

## Abstract

# Can Arginine Help to Improve Milk Supply in Humans? It Does in Cows<sup>†</sup>

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Arginine can be metabolized into nitric oxide, polyamine, creatine, or agmatine, and each of those metabolites has several biological functions. Arginine has been shown to play an important role in the regulation of metabolism, immune function, and hormone secretion in mammals. The present study tested the hypothesis that arginine could be beneficial to milk supply by enhancing the efficiency of nutrient utilization. Using lactating cows as the study model, we found that supplementation with arginine via a jugular vein increased the daily milk yield, milk protein yield, and milk fat yield. The supplementation had no effect on the feed intake or the digestibility of dry matter, crude protein, or ether extract. The urea nitrogen in serum, urine, and milk was lower in cows that were infused with arginine, indicating a better utilization of nitrogen in the cows that were supplied with extra arginine. The underlying cause of these changes may have been the elevated serum nitric oxide (a potent vasorelaxant in mammals), stimulating mammary blood flow and the supply of amino acids, fatty acids (FAs), and glucose to the mammary gland in the cows that were infused with arginine. Furthermore, the expression of genes that code for amino acid transporters (*SLC7A2* and *SLC7A8*), and enzymes involved in the biosynthesis of FA (*ACACA*) and triglycerides (*SCD*), and FA desaturation (*DGAT1*) were higher in the mammary gland of cows that were infused with arginine. As a result, the de novo synthesis of FA and casein in the mammary gland were enhanced in the cows that were supplied with extra arginine. Taken together, the available data suggest that the positive effect of arginine on milk supply was caused by a combination of more blood flow via nitric oxide and a direct effect of arginine on the expression of genes that code for proteins that are involved in the synthesis of milk protein and milk fat.

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