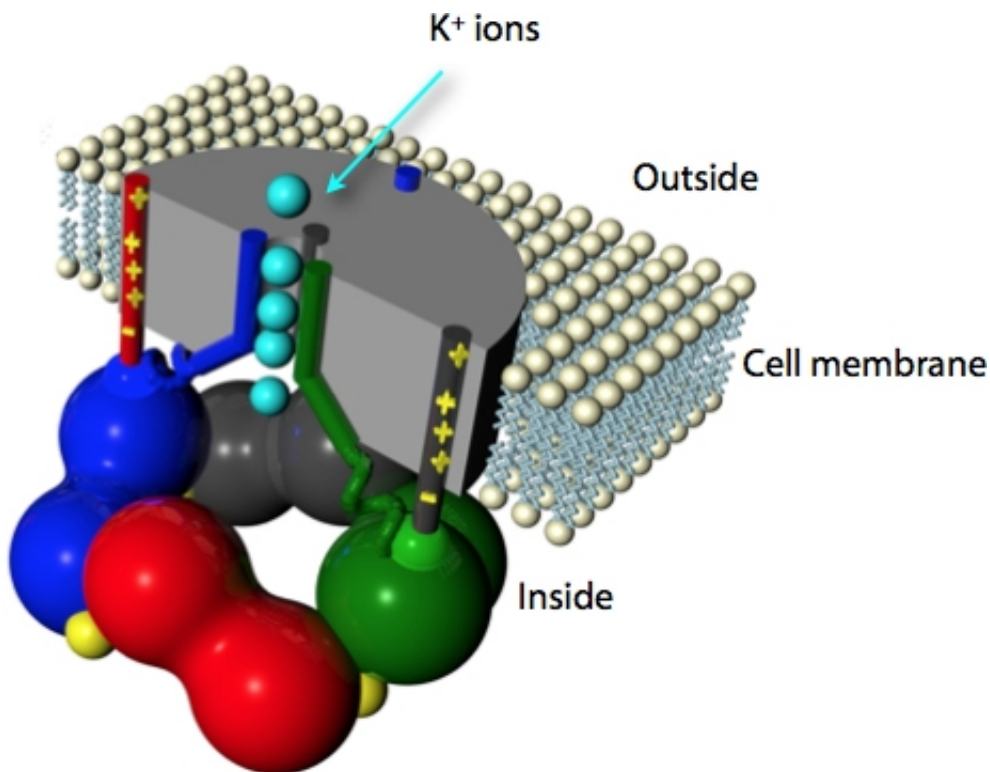


Omega-3s from fish vs. fish oil pills better at maintaining blood pressure in mouse model

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Graphic representation of a potassium transmembrane ion channel. Credit: Toshinoru Hoshi, Ph.D., Perelman School of Medicine, University of Pennsylvania

Omega-3 fatty acids found in oily fish may have diverse health-promoting effects, potentially protecting the immune, nervous, and cardiovascular systems.

But how the health effects of one such fatty acid—docosahexaenoic acid (DHA)—works remains unclear, in part because its molecular signaling pathways are only now being understood.

Toshinori Hoshi, PhD, professor of Physiology, at the Perelman School of Medicine, University of Pennsylvania, and colleagues showed, in two papers out this week in the *Proceedings of the National Academy of Sciences*, how fish oils help lower blood pressure via vasodilation at ion channels. In vascular smooth muscle cells, such as those that line blood vessels, ion channels that span the outer membrane of a cell to let such ions as sodium, calcium, and potassium in and out, are critical to maintaining proper vessel pressure.

Omega-3 fatty acids bind directly to a specific group of channels that allow potassium ions to move out, which affects how much voltage is required to open the channel. If omega-3 fatty acids bind to the channel, only a small amount of voltage is needed. This is good for a cell because an open potassium channel means the cell is at rest, and when smooth blood muscle cells are relaxed, blood pressure is at a good level. However, when vessels constrict, blood pressure increases.

The researchers found that DHA rapidly and reversibly activates these channels by increasing currents by up to 20 fold. DHA lowers blood pressure in anesthetized wild type mice but not in mice genetically engineered without a specific ion channel subunit.

In comparison, the team found that a dietary supplement, DHA ethyl ester, found in most fish oil pills fails to activate the same channels, and even antagonizes the positive effect of DHA from natural sources, on the cells. The DHA ethyl ester seems to compete with the natural form of DHA for binding sites on the ion channel.

The team concluded that these channels have receptors for long-chain

omega-3 fatty acids, and that DHA—unlike its ethyl ester cousin—activate the channels and lower blood pressure.

The findings have practical implications for the use of omega-3 fatty acids as nutraceuticals for the general public and also for critically ill patients who may receive omega-3–enriched formulas as part of their nutrition.

Coauthor Michael Bauer from Jena University Hospital in Germany, who studies sepsis in a clinical setting, says the findings may encourage physicians to have a closer look at the specific formulations given to sepsis patients as they may contain either the free omega-3 acid or the ester.

The findings also underscore the importance of obtaining omega-3 fatty acids from natural food sources such as oily fish.

More information: Hoshi, T. et al. (2013) Omega-3 fatty acids lower blood pressure by directly activating large-conductance Ca²⁺-dependent K⁺ channels. *Proceedings of the National Academy of Sciences* ([DOI: 10.1073/pnas.1221997110](https://doi.org/10.1073/pnas.1221997110))

Hoshi, T. et al. (2013) Mechanism of the modulation of BK potassium channel complexes with different auxiliary subunit compositions by the omega-3 fatty acid DHA. *Proceedings of the National Academy of Sciences* ([DOI: 10.1073/pnas.1222003110](https://doi.org/10.1073/pnas.1222003110))

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