centre test tube the less heat that is given off and so forth the animal stays warmer in the huddle.

Evaluation

The experiment went well but looking at my graph, some results seem to be out of place and could be improved upon too make them more accurate and useful.

Things that could have went wrong include, timing, amount of water poured in, temperature of water.

Next time I could improve the way timing was made and that the water went into the same test tubes at the same time.

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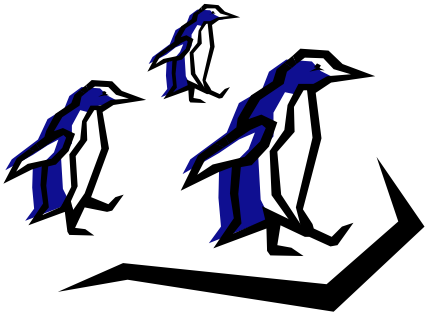

Investigation into how

huddling keeps

animals warm

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