

How Seals Stay Warm by Meghan Piepho

Seals are the largest mammals living on Antarctica, where the air temperature can fall far below zero and water temperature can fall to 28° Fahrenheit. How can these animals stay warm?

Dr. Rosevelt Pardy, a professor of animal physiology at the University of Nebraska-Lincoln, told me that blood freezes at 28° Fahrenheit. So why don't seals freeze and sink to the bottom? After consulting Dr. Pardy a little more and reading about seals in a textbook called *Animal Physiology Adaptation and Environment*, I found some answers. The answers lie in the seal's head size, blubber, fur, skin and flippers.

Seals are large mammals, but in comparison to their bodies, their heads are very small. Dr. Pardy said the significance of the smaller head is that, unlike humans who lose a lot of heat from their faces, seals do not. By minimizing these features, the seal reduces heat loss through the face.

Dr. Pardy said the seal also has a large layer of insulating blubber—a large, thick layer of fat that insulates the animal on land and in water. So for a seal in Antarctica, fat is definitely in style.

The fur is another characteristic the seal has acquired to stay warm. Dr. Pardy says the fur of a seal works like insulation, in the same way that a neoprene suit keeps a diver warm.

The seal's black skin also reduces heat loss. The color black absorbs warmth from sunlight because black absorbs all the different wavelengths of light and doesn't reflect any of them. So when a seal is swimming or just lying out on the ice, the seal warms its body by absorbing heat from sunlight. If the seal had a lighter skin color—pink, for example—it wouldn't be able to absorb as much heat from the sun because light colors reflect light.

A seal's flipper also uses a neat process that helps to keep the animal warm. The process is called "countercurrent heat exchange." It prevents the seal from losing body heat in cold water and air.

First, a reminder: As blood circulates through the body, arteries carry warm, oxygen-filled blood away from the heart and lungs; veins return deoxygenated blood to the heart and lungs.

Heat loss could apparently occur easily in the seal's flippers because they are very thin and have no blubber layer. But where the flipper joins the body, the veins and arteries are laid out in a "countercurrent pattern." That is, the warm blood approaches the flippers through arteries that are surrounded by many veins, holding cooler blood. On its way to the flipper, the warm arterial blood flows past the veins, transferring heat to them. The veins carry the warmed blood back to the body. Meanwhile, the cooled arterial blood is already close to the external temperature, so little heat is lost to the surroundings, thus preserving the seal's core body temperature. The countercurrent heat exchange is a great mechanism, allowing seals to keep warm in cold Antarctica.

In fact, not only do seals survive in Antarctica's inhospitable climate; they thrive. One key to this wonder is how a seal stays warm.

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Sources:

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