



# Penguin Science

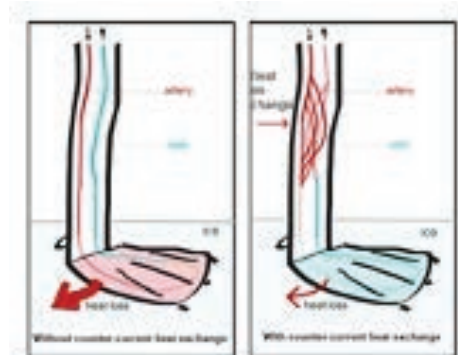
## Junior Penguin Keeper Worksheet

Have you ever wondered how a penguin survives in Antarctic conditions, how baby birds get out their eggs or maybe what we do keep our penguins happy and healthy?

### How do Penguins stay warm when they live and stand on ice?

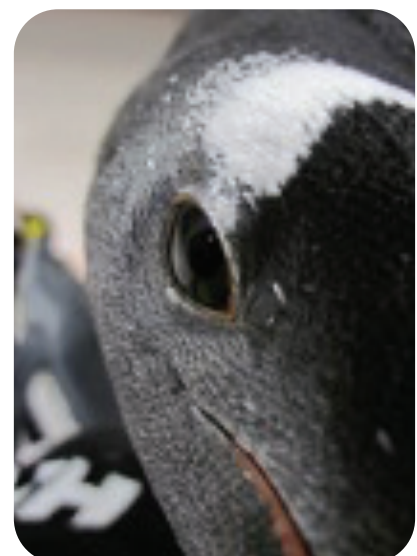
#### FEET

If a human stood on the ice, not only would our feet get very cold very quickly, but our core body temperature would drop too! Why? This is because we have blood vessels running in a basic loop from our heart to our feet and back to our heart, meaning warm blood would travel down to our feet, get very cold from the ice, and then cold blood would travel back to our heart. (insert diagram of human heart to feet to heart) Penguins however have very special feet with a counter current heat exchange system! This means that rather than a basic blood vessel loop, the penguins have blood vessels running to and from the heart that are intertwined, which means the warm blood coming down from the heart warms up the cold blood coming back from the feet, keeping them nice, toasty and warm! (please make the diagram below nicer and match the other)



#### FEATHERS

To stay warm in an icy environment, we must put on lots of different layers of clothing and turns out, penguins have layers too! Penguins have 4 different layers of feathers: contour feathers and filoplumes, which is the outer layer of those pretty coloured feathers that help them stay waterproof, and after feathers and plumules, which are the soft downy feathers for insulation to keep them warm! They replace all these feathers once a year in what is called catastrophic moult, which means unlike other birds who lose random feathers here and there, penguins lose all their feathers and grow all new feathers all at once! Which means they look even more fluffy than usual, that's a lot of feathers!



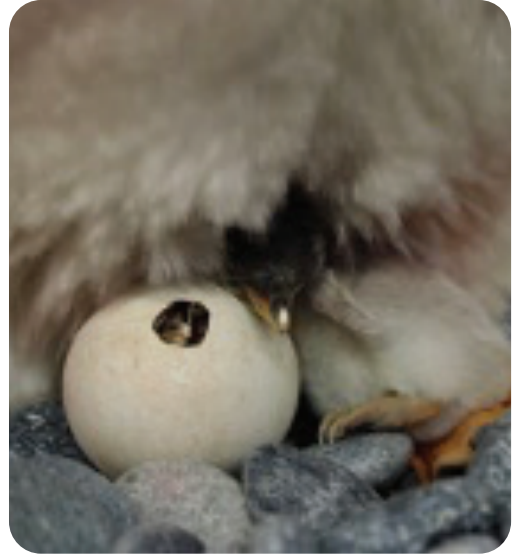


# Penguin Science

## Junior Penguin Keeper Worksheet

### How does a Gentoo penguin chick get out of the egg?

When a Gentoo chick has finished growing and developing inside the egg after 35-38 days, it is time for them to come out into the world! The fully developed chick will internally pip, which means it breaks through the inner membrane of the egg and starts to breathe in the airspace that is inside the egg with it. However, once the chick starts breathing and the carbon dioxide level in the airspace gets to 10%, this causes the chick to have a spasm, where they throw their head back, causing their egg tooth on their beak to hit the egg shell and cause it to crack! Now the chick has externally pipped and can breathe in air from outside and begin to wiggle their way out of the egg over the next 48 hours!



### Penguin Science Quiz

What did you learn from this worksheet?

1. Why are penguin's feet special?
  - (a) Their toenails keep them warm
  - (b) They have natural socks
  - (c) They have a counter current heat exchange system
2. How do penguins keep warm on the ice?
  - (a) Penguins have four layers of feathers
  - (b) Penguins have thick skin
  - (c) Penguins wear jackets
3. How does the penguin chick get out the egg?
  - (a) The chick kicks its way out of the egg
  - (b) The chick internally pips, it breaks through the egg with its egg tooth
  - (c) The chick's parents get it out with their beaks



Answers  
1. (c) 2. (a) 3. (b)