NATURE | NEWS

Red meat + wrong bacteria = bad news for hearts

Microbes turn nutrient in beef into an artery-clogging menace.

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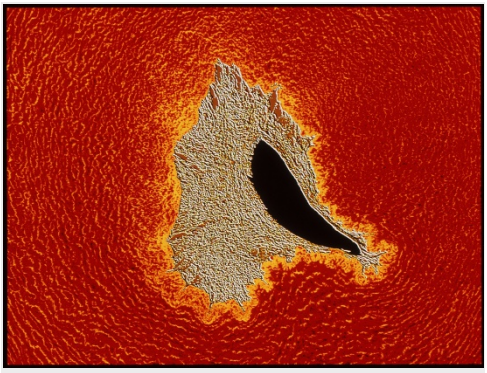

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A chemical found in red meat can encourage the growth of fatty deposits (grey) on the walls of arteries (orange).

Lean steak is low in fat and cholesterol and high in protein — qualities normally considered healthy. But eating a lot of it can still cause heart disease. Researchers have now laid the blame on bacteria in the human gut that convert a common nutrient found in beef into a compound that may speed up the build-up of plaques in the arteries.

The results are published in *Nature Medicine* today[1]. Co-author Stanley Hazen, head of cardiovascular medicine at the Cleveland Clinic in Ohio, says that the study could signal a new approach to diet and health. In some cases, an individual's collection of intestinal microbes may be as important to their diet as anything on a nutrition label, he says. "Bacteria make a whole slew of molecules from food," he says, "and those molecules can have a huge effect on our metabolic processes."

Consumption of red meat has been found to increase the risk of death from heart disease, even when controlling for levels of fat and cholesterol[2]. To find out why, Hazen and his colleagues gave the nutrient l-carnitine — found in red meat and dairy products — to 77 volunteers, including 26 who were vegans or vegetarians. One committed vegan even agreed to eat a 200-gram sirloin steak.

Tests showed that consuming l-carnitine increased blood levels of trimethylamine-*N*-oxide (TMAO), a compound that, evidence suggests, can alter the metabolism of cholesterol and slow the removal of cholesterol that accumulates on arteries' walls.

But even when they took l-carnitine supplements, vegans and vegetarians made far less TMAO than meat eaters. Faecal studies showed that meat eaters and non-meat eaters also had very different types of bacteria in their guts. Hazen says that a regular diet of meat probably encourages the growth of bacteria that can turn l-carnitine into TMAO.

Double checking

To further make the case, researchers checked the levels of l-carnitine in the blood of nearly 2,600 people who were having elective heart check-ups. By itself, the nutrient didn't seem to make a difference. However, people who had high levels of both l-carnitine and TMAO were prime targets for heart disease, further evidence that it's the bacterial alchemy — not the l-carnitine alone — that poses the real threat.

Finally, the researchers found that feeding l-carnitine to mice doubled the animals' risk of developing arterial plaques, but only when the mice had their usual gut bacteria. When the animals were treated with gut-clearing antibiotics, l-carnitine in the diet did not encourage plaques.

Daniel Rader, director of preventive cardiovascular medicine at the University of Pennsylvania in Philadelphia, says that the study makes a "fairly compelling" case that intestinal bacteria feeding on l-carnitine increase the risk of heart disease.

The finding should give pause not only to meat lovers, but also to people who take l-carnitine supplements, which are marketed with the promise that they promote energy, weight loss and athletic performance, says Hazen. "None of those claims have been proven," he says. "I see no reason why anyone needs to take it."

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References

1. Koeth, R. A. et al. *Nature Med.* http://dx.doi.org/10.1038/nm.3145 (2013).

2. Pan, A. *et al*. *Arch. Intern. Med.* **172**, 555–563 (2012).