



Editorial

Who needs a conventional dairy industry?

Does milk necessarily need to come from cows or other mammals? What if we could make milk microbially? The dairy industry will be quite different then. There will be no waiting for the milking season and the calf to become a dairy cow. Millions of liters of milk will no longer have to be transported from the farm to the dairy factory. Because of precisely controlled production conditions, there will be no worry about the possible presence of residues of pesticides, antibiotics and other unwanted chemicals in the milk. The environmental impact of the dairy farming will disappear. Significant savings in energy will accrue and the many people employed in dairy farming would be released for more productive jobs. In addition, the consumer will have milk that is virtually identical to cow's milk in taste, appearance and nutritional value, but costs less.

All this presupposes that milk can be made using microorganisms. While the idea of microbial milk is powerful, it has not been proved; nevertheless, achieving it within a short period is quite realistic.

Natural milk is a complex mixture of colloidal and dissolved proteins, dispersed fat globules, phospholipids, lactose, and inorganic salts. Starting from vegetable oils, we can already make margarine that is barely distinguishable from butter. We know how to stably disperse fat (e.g. margarine) globules in an artificial aqueous medium that is the equivalent of skim milk. Recombinant production of the milk sugar lactose appears feasible and many soluble proteins present in milk are already being made in recombinant microorganisms. For example, recombinant lactoferrin and albumin are available. Most likely, not every minor protein present in natural milk will be required in microbial milk for the latter to be nutritionally and organoleptically identical to cow's milk. Production of caseins (the colloidal protein in milk) in microorganisms has been demonstrated. And microbial production of various lipids and phospholipids has been proved.

The scenario outlined here is plausible. Clearly, biotechnology promises a radically different future for many traditional products and industries. Like any major scientific advance, biotechnology will usher in significant social and structural changes in at least some sectors of the economy.

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