

Study on the differences in digestibility of powdered protein drinks using rat portal vein catheterization

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Abstract

Commercially available powdered protein drinks have different protein materials and formulations depending on their purpose. It is generally believed that the digestion and absorption rates of whey protein are fast, while those of soy protein are slow. However, there is no scientific evidence to support these claims. In this study, we examined the differences in digestibility between whey protein and soy protein, which are raw materials for protein drinks, using a technique for the *in vivo* catheterization of the portal vein in rats, which allows direct measurement of digested and absorbed amino acids. A whey protein suspension or soy protein suspension prepared to a total nitrogen content of 1.125 g/100 mL was administered to rats at 15.0 mL/kg, and the concentration of free amino acids in portal vein blood was measured over time. The results showed that the absorption levels of essential amino acids, such as valine, leucine, and isoleucine, were significantly higher with the whey protein than the soy protein. In contrast, the absorption levels of non-essential amino acids, such as asparagine and arginine, were significantly higher with the soy protein than the whey protein. In addition, a comparison of the digestion and absorption rates revealed that whey protein was digested and absorbed significantly faster than soy protein.

This study successfully demonstrated scientifically that the types of amino acids supplemented and the rates of digestion and absorption differed depending on the protein used in protein drinks, i.e., whey protein or soy protein.

Keywords : rats, digestion, absorption, whey protein, soy protein

I Introduction

Commercially available powdered protein drinks are used by professional athletes and athletic clubs, such as those in universities, for the purpose of maintaining and strengthening muscles, and the protein materials and compositions of the drinks differ depending on their purpose. Whey protein, soybean protein, and casein are the mainstay proteins used in protein drinks. In addition, there are protein drinks that combine different protein materials and/or include proteins that have added branched-chain amino acids and dextrin, etc., and each combination has a different function and purpose.

In general, it is commonly believed that whey protein is easy to digest and absorb, and can be expected to have

muscle-repairing effects when ingested immediately after exercise, while soy protein and casein are suitable for protein supplementation during dieting and non-exercise days, because they are slowly digested and absorbed. However, there is no scientific data to support these claims. The reason for this is that there has never been a method for directly evaluating the digestion and absorption of proteins. When evaluating the digestion and absorption of proteins using the blood free amino acid concentration as an index, it is necessary to measure the amino acid concentration before metabolism in the liver; however, it has been considered technically difficult to collect portal blood over time. The rat with gastric and portal vein catheterizations model is an experimental model in which a catheter is placed in the gastric and portal vein of a rat to enable