

COMPARISON OF HUMAN AND BOVINE COLOSTRUMS

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Colostrum has evolved in nature as a nutritional supplement that is fed to the newborn by its mother during a short period after birth. Its natural evolution can be shown to follow a path that meets the immediate demands of the newborn and, since most species of mammals develop at different rates and have different nutritional requirements, the colostrum and follow-on milk of each species has a different composition. Some colostrums are very similar and some are extremely different. The composition of bovine colostrum is quite different from the colostrum produced by humans.

The most substantial difference is found in the immunoglobulin (antibodies) content of these colostrums. In humans, the IgG immunoglobulins are conveyed from the mother's bloodstream through the placenta while the fetus is still in the mother's uterus and are not found in the colostrum. This provides some degree of temporary passive immunity to the newborn against possible infectious agents after birth. In contrast, none of the immunoglobulins in the pregnant cow's bloodstream are transferred across the placenta and, thus, the calf is essentially defenseless when it is born unless it gets colostrum. The major immunoglobulin found in bovine colostrum is, therefore, IgG, but, although there is only a small amount of immunoglobulins in human colostrum, the major one is IgA. The immunoglobulin (IgA) in human colostrum and milk is unique in that it has a special protein fragment attached to it that is believed to protect it from the effects of stomach acid and digestive enzymes.

It must also be recognized that since the immunoglobulins are transferred across the placenta in humans, many of the essential growth factors are also transferred. Therefore, human colostrum contains only trace amounts of these growth factors. The colostrum and the milk that follows become supplementary resources for these biologically active substances and the newborn can survive and develop without receiving them by suckling. In contrast, none of these factors are transferred across the placenta in the pregnant cow and calves that do not receive enough colostrum suffer serious deficiencies in the development of their immune system and their body mass.

Bovine and human colostrum also differ in other ways that reflect the different needs of the respective newborns. For example, human colostrum and milk contain the highest amount of lactose (milk sugar) of any species. The lactose provides about 40% of all of the calories available to the suckling infant. The high lactose content is believed to serve two purposes: (1) the infant brain is very large, much larger than any other species, and requires a lot of glucose, as a source of metabolic energy, to develop rapidly; lactose is easily broken down into glucose and galactose before it is absorbed by the intestines; and (2) for physical chemical reasons, the high lactose content causes the

secretion of a large amount of water into the mammary gland, assuring that the infant's needs to support fluid loss through sweating and urine formation are met.

Bovine colostrum and milk contain substantially more casein than is found in human colostrum or milk. Casein is a complex protein that inter-relates with the fat and this combination is acted upon by enzymes in the stomach to form a curd that has the consistency of cottage cheese. In the calf, this curd is much harder than the curd that forms in babies that are nursed. The curd allows time for additional enzymes to break the protein down into small peptides and amino acids. It also protects the other biologically active substances from the effects of stomach acid and enzymes, which allows them to pass safely into the small intestine and be absorbed intact. The breakdown products of casein are also absorbed in the small intestine and serve as the building blocks for new proteins to build muscle. The extra casein in bovine colostrum and milk reflects the need for a ready source of more muscle-building capacity since the body mass of a calf develops much more rapidly than that of a newborn baby.

Colostrum is an amazing material that, like many other things in nature, reflects the evolutionary development of a unique composition that will serve the needs of the offspring for which it is intended. The most unique of the colostrums from mammalian species occurs in bovine species where everything required for the development of a healthy, productive offspring is provided in the colostrum. As such, it provides a specialized resource that offers the broadest possible spectrum of biologically active substances that can promote the development of a sound body mass, provide controlled metabolism of nutrients and support the activation and maintenance of a fully functional immune system capable of efficiently and effectively combating potential insults from microorganisms and other deleterious sources. Bovine colostrum is also compatible with almost any species and can readily convey its full benefits to humans by routine dietary supplementation.

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