Medical Xpress

Lack of omega-6 fatty acid linked to severe dermatitis

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University of Illinois scientists have learned that a specific omega-6 fatty acid may be critical to maintaining skin health.

"In experiments with mice, we knocked out a gene responsible for an enzyme that helps the body to make arachidonic acid. Without arachidonic acid, the mice developed severe ulcerative dermatitis. The animals were very itchy, they scratched themselves continuously, and they developed a lot of bleeding sores," said Manabu Nakamura, a U of I associate professor of food science and human nutrition.

When arachidonic acid was added to the animals' diet, the itching went away, he said.

Nakamura's team has been focusing on understanding the function of omega-3 and -6 fatty acids, and doctoral student Chad Stroud developed a mouse model to help them understand the physiological roles of these fats. By knocking out genes, they can create deficiencies of certain fats and learn about their functions.

"Knocking out a gene that enables the body to make the delta-6-desaturase enzyme has led to some surprising discoveries. In this instance, we learned that arachidonic acid is essential for healthy skin function. This new understanding may have implications for treating the flaky, itchy skin that sometimes develops without an attributable cause in infants," he said.

Nakamura explained that our bodies make arachidonic acid from linoleic acid, an essential fatty acid that we must obtain through our diets. It is found mainly in vegetable oils.

Scientists have long attributed healthy skin function to linoleic acid, which is important because it provides the lipids that coat the outer layer of the skin, keeping the body from losing water and energy, which would retard growth, the scientist said.

But skin function seems to be more complicated than that. These itchy mice had plenty of linoleic acid. They just couldn't convert it to arachidonic acid because the gene to make the necessary enzyme had been knocked out, he noted.

Arachidonic acid is also essential to the production of prostaglandins, compounds that can lead to inflammatory reactions and are important to immune function. Common painkillers like aspirin and ibuprofen work by inhibiting the conversion of arachidonic acid to prostaglandins.

"We usually think of inflammation as a bad thing, but in this case, prostaglandins prevented dermatitis, which is an inflammatory reaction. We measured prostaglandin levels in the animals' skin, and when we fed arachidonic acid to the knockout mice, they resumed making these important chemical compounds," he said.

Nakamura cautioned that there are still things they don't understand about the function of this omega-6 fatty acid. "This new knowledge is a starting point in understanding the mechanisms that are involved, and we need to do more research at the cellular level."

More information: The study was published in a recent issue of the *Journal of Lipid Research*.

Provided by University of Illinois at Urbana-Champaign