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PROTEIN HYDROLYSATES IN POWDERED FORM—A COSMETIC RAW MATERIAL

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The method of production of powdered protein hydrolysate from the spinal cord waste of slaughter animal was presented. This product containing almost all essential amino acids can be used as an external active agent for skin and hair nutrition in cosmetic preparations.

From a physico-chemical point of view, human skin is a protein gel consisting of 30% protein and 70% water on average constantly fed with amino acids delivered with blood from inside the body. About 25 amino acids present in the organism have been identified so far. Each of them has its own significance for the regeneration of skin cells and the maintenance of skin functions. A normal diet usually satisfies the demand for amino acids. However, more often than it could be normally assumed, some shortages occur which are due either to incorrect nourishment or to metabolism disturbances induced with by age. They can cause various skin defects such as dryness of skin, senile appearance, flaccidity and difficulties in the healing of wounds. In extreme cases amino acids deficit may lead to loss of hair, nail damage or skin diseases. It was observed that an external administration of protein hydrolysate can improve the condition of the skin which is shown by:

- an acceleration of the cicatrization process,
- a settlement of the colloidal equilibrium of the skin (lipid-protein ratio, oxidation reduction potential and, there from, settlement of skin moisture content).

It was established that protein hydrolysates are highly substantive to a cornea layer of skin and, if adsorbed, they cannot be washed out. The degree of moisture absorption by the skin treated with protein hydrolysates is greater than the absorption by an untreated skin. The difference in absorption is much greater

than could be expected from the natural hygroscopicity of these substances. In addition to a direct nutrient action on the skin and hair protein hydrolyzates have a protective action in the presence of surfactants, especially anionic agents. This protective action relates to both skin and eye mucous membrane. It is due to the creation of hydrogen bonds and ionic connections between the functional groups of the skin, protein hydrolysate and detergent. In such a case the skin is not washed with a detergent but with a complex of protein hydrolysate and surface-active agent, the action of the complex being very mild. A similar protective action of protein hydrolysates can be found in products used for permanent wave.

From the point of view of cosmetic usability, molecular weight of the hydrolysate is of fundamental importance as it is connected with the difference in transfer processes through biological membranes [1-5]. So-called oligopeptides with weight below 1000 i.e. containing no more than 10 amino acids in a molecule, are generally believed to exert the best action. For the preparation of such compounds the following methods of protein hydrolysis are known:

- enzymatic,
- alkaline,
- acidic hydrolysis.

The first method requires a most precise and expensive preparation of the reaction medium which makes possible a specific decomposition of chosen peptide bonds, this however, being not necessary for our purpose (cosmetics). During acid and alkaline hydrolyses non-specific decomposition of peptide bonds occurs and the distribution of molecular weights after each reaction is consistent with Gaussian distribution.

In the process of alkaline hydrolysis the carboxyl groups of decomposed peptides take the form of salts while amine groups are free so they can be split off due to the strong reaction conditions. Consequently a hydrolysate with a slight excess of acid groups over amine is obtained.

In our laboratory, the hydrolysis process was performed by the alkaline method. The material used for examination was spinal cord (medulla) waste from slaughtered animals. It is produced in large amounts as a waste material in the process of extraction of cholesterol and phospholipides from the spinal cords of slaughtered animals. This product is rich in protein with an amino acids physiological composition.

The degree of hydrolysis during the experiments was evaluated through standard determination of the ratio of α -amine and total nitrogen.

Amino acid composition of hydrolysate was examined on an automatic amino acid analyser.

The process diagram of the production of protein hydrolysate in powder form from spinal cord waste is shown in Figure.

The spinal cord waste is hydrolysed in a low-percent hydroxide solution at elevated temperature.

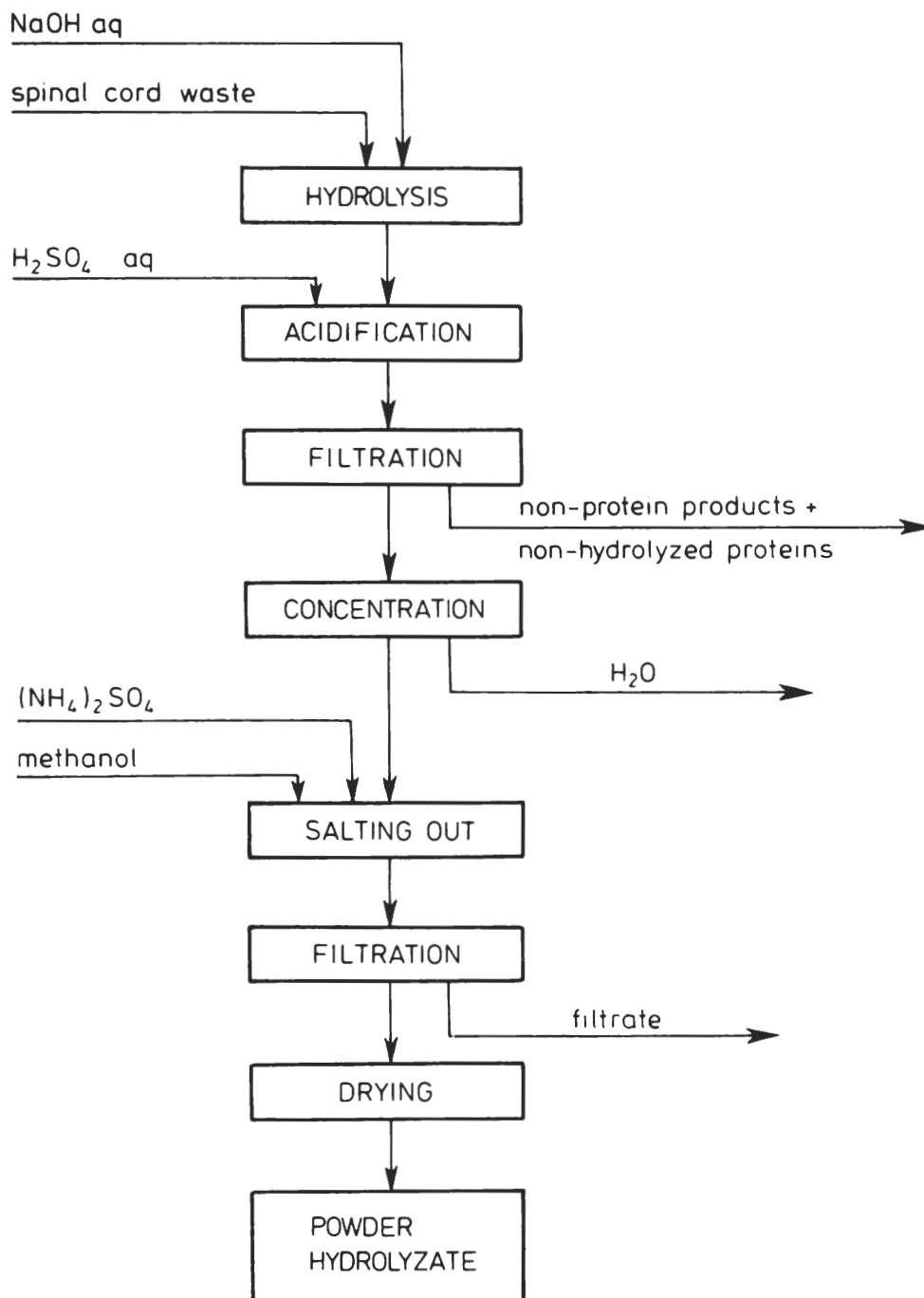


Fig. Process diagram of the production of protein hydrolysate in powdered form from spinal cord waste

Undissolved substances are filtered off. The filtrate is concentrated and then amino acids and peptides are isolated by salting out. As salting agents ammonium sulfate and methanol are used. The precipitate is filtered off and dried. Preparation of powdered hydrolysate seems to be very simple but in practice it can create difficulties as spinal cord waste contains some lipides which are converted into soaps during the hydrolysis causing foam formation in the reaction solution. Filtration after the reaction is also difficult due to gelling.

A final powder hydrolysate contains sodium salts of amino acids and peptides "diluted" with inorganic salts. It is an amorphous, hygroscopic light yellow powder with a weak pleasant characteristic smell. The composition of the protein part of the product is shown in Table.

As can be seen, the powder hydrolysate contains 17 essential amino acids

Table. Content of amino acids in powder hydrolysates from spinal cord waste of slaughter animals

Amino acid	Ratio of amino acid to 100% of proteins (%)
Tryptophan	0.84
Lysine	10.26
Histidine	1.77
Arginine	1.91
Asparagine + aspartic acid	4.20
Threonine	1.96
Serine	2.43
Glutamic acid + glutamine	1.59
Proline	2.05
Glycin	15.02
Alanine	11.38
Valine	9.98
Methionine	7.84
Iso-leucine	4.29
Leucine	12.50
Tyrosine	2.89
Phenylalanine	9.05
Total	100.00

mostly lysine, valine, methionine, leucine iso-leucine and phenylalanine. The hydrolysate can thus be used as an external active agent for skin and hair nutrition in the form of creams, cosmetic milks, lotions and shampoos [6].

Protein hydrolysate from spinal cords has been accepted by the National Institute of Hygiene for use in cosmetic products. The Industrial Chemistry Research Institute has worked out several cosmetic products containing powderized hydrolysate. Some of them have been already examined in the Dermatological Clinic of the Medical Academy with good results.

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HYDROLIZATY BIAŁKOWE W FORMIE PROSZKOWEJ — SUROWIEC KOSMETYCZNY O DZIAŁANIU ODŻYWCZYM

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Streszczenie

Przedstawiono metodę otrzymywania hydrolizatu białkowego w formie proszkowej z odpadu rdzenia kręgowego zwierząt rzeźnych. Produkt ten zawiera prawie wszystkie aminokwasy egzogenne i może być stosowany w kosmetyce jako substancja odżywcza dla skóry i włosów.