

## 6.1: Other Animals Reading

### Salmon and Breathing in the Water

#### *How Do Salmon Cells Get Oxygen If Salmon Don't Breathe Air?*

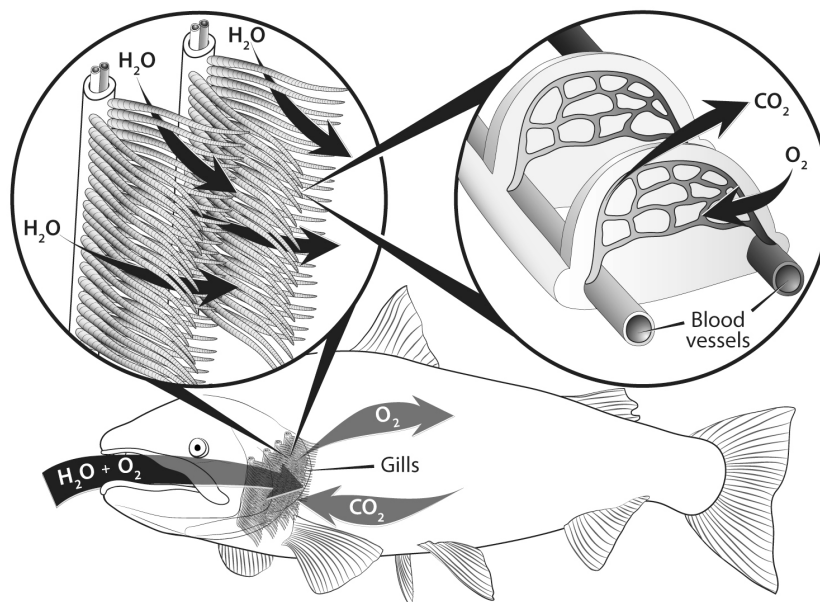
Salmon are a common fish that are found in the Atlantic Ocean, Pacific Ocean, and the Great Lakes. They are one of the most common types of fish that people eat! They are mostly farmed, but you may be able to find wild caught salmon at your local supermarket. The pinkish orange flesh that they have is from the pigments in their diet of shrimp and krill. Farm raised salmon are given artificial colors to make their flesh pink.

Another interesting thing about salmon is that they don't spend their whole life in the ocean. This is called anadromy. They are born in rivers, travel to open bodies of water to live their juvenile and adult life, and then return to the same river they were born in to spawn.

Another interesting thing about salmon, and fish in general is that they can breathe underwater! How is it that fish can breathe underwater while mammals like people drown?

It might seem that fish have plenty of oxygen, since water is  $\text{H}_2\text{O}$ . But fish can't use the oxygen in  $\text{H}_2\text{O}$  molecules for cellular respiration. They need oxygen gas molecules— $\text{O}_2$ . Fish can get  $\text{O}_2$  because the water in streams, lakes, and the ocean has dissolved gases from the air—including  $\text{O}_2$ ,  $\text{N}_2$ , and  $\text{CO}_2$ . The dissolved  $\text{O}_2$  is what fish need for cellular respiration.

But fish are different from birds, mammals, and reptiles in that they don't have lungs. How do fish get oxygen if they don't have lungs? The answer is their gills! Gills are organs in fish that are full of blood vessels. A fish "breathes" in water through its mouth, and this water passes over the gills. Dissolved oxygen that is in the water moves into the blood and travels to the fish's cells. You can trace the path of  $\text{O}_2$  and  $\text{CO}_2$  in the illustration below.

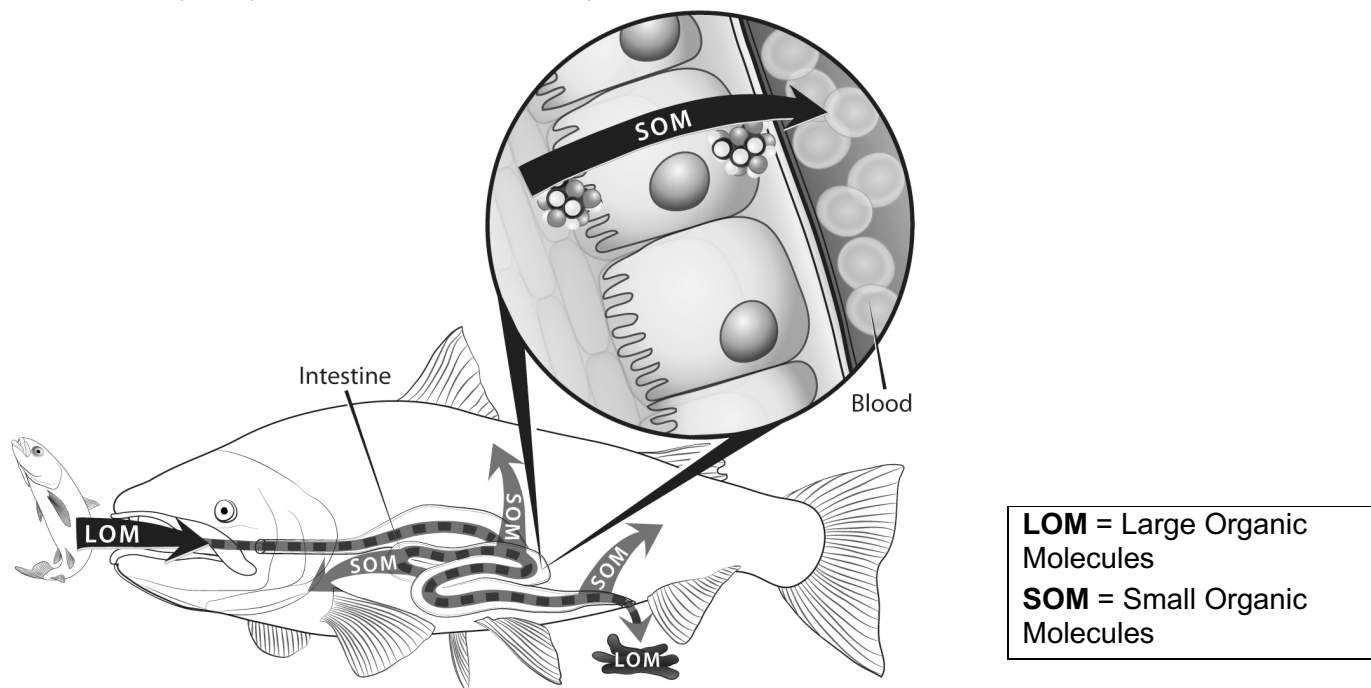


#### *How Do Salmon Live and Grow?*

Like other animals, salmon eat and digest food that contains large organic molecules. Salmon mostly eat smaller fish and invertebrate animals. They use this food and oxygen from their gills to live, move, and grow. We can explain how a salmon does this in four steps.

**Step 1: Salmon make the large organic molecules in food into small organic molecules through the process of digestion.** Salmon are like cows and humans in that they have a digestive system with intestines containing enzymes that break the large organic molecules in their food—mostly fats and proteins—into small organic molecules that can leave the intestine.

Then the salmon's blood carries those small organic molecules to all the cells in the salmon's body, as you can see in the drawing below.

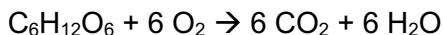


**Step 2: Blood carries food and oxygen to all the cells in the salmon.** The salmon's circulatory system has small blood vessels near the intestines. Small organic molecules from digested food can enter the blood there.

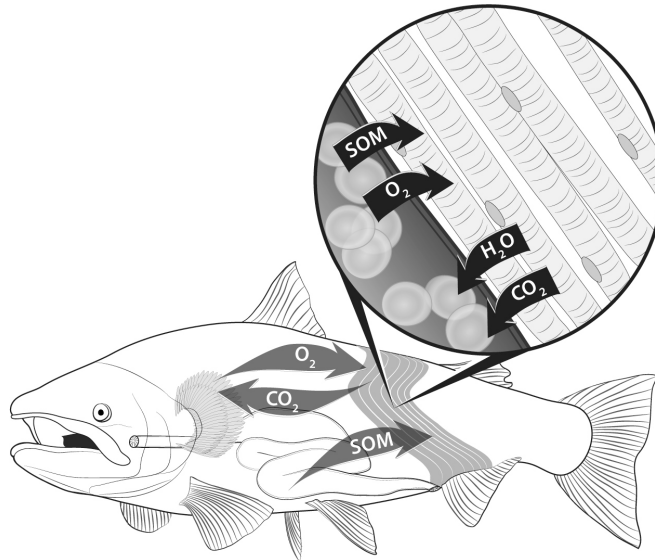
There are also small blood vessels in the salmon's gills. Oxygen molecules dissolved in the water can enter blood there.

The blood carries food and oxygen to every cell in the salmon's body. That's a good thing, since every cell needs food and oxygen to live and grow!

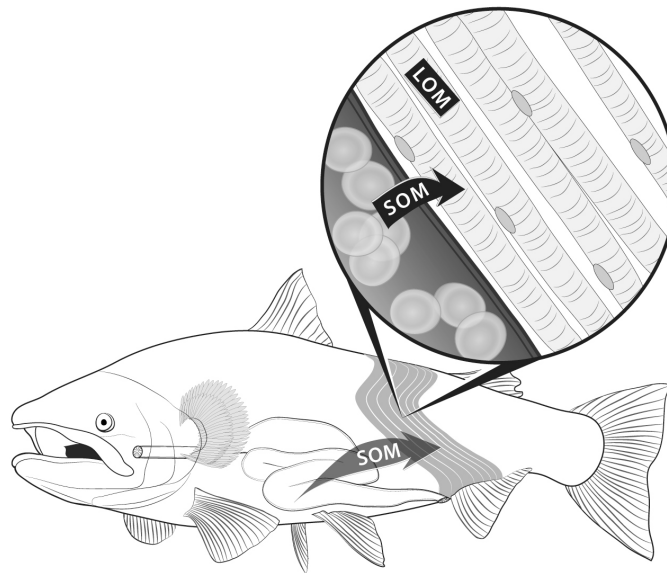
**Step 3: All the cells get energy by combining small organic molecules with oxygen in the process of cellular respiration.** All the cells need energy to carry out their life functions, and they get that energy by combining glucose and other small organic molecules with oxygen. You are familiar with the chemical equation for cellular respiration:



The waste products from cellular respiration— $\text{CO}_2$  and  $\text{H}_2\text{O}$ —go back into the blood. They leave the salmon through its gills and urine.



**Step 4: Cells grow by making large organic molecules from small organic molecules in the process of biosynthesis.** Salmon grow when their cells grow and divide. In order to grow and divide the cells need to make large organic molecules such as fats and proteins. Each cell combines the small organic molecules from the blood into the large organic molecules that make up the cell and carry out its functions.



### ***Digging Deeper***

Here are some more places that you can go to learn about salmon:

- Read more about the salmon life cycle: <https://www.nps.gov/olym/learn/nature/the-salmon-life-cycle.htm> or watch this video: <https://www.youtube.com/watch?v=5DqjsWsY8-g>
- Watch this video on how salmon provide nutrients for forests: <http://www.bbc.com/future/story/20140218-salmon-fertilising-the-forests>
- Read more about how salmon are important in ecosystems and what is being done around the world to help them: <https://www.wildsalmoncenter.org/work/why-protect-salmon/>