MedicalXpress

Malnutrition, shaping up to be a first world problem

July 18 2016

Australian researchers have discovered that a bad diet has consequences on your immune system even before you notice an increase in body weight.

Scientists from the Australian Research Council Centre of Excellence in Advanced Molecular Imaging have investigated the impact of a western-style high fat diet on our immune system, with two quite surprising results.

The link between diet and immunity and the ability of nutrition to speed-up or slow-down our immune response has long been suspected. This new research, published in the *Journal of Immunology*, shows that our immune system can be affected by diet prior to weight gain and other clinical signs of obesity.

Lead author, Dr Abigail Pollock, University of New South Wales (UNSW), says excess body fat can cause severe health problems.

"Obesity is now a huge financial burden to the health systems of many Western countries," she says.

"The World Health Organisation reported in 2014, that more than 1.9 billion adults were overweight, and of these over 600 million were obese.

"But what if immune dysfunction occurs before obesity?" Dr Pollock says. "Our research looked at whether bad diets have consequences

before we notice an increase in body weight. And we found that the over consumption of saturated fats is a form of malnutrition: one that needs to be taken seriously."

To identify mechanisms in which a diet rich in saturated fats, can impact immune function the researchers examined the impact of dietary lipids on a class of immune cells - T lymphocytes, or T cells.

"We fed mice a Western-style high fat diet for nine weeks to observe if this diet would impact the T cell response before the animal gains weight," Dr Pollock says.

"Despite our hypothesis that the T cell response would be weakened we actually saw the opposite: the percentage of T cells multiplying increased."

One clinical ramification of overactive T cells may be autoimmune disease - diseases where the immune system begins attacking healthy parts of the body.

UNSW Professor Kat Gaus, Deputy Director of the Imaging CoE, says the other unexpected finding was that T cell responses were altered even in the absence of obesity and obesity induced inflammation.

"Our lab has previously shown altering the lipid content of T cell membranes, artificially, changes the T cell response. So, we devised this experiment to see if the same structural changes would occur naturally through a high fat diet," says Professor Gaus.

"The team set out to demonstrate that nutrition is able to directly impact immune function," she says.

And the results reveal that dietary lipids do in fact directly influence T

cell activation and responsiveness by altering the composition and the structure of the T cell membrane.

"T cells are actually effected prior to the mice becoming overweight," says Dr Pollock. "Lipids in the diet change the abundance of lipids in the cell membrane, which in turn changes the structure of the cell altering the responsiveness of the T cells and changing the immune response," Dr Pollock says.

Where to from here?

"We now know that dietary lipids have the ability to directly affect T cell function through changing the lipid composition of the cell. Further research is needed to work out the link between lipids and T cell function so that we better understand which fats we should avoid," Professor Gaus says.

"To do this, we would remove the T cells from the mice and then conduct imaging or microscopy experiments on the cells to watch if and how the signaling changes compared with cells that have not undergone structural changes do to dietary intervention," Dr Pollock concludes.

More information: *Journal of Immunology*, DOI: 10.4049/jimmunol.1501.261 , www.jimmunol.org/content/196/10/3993.full

Provided by Monash University