Branched-chain fatty acids (BCFA) are primarily saturated fatty acids (FA) with a methyl branch, usually near the terminal methyl group. BCFA are abundant in bacteria, skin, and vernix caseosa but have seldom been studied with respect to human nutrition. They are generally at low concentration in the liver, brain, and other internal organs, but are major constituents of the lipids of the skin, being synthesized by sebocytes, and other skin glands, especially the meibomian and Moll’s glands of the eyelid where BCFA are found in membrane lipids.

In vernix, they appear with carbon chain lengths from 11 to 26 with a mean total concentration between 25 and 30% of total FA, the highest of any biological tissue or substance. In the last trimester of normal gestation, vernix sloughs off the fetal skin and becomes suspended as particulates that are swallowed by the fetus. BCFA are found in meconium with carbon lengths from 16 to 26, reflecting selective disappearance of the shorter chain BCFA in transit through the fetal alimentary canal. The few published reports of BCFA in human milk enable an estimate that breastfed infants consume 19 mg BCFA per 100 ml milk.

BCFA are major constituents of the membranes of 15–20% of bacteria, where they play biophysical roles similar to unsaturated FA but are not susceptible to damaging chemical oxidation. Moreover, BCFA availability in growing media modifies the function of some bacteria including the virulence of pathogens.

We recently investigated whether BCFA substituted for polyunsaturated FA in feeds protect against necrotizing enterocolitis (NEC) in the premature rat pup model. Dietary BCFA at levels similar to those found in human vernix reduced NEC incidence by more than 50% (fig. 1), increased the abundance of BCFA-containing bacteria in the nascent microbiota, and increased the expression of ileal anti-inflammatory IL-10.
These effects are all consistent with bioactive effects of BCFA enhancing the establishment of healthy microbial flora in the first days of life.

BCFA are prominent components of the adult diet. Published data and our own preliminary data indicate that BCFA enter the diet principally via consumption of milk fat, beef, mutton, and other ruminant products because rumen bacteria biosynthesize BCFA. A sampling of dairies supplying a major amount of the US fluid milk supply shows that more than 2% of FA are BCFA. Their carbon numbers are from 14 to 18 carbons and are dominated by two anteiso BCFA, anteiso-15:0 and anteiso-17:0. Because of the prominence of dairy and ruminant products, the diets of most adults are expected to include major quantities of BCFA.

Considering primarily milk fat and beef as the main sources of dietary BCFA, we calculate that US adults consume more than 400 mg BCFA per day. This estimate exceeds by severalfold the average dietary intake of bioactive FA that occupy much more research attention; for instance, eicosapentaenoic acid and docosahexaenoic acid intakes combined average about 100 mg/day.

We conclude that BCFA are bioactive, abundant but neglected components of the human food supply. BCFA are likely to influence establishment of microbiota in neonates, and alter microbiota throughout life, and early evidence suggests they influence gut inflammatory state.

**Fig. 1.** Proportions of animals that were healthy (white) and ill with NEC (black) in each treatment group: DF (dam fed; no ill animals; a), control (formula fed, no BCFA; 17 of 31 animals were sick; b), BCFA (formula fed, 20%, w/w BCFA; 5 of 24 animals were ill; c). BCFA reduced NEC compared to the control group.