

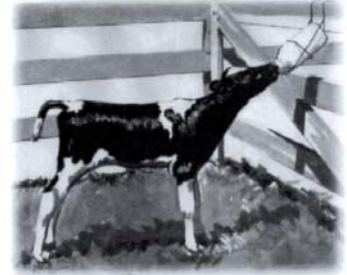
## The Nutritional Value of Milk Proteins

*Milk is an excellent source of high quality protein. The proteins in milk have balanced amino acid profiles and good digestibility. In addition, they contain high levels of the amino acids which are deficient in vegetable proteins. Because of this, milk proteins are excellent "complementary" proteins.*

### Utilization of Proteins and Amino Acids

All proteins contain amino acids, the protein "building blocks" utilized by the body. During the digestion process, proteins are hydrolyzed to smaller peptides and their constituent amino acids. These are absorbed and the amino acids transported in the blood stream to various locations in the body where they are resynthesized into the proteins required for muscle and tissue development, enzyme formation, nutrient storage, etc.

Calves, like humans, are able to synthesize some of the required amino acids from these food sources. Some however, cannot be synthesized, and it is essential that these be obtained from the diet in adequate amounts. Some specific amino acids can replace a portion of the requirement for other amino acids. The efficiency in which the proteins in the diet are utilized depends on adequate amounts being present, and the proportions in which the amino acids are supplied. A deficiency in one or more essential amino acid limits the extent to which protein in the diet can be used for the synthesis of body proteins. Amino acids not used in protein synthesis are broken down, the nitrogen excreted as urea, and the remainder stored as fat or used immediately in energy metabolism.



### Limiting Amino Acids and the Effect of Complementary Proteins

The nutritional value of protein sources is often limited by a shortage of one or more of the essential amino acids. The "limiting amino acid" of any protein is the essential amino acid present in the greatest deficit when compared with recommended levels. For example, some vegetable proteins are low in the same essential amino acids in which milk proteins are high.

Fortunately, it is the blend of proteins which is consumed at any time that determines the overall amino acid utilization by the body. Therefore, if a protein deficient in a specific amino acid is consumed with a protein which contains an excess of that amino acid, a complementary effect will occur, and total protein utilization will be increased. For example, the high levels of lysine and methionine in soy proteins or casein (the main protein in milk) can "complement" the deficiencies in whey protein if the two proteins are consumed together.

### Milk Replacer Formulation for Protein

The young calf, lamb, or pig often relies entirely on a milk replacer for its early nutritional needs. Milk Products' milk replacers are all formulated with specific levels of certain amino acids, to ensure the most efficient digestion and growth of young animals. Some amino acids can be added individually, others are provided by the ingredients used in each formulation.