Red meat, gut bacteria and heart disease

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Red meat intake has been associated with elevated risk of cardiovascular disease and cardiovascular death.[1-5] For example, combined data from the Nurses' Health Study and Health Professionals Follow-up study, comprising over 120,000 people, estimated that **each serving (100 grams) of red meat raises the risk of cardiovascular death by 18 percent**.

Two widely accepted factors that are thought to link red meat to increased cardiovascular disease risk are the high saturated fat and heme iron contents of red meat. Saturated fats are known to elevate total and LDL cholesterol levels, and excess iron is associated with oxidative stress, which promotes atherosclerosis.[6-9]However, scientists have theorized that these factors alone do not explain the contribution of red meat to cardiovascular risk.[3] Additional properties of red meat are likely involved.

Fascinating new research presents a new potential mechanism by which red meat may increase cardiovascular risk – by modulating the species of bacteria that populate our digestive tract!

We are now learning that our intestinal flora interacts with the cells of the intestinal wall to exert profound effects on our health. Beneficial microbes produce vitamins, protect us against pathogenic microbes, promote healthy immune function, facilitate energy extraction from food, and break down fiber and resistant starch into beneficialshort chain fatty acids, which protect us against colon cancer. Importantly, what we eat determines which species of bacteria thrive in our digestive tract. Healthful, fiber-rich plant foods provide an energy source ("prebiotics") for beneficial bacteria to grow.[10,11]

Is the reverse true? Do unhealthy foods promote proliferation of unhealthy gut bacteria?

Carnitine is an amino acid involved in energy production, and it is abundant in animal products, especially red meat; there is little or no carnitine in plant foods, and the human body can produce adequate carnitine from other amino acids, lysine and methionine. Studying mice, the scientists found that carnitine was metabolized by intestinal bacteria, producing trimethylamine-N-oxide (TMAO), a substance previously shown to contribute to atherosclerotic plaque development by slowing the removal of cholesterol from the arterial wall. They then sought to confirm these findings with human subjects. When analyzing the blood levels of carnitine and TMAO in human subjects, they found that the combination of high carnitine and high TMAO was associated with increased likelihood of cardiovascular disease or cardiovascular events (heart attack and stroke). When they gave humans carnitine supplements, they interestingly found that omnivores produced far more TMAO in response to carnitine than vegans and vegetarians. In addition, the species of gut bacteria in omnivores were different from those in vegetarians and vegans. These results suggest that regularly eating carnitine-containing foods promotes the growth of gut bacteria that can metabolize carnitine into a heart disease-promoting substance.[12-14]

Our overall dietary pattern determines the bacteria that live in our gastrointestinal tract, and this research indicates that eating red meat regularly promotes the growth of bacteria that produce harmful substances from the components of red meat**.** It also indicates that those of us that regularly consume a healthful diet of whole plant foods have a healthier microbial profile, and we are less susceptible to the disease-promoting effects of high-carnitine meats. Future studies will continue to uncover more of these intriguing links between diet, gut bacteria, and health.

Carnitine content of animal foods:[15]

Food	Carnitine (mg)
Beef steak (3 ounces)	81

Ground beef (3 ounces)	80
Pork (3 ounces)	24
Milk (whole; 1 cup)	8
Fish (cod; 3 ounces)	5
Chicken breast (3 ounces)	3
Cheese (1 ounce)	1

This new research highlights an additional way that red meat likely increases heart disease risk, but certainly the high amount of carnitine in red meat does not exonerate fish, chicken, eggs and dairy products. We already have plentiful evidence that excessive consumption of animal products in general are associated with increased risk of death from all causes. Animal products overall are micronutrient-poor, void of phytochemicals and antioxidants, contain pro-inflammatory fats, increase cholesterol levels, calorically concentrated, promote weight gain, and most importantly elevate IGF-1 which increases heart disease and cancer risk.

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