

# Calf Notes.com

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## ***Calf Note #23 – Soy Protein in Milk Replacers***

**Introduction.** Milk replacers are an excellent source of nutrition for calves prior to weaning. When properly formulated, manufactured, mixed and fed, milk replacers can provide performance that is close to that of whole milk. The ingredients that traditionally were used to make milk replacers - skim milk, casein, whey proteins - have become expensive in the U.S. Consequently, there has been a tremendous amount of research done to find ways to use alternative proteins in milk replacers and maintain acceptable animal performance. One of the alternative proteins that is widely used is soy protein.

**Types of soy protein.** There are many types or forms of soybean protein that can be used in milk replacers. Soy flour, modified soy flour, soy protein concentrate, and soy isolate are examples. Soy flour is finely ground soybean meal and contains approximately 50% protein. Soy protein concentrate is the protein portion of soybeans concentrated by the removal of soluble carbohydrates. It is about 66% protein. Soy isolate (or isolated soybean protein) is higher in protein (about 85 to 86%) and has the carbohydrate fraction removed. Soy isolate has no measurable crude fiber.

**Problems with soy protein.** One of the biggest problems with using soy proteins in milk replacers is the presence of anti-nutritional factors in soybeans. These include trypsin inhibitor, glycinin and  $\beta$ -conglycinin. Trypsin inhibitor can reduce digestibility by binding trypsin, an enzyme in the digestive tract. Glycinin and  $\beta$ -conglycinin are proteins that may cause an allergic reaction in some calves. Reduced digestibility is a particular concern in calves less than 3 weeks of age. Calves < 3 weeks of age have lower secretion of pancreatic enzymes compared to older animals and a lower proteolytic activity of the pancreatic secretions, so digestion tends to be somewhat lower. This is especially true for non-milk proteins, which are not as well digested by very young calves. Some manufacturers have developed strategies for reducing the amount of anti-nutritional factors in soy flour and soy protein concentrate. In these cases, the soybean protein source is treated under specific conditions, sometimes with alcohol (methanol, ethanol), hexane and other chemicals, heat, and other procedures. Many of these procedures can reduce the antigenicity of soy flour markedly, so that these products can safely be included in modern milk replacers.

An additional concern with using soybean protein is the amino acid profile compared to that of milk protein. Soybean protein is somewhat deficient in methionine, so inclusion of this important amino acid is often necessary in milk replacers containing soy proteins.

**Why include soy proteins in milk replacer?** The primary reason is economy. When milk proteins are expensive, then the price of an all-milk replacer will become expensive also. In addition, many of these milk proteins can be used for humans, which puts calves in competition with people for protein. Including soy proteins in milk can reduce the cost of milk replacers and the competition for protein sources. When included in carefully formulated milk replacers, soy proteins can provide an economical source of protein with no marked depression in animal performance. However, when

large amounts of poorly processed soy flour are included in replacers, animal performance may well suffer.

***How can you tell if your milk replacer contains soy protein?*** The feed tag will have a list of ingredients, which will include a listing of the soybean protein. If the tag includes terms like "plant protein products", then you may have soybean protein - or any of a number of other plant proteins, like cottonseed meal, wheat flour, brewers yeast, and others. Using crude fiber does not *necessarily* indicate the use of soy proteins. For example, soy isolate contains no measurable fiber. However, if your milk replacer contains > 0.2%, it will generally indicate the inclusion of some plant (fiber-containing) protein.

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