Overwintering Turtles- How Turtles Hibernate

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Colder temperatures mean one thing: winter is on its way. For animals and people, that means a lot of prep-work. Turtles are no exception. In fact, turtles use some incredibly unique methods to get through the winter. From using their rear-ends to breath, to forgoing oxygen altogether, and even using their shells as "Tums" to aid cramps, turtles have come up with fascinating solutions for freezing temperatures. The amazing things they do in order to survive the winter proves that turtles are, quite literally, *the coolest!*

Before we jump into all the amazing facts about how turtles overwinter, let's review the basics.

Turtles are ectotherms, or "cold blooded." This means that instead of producing their own body heat, ectotherms rely on their environments. So, whatever temperature it is in its surroundings, is the same as the internal temperature of a turtle (or any ectotherm). That's why you'll see turtles basking on logs or on the sides of roads—that's how they get warm and allow their bodies to regulate normally. Since turtles rely on their surroundings for their internal body temperatures, that means that when the temperatures start getting colder, turtles get just as cold. The implications of being an ectotherm has led to the strategy turtles have developed in order to make it through the winter.

Adult turtles are not able to survive anything below 0° C, because the water in their bodies would crystallize and expand- and they would freeze to death. Therefore, turtles have to find places that are just above freezing temperatures to spend the winter. Luckily, deeper bodies of water such as ponds, lakes, and wetlands don't freeze all the way through. Often, if the water is deep enough, only the part of the water closest to the surface freezes and forms a sheet of ice; meanwhile, the water below, near the bottom of lakes and ponds, remains above 0° C. This is lucky for turtles. However, turtles still have to adjust and adapt to being so cold.

Unlike us endotherms that can regulate their own temperature internally (most animals and humans too), turtles can't put on layers to stay warm. When they get cold, everything slows down in their bodies. Their metabolism hits the breaks dramatically, their hearts slow down and beat extremely slowly at one beat every few minutes! They also have reduced immune-system functions and are more prone to any diseases. And during hibernation, they don't require as much oxygen.

Not needing to breath normally is pretty handy, considering there's a thick brim of ice preventing them from coming up for air. So how do turtles breathe if they can't come to the top of the water to fill their

lungs with oxygen? The answer is fascinating. During hibernation turtles will develop highly vascularized tissue on their bodies that allows oxygen to be absorbed through their skin. The area that experiences this vascularization the most is in their cloaca- the cloaca is basically their bum! That's right. You read that correctly. During hibernation, turtles breathe through their rear-ends. The formal term for this is "cloacal respiration."

Unfortunately, even with their fancy schmancy "cloacal respiration" getting through the cold months comes with other obstacles bum-breathing can't solve. Quite often, the bodies of water that turtles will overwinter in have other creatures in it too. That means that the oxygen underneath the ice is limited, and it can run out completely. Also, if water bodies that they are wintering in experience changes in water depth over the winter from dam-drawdowns, this can limit the oxygen further.

To prove, once again, that turtles are the coolest creatures, they developed another way of surviving, even when their oxygen runs out! In these times, turtles literally *switch* their metabolisms to another system; one that doesn't need oxygen at all. Even more fascinating; researchers have found in the lab that turtles can use this other metabolism—that doesn't use oxygen—for up to 100 days! Of course, an impressive feat like switching a metabolism doesn't happen easily. When turtles burn their energy reserves without oxygen (in hypoxic situations), lactic acid builds up in their bodies. Humans experience lactic acid build up too: it's what causes cramps in muscles after exercise. This is as uncomfortable for turtles as it would be for us- and the way they deal with it is incredible. Once again, turtles rise to the challenge and have developed a unique method for keeping lactic acid build up at bay- by using their shells! That's right, turtles use their shells, specifically the calcium they store inside of it, in order to neutralize the acid, and subdue and calm their cramps. Just like a calcium-rich antacid you would take for heartburn, turtles use the calcium from their shells to deal with the lactic acid building up in their bodies. Too cool!

Now, surviving without oxygen in hibernation is limited to a few months and also dealing with lactic acid build up has its limitations: Near the end of winter, turtles get quite uncomfortable. In fact, when they finally emerge from hibernation, they will often be quite disoriented from any excess build up of acid and from the discomfort associated with it. Therefore, turtles in spring look immediately to warm up (whether on rocks or on roads) in order to revv up their metabolism and rid their bodies of remaining lactic acid and discomfort. This is important to understand because it means turtles need us to keep an eye out for them once they finish hibernating. With so much of their already energy depleted and their entire focus put towards getting warmer, turtles coming out of hibernation aren't always aware of their surroundings. That means, even before nesting season, us Turtle Guardians need to keep an eye out for groggy, cramped turtles that might be on roads trying to get warm!

Here are other ways you can help turtles with hibernating:

-Protect the water they hibernate in! Don't let water levels get too low in frozen ponds or wetlands where turtles are overwintering. If water gets too low, the oxygen and warmer layer below will be diminished or the water will freeze solid and that means the turtles underneath in the muck may die.

-If you see a turtle underneath the ice, let it be! Turtles know what they are doing. It might seem impossible, but turtles know how to handle the winter months. It can be dangerous to try and "save" a hibernating turtle by removing them from the water underneath the ice and exposing them to the cold winter air.

- Don't take turtles out of the natural environment or move them from their natural territories; turtles know where they hibernate. They have dedicated hibernation sites. When moved, turtles will try desperately to return to these sites and will often die trying to get home.

- Young hatchlings need to find hibernation sites. They have approximately three years to imprint routes, hibernation areas, feeding grounds, and territories into their minds. Let them be in the natural world so they can imprint these areas and survive into adulthood.

- Don't pollute aquatic environments; turtles are more susceptible to pollution and disease in the winter months. Studies have shown that plastics and additives have implications for our and wildlife immune systems; and nitrates can also compromise immune systems. Don't flush toxins into septic systems or into water systems.

- Don't release pet turtles (often red-eared sliders) into the environment. They don't know how or where to hibernate and they may carry and spread diseases such as herpes.

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