

Penguins tend to
huddle together for
warmth



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I am going to carry out an experiment to proof why these animals do this and whether it is a method of preventing heat loss

Penguins are Cold-blooded animals this means they can

maintain their body temperature by behavioural means. An example is a cold-blooded creature going out to bask in the sun and taking shade when the creature is too hot. Therefore warm-blooded animals have certain advantages over cold-blooded animals:

• They can remain active all day.

• They can survive in harsh environment..

The advantage of warm-blooded animals is that all these internal processes that maintain the body temperature require a lot of energy. This energy is obtained from food. Warm-blooded animals eat up to ten times as much as cold-blooded animals because their demands are greater

Due to the reasons mentioned above, it is vital that warm-blooded animals reduce heat loss. This can be achieved by;

• Having the right size and shape

• Physical means -

• Insulation (hair trapping air & layers of fat)

• Vasodilatation / vasoconstriction

• Sweat production

½ Behavioural methods-

½ Hibernating

½ Increased movement

½ Burrowing
½ Seeking shade

The factor I am investigating is temperature. I am going to do this by using plastic bottles as penguins and isolating one of the bottles in the middle to measure its heat loss. I will place bottles of the same temperature and size around this bottle to see what affect this has on the isolated bottles heat loss. I will then continue to detract a bottle from the huddle every minute and continue to measure the temperature of the isolated bottle.

I predict that the more bottles that surround the isolated bottle the less heat loss.

Variables

Dependant-Volume of water (30ml)

Controlled-

Shape of liquid (using similar bottles with a similar shape and size)

Type of liquid (collecting the water form the same resource)

Time Interval (15 minutes)

Temperature at the start of experiment (500C)

Independent-Temperature of isolated bottle (amount of heat loss)

Aim: The aim of this experiment is to investigate how groups of animals conserve heat

Plan : Using 15 similar bottles containing water at 50 0C. I will huddle the bottles around the bottle in the middle which I am using in my investigation. I will measure the temperature of this bottle every minute using a stopwatch to time the experiment. After each minute has passed I will remove one bottle from the huddle, take the temperature of the isolated bottle and record the results (IN THE TABLE BELOW)

Time since start of experiment(mins)

No bottles in huddle

Temp of isolated bottle test 1 (0C)

Temperature of Isolated Bottle Test 2(0C)

Average Obtained

1

15

50

50

50

2

14

3

13

4

12

5

11

6

10

7

9

8

8

9

7

10

6

11

5

12

4

13

3

14

2

15

1

Apparatus

Thermometer (to measure temperatures)

Measuring Cylinder (to measure amount of water 30ml)

Plastic bottle (to use to represent the penguins)

Stop watch (to time experiment 15minutes)

Kettle (to heat water)

Other apparatus: kettle, stop clock, measuring cylinder.

Method:

Collect all equipment and boil the kettle.

Using a measuring cylinder dispense 35ml of water into each bottle

Assemble huddle and pour water in all of the tubes

Measure the temperature of each bottle

When ready, start the clock and pour water into the centre of the huddle and into the isolated bottle.

Take the temperature of the isolated bottle and the bottle at the centre of the huddle every minute and remove one bottle from the huddle until the desired time is up.

Then Record results in empty table.

How have I made the experiment more accurate?

- * Carried out the experiment in the same environment (room temperature would have an affect on results)
- * Used the same water containers
- * Used a measuring cylinder to measure exact amount of water
- * Used a thermometer to get exact temperatures
- * Repeat experiment to obtain averages.

Safety

Making sure the water was at a reasonably low temperature to avoid injury.

Checking and cleaning the surface where the experiment is taking place for any foreign substances or spillages

Pushing in all chairs in the lab. Clearing all floor surfaces

Wearing safety goggles and taking off any loose items of clothing or jewellery

Time since start of experiment(mins)

No. bottles in huddle

Temp of isolated bottle test 1 (0C)

Temp of Isolated Bottle Test 2(0C)

Average Obtained

1

15

50

50

50

2

14

48.5

49

48.75

3

13

48

47.5

47.75

4

12

47

47

47

5

11

46.5

46.5

46.5

6

10

46

46

46

7

9

46

45

45.5

8

8

45.5

44.5

45

9

7

43

43

43

10

6

42

43

42.5

11

5

42.5

42.5

42.5

12

42

42

42

13

3

41

41

41

14

2

40.5

40

40.25

15

1

39

39.5

39.25

Just as I had predicted as the huddle became smaller the temperature of the isolated bottle decreased. This can be seen clearly from my obtained results.

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The reason now for the huddling of these animals is because it is an effort to obtain heat. If they were to isolate themselves from one another they would lose heat quite easily so instead they stay together in huddles to prevent heat escaping from their bodies. It is vital for penguins to keep warm as their living environment is usually in extremely cold places where there are sub zero temperatures. I hypothesise that a huddled group will lose less heat than an isolated animal. This is because the exposed surface area of a group of animals is less for each animal than an isolated animal .

Difficulties in experiment:

Getting the starting temperature for all the containers

Avoiding spillages of water therefore causing an accident

The table conducted some of the heat

Making sure no water was lost

The measurements may not have been accurate

Improvements to the experiment:

> Introduce more bottles to the huddle

> Studied the isolated bottle over a longer amount of time

> Used different materials of bottles which would have meant that they would have had different types of properties in regard to heat loss

> Used a thermostatically controlled water bath to obtain better results

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- > Use a digital stopwatch

- > Stir the bottles of water

- > Vary starting temperature of water

- > Using a digital thermometer