

Fish Respiration lab Research

In order to successfully complete the goldfish lab, you need to have a good understanding of how gills work and how they react to changes in the environment!

How do a fish's gills work?

Gills do the same job for fish that lungs do for many other kinds of animals, including humans. Animals need to take in oxygen gas for the chemical reaction that powers their bodies. They also need to throw out carbon-dioxide gas, which is a waste product of that reaction. Lungs take oxygen from the air and send carbon dioxide out through the air. Gills take oxygen out of the water and let water carry away carbon dioxide. Fish force water through their gills, where it flows past lots of tiny blood vessels. Oxygen seeps through the walls of those vessels into the blood, and carbon dioxide seeps out.



Extracting oxygen from water is more difficult and requires a greater expenditure of energy than does extracting oxygen from air.

Water is a thousand times more dense (heavier per unit volume) than air, and at 20 deg C (68 deg F) it has 50 times more viscosity (resistance to flow) than air and contains only 3% as much oxygen as an equal volume of air.

Fishes, therefore, have necessarily evolved very efficient systems for extracting oxygen from water; some fishes are able to extract as much as 80% of the oxygen contained in the water passing over the gills, whereas humans can extract only about 25% of the oxygen from the air taken into the lungs.

Gills are made efficient in a number of ways.

(1) A large surface area for gaseous exchange means that more oxygen can enter the bloodstream over a given period of time. A single gill of a bony fish consists of a curved gill arch bearing a V-shaped double row of gill filaments. Each filament has many minute folds in its surface, giving it a sort of fuzzy appearance and increasing the amount of surface area along a given length of filament. Consequently, the surface area of the gills is commonly 10 to 60 times more than that of the whole body surface.

(2) A short diffusion, or travel, distance for the oxygen increases the rate of oxygen entry into the blood. The blood traveling in the folds of the filaments is very close to the oxygen-containing water, being separated from it by a very thin membrane usually 1 to 3 microns (4/100,000 to 1/10,000 in) thick, and possibly less

A. Questions:

1. Why do fish need oxygen?
2. Gills extract oxygen from?
3. Why is it more difficult to extract Oxygen from water than air?
4. How much oxygen can fish extract out of water compared to humans

B. Watch following animation: Take notes

http://www.cengage.com/biology/discipline_content/animations/fish_countercurrent.html

C. Watch the following video: Take notes <https://www.youtube.com/watch?v=uEjvzFzUI9U>

D. Watch the following video: Take notes <https://www.khanacademy.org/partner-content/mit-k12/chem-and-bio/v/homeostasis>

