Unlocked Longevity Secrets from Dolphins

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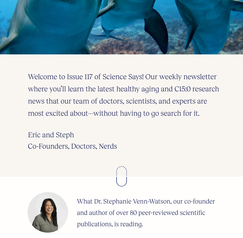

Welcome to Issue 117 of *Science Says*! Our weekly newsletter where you'll learn the latest healthy aging and C15:0 research news that our team of doctors, scientists, and experts are most excited about—without having to go search for it.

Eric and Steph
Co-Founders, Doctors, Nerds

What Dr. Stephanie Venn-Watson, our co-founder and author of over 80 peer-reviewed scientific publications, is reading.

HEALTHY AGING

Surprising Parallels Between Humans & Dolphins

The countdown is on until Simon & Schuster's March 25th release of *The Longevity Nutrient*. This book tracks our 20-year scientific journey - starting with an unexpected discovery of C15:0's health benefits while helping dolphins - which has culminated in a movement to improve global health. And dare we say, humanity?

In this series of *Science Says*†, we provide a behind-the-scenes science peek relevant to each of the book's chapters - from surprising dolphin discoveries to longevity molecule must-haves, from how essential fatty acids are discovered to the many ways C15:0 works, from how a newly discovered nutritional deficiency accelerates aging to how fixing and optimizing our C15:0 levels can slow aging to help us live healthier, longer.

This week, let's talk about some unexpected parallels between dolphins and humans, which help explain why dolphins are so darn special - and helped to unlock a core secret to longevity (aka C15:0).

First up, dolphins and humans share a key evolutionary driver of insulin resistance.

Back in 2007, we discovered that dolphins naturally produce high levels of glucose between meals. This mimics insulin resistance and type 2 diabetes in people.

Why would dolphins want to go into this state? Well, for three reasons:

- Dolphins have big brains, which like us, require lots of glucose to keep humming.
- Dolphins have little to no carbs in their diets, so they have evolved to readily make their own carbohydrates (aka glucose).
- Dolphins, especially deep ocean diving dolphins, have to be able to switch in and out of fasting states to thrive during times of both feast and famine.

Dolphins are artiodactyls, which also include cows and camels. It is believed that dolphins developed their insulin resistance trick when they moved from the land to the ocean, which was about 53 million years ago. This move included leaving carbs behind and adapting to a high protein fish diet.

This adaptation actually fits well with the Carnivore Connection Hypothesis which, as described by Brand-Miller et al, shows that insulin resistance is actually a survival tool in large-brained species that have a high protein, low carbohydrate diet. Similar to what happened in dolphins, it is believed that humans developed insulin resistance during the Ice Ages, to survive during periods with lots of meat and few plants.

Insulin resistance in humans, however, turned from a great survival tool to a catalyst for type 2 diabetes, when the ice melted and carbs came back in the form of not only plants, but donuts and cookies, too.

So, big brains and a shared evolutionary history of moving from having-to-not-having dietary carbohydrates may explain how both dolphins and humans can manifest insulin resistance. Let's talk big brains.

Who has a big brain?

There's this thing called the encephalization quotient (or EQ), which is the ratio of an animal's brain size given its body mass. Can you guess which animal has the highest EQ? That's right - humans!

Of all other animals, including other primates, guess which species has the next highest EQ? That's right - dolphins. Specifically, bottlenose dolphins (*Tursiops truncatus*). In their paper, Montgomery et al. explain that only primates and cetaceans have coincidentally evolved over tens of millions of years to develop increased brain size with static or decreased body size.

Fascinatingly, to support these large brains, Craik et al. have shown that among all adult animals, only primates and cetaceans have a special rapid glucose transport system in red blood cells (called GLUT-1) that ensures glucose gets to these big brains.

Well, that certainly shows that dolphins and humans share special physiological ties. Anything else?

Indeed, there are many other parallels between dolphins and humans, including the following:

- **Human chromosome 1.** Of our 23 pairs of chromosomes, Human chromosome 1 is the largest, and it includes genes relevant to aging, metabolic abnormalities, obesity, and Alzheimer's disease. As described by Murphy et al., of all animal taxa, only three others have conserved the nearly exact same Human chromosome 1 order of genes: higher primates (no surprise), cetaceans - including dolphins (surprise), and two-toed sloths (even more of a surprise).
- **Alzheimer's disease.** Gunn-Moore et al. discovered that dolphins can develop Alzheimer's disease, and concluded that Alzheimer's is a shared consequence of longevity.
- **Metabolic dysfunction-associated steatotic liver disease (MASLD, previously known as NAFLD).** During 2012, we were the first to publish fatty liver disease in dolphins, which mimicked fatty liver disease in humans. In people, the first cases were reported by the Mayo Clinic in 1980. Today, an estimated 38% (that's more than 1 in 3) people globally have MASLD.
- **Aging-associated conditions.** Over a period of ten years, we also reported the discovery of many other parallels between aging dolphins and humans, including increased susceptibility to anemia, hypercholesterolemia, and chronic systemic inflammation.

Thus, these evolutionary adaptations, many of which are unique to humans and dolphins (vs. worms, flies, and mice) set the stage for our big discovery.

The Longevity Nutrient: Deeper Dive on Dolphins

In the upcoming book, we dive deeper into the decade-long unfolding of fascinating teachings from dolphins that led to the discovery of C15:0 as The Longevity Nutrient.

The best part? These discoveries were the result of the Navy's ongoing efforts to continually improve the health of dolphins - both at the Navy and in the wild. All demonstrating that the One Health approach (by helping one species, we can help all species) can have important and positive impacts.

Have a wonderful week, everyone!

Dive deeper into the science

READ THESE STUDIES

- Venn-Watson & Ridgway. Big brains and blood glucose: common ground for diabetes mellitus in humans and healthy dolphins
- Brand-Miller et al. The Carnivore Connection Hypothesis: revisited
- Montgomery et al. The evolutionary history of cetacean brain and body size
- Montgomery et al. The evolutionary history of cetacean brain and body size
- Craik et al. GLUT-1 mediation of rapid glucose transport in dolphin (Tursiops truncatus) red blood cells
- Hensler et al. A gene involved in control of human cellular senescence on human chromosome 1q
- Ng et al. Genome-wide scan for metabolic syndrome and chromosome 1
- Bird et al. Wide range in age of onset for chromosome 1-related familial Alzheimer's disease
- Murphy et al. The origin of human chromosome 1 and its homologs in placental mammals
- Gunn-Moore et al. Alzheimer's disease in humans and other animals: a consequence of postreproductive life span and longevity rather than aging
- Venn-Watson et al. Hemochromatosis and fatty liver disease: building evidence for insulin resistance in bottlenose dolphins
- Venn-Watson et al. Physiology of aging among healthy, older bottlenose dolphins (Tursiops truncatus): comparisons with aging humans
- Venn-Watson et al. Blood-based indicators of insulin resistance and metabolic syndrome in bottlenose dolphins
- Venn-Watson et al. Dolphins and diabetes: applying one health for breakthrough discoveries
- Venn-Watson et al. Raising dietary and circulating C15:0 levels independently predicts improved health in dolphins

- Nerd out on all the C15:0 science at DiscoverC15.com