ITO 1401\_2 The Science of Torpor

*Video Open will be ITO host getting into bed for the night….*

So why do we need sleep at night? Well, one reason is that we need 7 to 8 hours of rest to give our brains and bodies a chance to recharge, right? But it’s more than just rest.

We actually lapse into an altered state of consciousness. We’re not conscious or unconscious. It’s kind of in-between. Our breathing, heart rate, and metabolism all slow down during sleep so we don’t burn as many calories. Our brains recharge through the process of dreaming.

Many organisms need much more than just daily rest and sleep to survive. They need an intense resting survival strategy called… **torpor**. Torpor is where an animal has a significant reduction in its metabolism and the calories it needs and that’s usually timed to periods when there isn’t any food available. Metabolism is the combination of body functions like physical movement, brain activity, breathing, heart rate, and burning calories to maintain body temperature. If some animals didn’t use torpor to reduce the amount of calories their bodies needed for normal activity, they might not survive.

They would burn more energy looking for scarce food than what energy they would gain from the little food they might find. The end result would be an overall calorie loss. Too much calorie drain over time and an animal might not survive. Unlike most hibernators, bears maintain a near-normal body temperature and do not fall into a deep sleep. They sleep in their dens all winter and can wake up easily. But they don’t eat for months, surviving on the large fat reserves in their bodies that they built up by over-eating during the fall.

Most insects also use torpor to survive. For instance, bumblebees hibernate inside a hole in the ground. Unlike bears however, their body temperature drops to just above freezing and their metabolism is reduced to almost nothing. Plus, they use another very interesting trick to stay alive during their state of torpor. Their bodies produce chemicals that are natural types of antifreeze to keep the moisture in their cells from freezing. Butterflies and moths use the same strategy to keep from freezing all winter when they hibernate.

Small fur-bearing mammals like chipmunks are “food-storing” hibernators that go through long periods of torpor where they fall into a very deep sleep. During winter, chipmunks eat seeds and nuts stored in parts of their den before falling into a deep sleep for about a week. During that long sleep or period of torpor, they lower their body temperature, breathing, heart rate and oxygen consumption. It almost looks like they’re dead. The result is a much lower rate of energy consumption from the food that they ate. Instead of eating every day like they would in the summer, they only need to fill their stomachs once a week. So the end result is that they make the same amount of food last about 7 times longer. That’s a very cool trick.

Perhaps some of the most amazing “warm-blooded” animals that use torpor are small birds. Take for instance the hummingbird. Because their body mass is so small, they don’t have a lot of fluffy feathers. They can’t retain much body heat during cold nights like larger birds. If their bodies tried to maintain their body temperature, heart rate and respiration all night long, they would use up all the calories in their miniature bodies and they might die during the night. Nature’s solution is a nighttime period of torpor called “noctivation” where the little birds become hypothermic and almost die. In fact, they go through such a dramatic drop in body temperature and metabolic rate that they appear dead. No kidding. But about an hour before the sunrises and begins to warm the air, the little hummingbirds take about 20 minutes to eventually come back to life, ready once again to begin their whirlwind lifestyle of eating all the nectar and insects they can before the next cold night makes them fall into another period of noctivation.

*Video close will be ITO host getting into bed for the night and turning off the light….*

And I thought I got cold feet during the night. Those little hummers take the science of torpor to the limit. So next time you say “good night”, consider all the ways nature uses torpor as a survival strategy. Good night…