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Estimation of Nutritional value of meat tissues based on their tryptophan and hydroxyproline compositions

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Meat is an excellent source of high-quality protein, since it is well-balanced regarding the ten essential amino acids required for the human nutrition. This refers particularly to skeletal muscle and its cellular, or plasma proteins, consisting of myosin, actin, actomyosin complex, myogen, myoalbumin, myoglobin, and various globulins.

Skeletal muscle contains also a small amount of low-quality protein, as far as the nutritional aspect is concerned, which is the connective tissue of the red meat. However, in the case of skeletal muscle, or lean meat, the amount of connective tissue is very small (1 to 5 %) and it does not affect greatly the overall nutritional value of such meat.

However for manufacturing various chopped meat products, lean meat alone is seldom used, and other, less expensive animal tissues, such as pork and beef trims, stomachs, giblets, etc., are incorporated into the products' formulations. These animal tissues, other than skeletal muscle, may contain considerable amounts of the connective tissue and, when incorporated into the products' formulations, will change the overall hutritional value of the total proteins of the resulting mixtures.

Usually, each particular meat product has its nutritional standard, which is maintained in the product by proper balancing of the essential amino acids present in its protein components. Such nutritional balancing requires a thorough knowledge of the amino acid composition of the tissue components used for the products' formulation, and since such knowledge is very limited, the nutritional value of the product is usually established by the determination of the ten essential amino acids in the products' total protein. Unfortunately, this is rather a tedious, time consuming, and an expensive laboratory investigation.

This study was undertaken to determine the nutritional value of ^{animal} tissues, or their mixtures, by determining only two amino acids ^{in a} protein mixture and calculating the remaining amino acids in the ^{total} protein of the mixture, based on the general biochemical knowledge ^{about} the relative amino acid composition of various animal proteins. It is commonly known that the muscle plasma proteins contain the essential amino acid tryptophan, which is not present in the connective tissue protein, while on the other hand, connective tissues contain considerable amounts of the amino acid hydroxyproline, which is absent in the muscle plasma proteins. This paper presents an investigation of this kind and, although, the research data are very limited, they present an evidence in favor of the idea of such determination of the nutritional value of the protein mixtures of animal origin.

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The main steps in the investigation are the following: 1. Determination of tryptophan content in a mixture of proteins.

- Estimation of the muscle plasma proteins in the protein mixture, based on the tryptophan value.
- 3. Substracting the meat plasma proteins from the total proteins of the mixture, thus giving as the difference the amount of the connective tissue proteins in the mixture.
- 4. Determination of hydroxyproline in the connective tissue.
- 5. Calculation of the relative amount of collagen and elastin in the connective tissue based on their hydroxyproline concentrations.
- 6. Calculation of the amino acid composition of the protein mixture, based on the amino acid compositions of muscle plasma proteins, collagen, and elastin.