Use of dairy raw materials and fat in producing meat products

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Abstract: This article describes the composition and properties of the secondary raw milk – whey, its nutrition and biological value and the necessity of full and efficient use of the principles of non-waste technology is emphasized. Several researchers paid attention to the specific properties of horse fat and its widespread use for medicinal purposes. It was established that the horse fat contains large amounts of polyunsaturated fatty acids, which, depending on the type of feeding and living conditions of animals ranges from 20 % to 25 %. This article is intended for dairy business professionals, specialists in the processing of agricultural raw materials and food agricultural industries of Agro industrial complex (AIC).
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1. Introduction

Dairy industry refers to material and power intensive industries. The expenses on dairy raw material make up more than 80% of the prime cost. Industrial processing of milk on the principles of non-waste technology, full extraction of all components, rational use of intermediates and byproducts, reducing normative losses and exception of unused waste is an important reserve of the developed dairy products' volume growth and increasing of production efficiency. Wasteless technology ensures the exclusion of environmental pollution and, therefore, has environmental significance.

Considering the non-waste technology within the agricultural sector, we should emphasize the necessity of raising the marketability level of milk and preserve its quality over the entire processing chain receiving - industrial processing - storage - use.

Dairy industry has considerable experience in complex industrial milk processing on the principles of non-waste technology with a complete and clised cycle of production.

A significant amount of skim milk and related products is used for feeding livestock. Special value and urgency is attached to production of whole milk substitutes as well as animal feed (dry milk protein concentrate) for feeding young farm animals.

The role of fat in the diet is determined by their high calorie and participation together with proteins in plastic processes. The fat, which is the part of cellular structures, is often called protoplasmic or structural unlike the reserve or backup, which accumulates in the body in the so-called fat depots.

In addition to high calorie, fat biological value is determined by the presence of fat-soluble vitamins (A, D, E) and polyunsaturated fatty acids. Vitamins A and D are contained in the fats of animal origin. They are especially numerous in the liver of fish and marine animals; in vegetable oils vitamin E dominates.

2. Methods. Determination of total chemical composition was performed by a method of weighing plate of a single tested sample. The method consists in sequential determining of moisture according to GOST 9793-74, of fat according to GOST 23042-86, of ash and protein according to GOST 25011-81. The amino acid composition was determined by automatic amino acid analyzer "Hitachi-KLA 38". Fatty acid composition was determined by gas-liquid chromatography method by a chromatograph "Perkin-Elwer".

Contents of macro-and micronutrients were determined by emission spectral analysis . Microbiological evaluation of the product was performed by the methods of bacteriological analysis in accordance with GOST 9958-81, GOST 51448-99 , GOST 50454-92, GOST 50455-92 , GOST 28560-90 , GOST 10444.7-86 GOST 10444.15-94. Sampling for analysis in accordance with GOST 9792-73. The following parameters as the number of mesophilic aerobic and facultative anaerobic microorganisms (MAFAM) in 1 g of the product; the presence of coliform bacteria, the presence of pathogenic Staphylococcus (Staph aureus); the presence of pathogenic microorganismswere determined. The vitamin content was determined by the colorimetric method.

Secondary dairy raw material is also characterized by greater nutritional value. Khramtsov A.G. and other scientists developed theoretical and practical bases of production and processing

secondary dairy raw material. Whey refers to secondary dairy raw material. The main and most valuable components of whey are lipids (milk fat) – 0,2 masses. %, proteins – 0,8 masses. % and carbohydrates (lactose) – 4,8 masses. %, mineral substances – 0,5 masses. % [1].

The biological value of whey is caused by the contents of milk proteins (serumal proteins, casein), carbohydrates, fats, mineral salts, vitamins, micro and ultra microelement and other substances in it which are necessary for normal development and activity of people and animals [2].

Whey also contains protein-free nitrogenous substances in the form of urea, uric acid, hippuric acid , creatine and purine bases (breakdown products of nucleic acids). Carbohydrates are primarily milk sugar (lactose), and its hydrolysis products (glucose and galactose). There is evidence of the presence of pentose (arabinose) and lactulose in small amounts. Some whey protein fractions have immune properties. Minerals are presented in the form of organic and inorganic compounds. Mineral composition of whey is presented by cations of potassium, sodium, magnesium and by anions of phosphoric, lactic, hydrochloric, and sulfuric and carbonic acid [3].

Table 1 shows the chemical composition and properties of the curd and cheese whey. The analysis of table data shows that cheese whey contains more solids and ash. Curd whey differs from cheese whey by containing less nitrogen and lactose, but has more non-protein nitrogen.

The results of the research made by Khramtsov and other scientists (Table 2.3) show that the amino acid composition of the curd and cheese whey and the content of minerals in them are different for each kind of whey. Both kinds of whey differ significantly in content of calcium, phosphorus and potassium. They are mostly contained in the cheese whey, but curd whey is richer in amino acids. Tables 2, 3 present the amino acid and mineral composition of whey.

The content of volatile fatty acids in the curd whey is higher than in the cheese whey. Most dramatically whey samples different by the content of acetic acid: in the curd whey it is 4.2 times more than in the cheese whey (Table 4).

The content of aromatic agents, mg/100 g of dry matter: in curd whey - 68.5, in cheese whey - 48.8. They play an important role in formation of flavor, particularly if the product is subjected to heat treatment. In addition to milk fat curd whey contains phosphatides (lecithin, cephalin, sphingomyelin) and sterols (cholesterol and ergosterol).

Polanski K. K. and other scientists have studied physical and chemical properties and structure of curd whey. It has been determined that the density of whey ranges (from 1.021 to 1.023) kg/m, and pH ranges from 4.5 to 5.0.

The analysis of literature data show that in food industry preference in application of cheese whey and curd whey is given to the latter by virtue of its balanced chemical composition and properties.

Technological, economic and nutritional physiology aspects [3,4,5,6] should be considered at the same time.

Whey has healing properties as being a milk product, in accordance with the teachings of Pavlov, it affects the digestive, nervous, cardio-vascular system and resistance of the organism to diseases [7,8,9].

Table 1 - Chemical composition of whey

Index	Whey	
	Curd	cheese
Mass fraction of water,%	95,58	93,30
Mass fraction of solids,%	6,42	6,70
Density at 15 ^{0}C	1,024-1,025	1,026
Protein, mg / g	0,53	0,60
Total nitrogen mg / g	1,19	1,30
NPN (non-protein nitrogen), mg / g	0,34	0,34
Protein nitrogen, mg / g	0,85	0,95
Soluble nitrogen	1,18	1,30
Mass fraction of NPN to total nitrogen, mg %	28,60	26,20
Mass fraction of lactose, %	4,40	5,00
Mass fraction of ash, %	0,60	0,52
pH	4,7	6,1

Table 2 - The amino acid composition of whey

Amino Acids, mg /100 r	Whey	
	Curd	cheese
valine	43,1	46,2
isoleucine	38,8	49,8
leucine	85,1	81,8
lysine	72,3	71,6
methionine	14,9	13,8
threonine	40,7	50,2
tryptophan	15,5	16,3
phenylalanine	27,1	24,5
alanine	33,2	37,1
arginine	18,6	18,1
aspartic acid	80,0	81,8
histidine	15,5	13,1
glycine	16,2	16,8
glutamic acid	139,1	140,1
proline	40,8	48,4
serine	37,7	40,8
tyrosine	23,2	19,0
cysteine	15,4	9,6

Table 3 - Contents of the main minerals in whey

Minerals, mg/100 g	Whey	
	curd	cheese
Ash (total)	0,59	0,52
Calcium	86,00	22,50
Phosphorus	63,00	42,50
Magnesium	8,90	5,8
Sodium	40,00	35,00
Potassium	133,00	109,00

Table 4 - The volatile fatty acid in whey

Volatile fatty acids, mg/100 ml	Whey	
	Curd	cheese
formic	1,04	1,68
acetic	3,70	13,96
oil	0,26	0,37
propionic	-	trace

Several researchers paid attention to the specific properties of horse fat and its widespread use for medicinal purposes. It was established that the horse fat contains large amounts of polyunsaturated fatty acids, which, depending on the type of feeding and living conditions of animals ranges from 20 % to 25 %. According to Anashina N.V. the fat of a horse under the age of three years, has the highest amount of polyunsaturated fatty acids and has a high iodine value. It has been established that horse fat storage period without changing the original properties at room temperature is 3-5 days in the light, in the dark room - 90 days without air - 150 days, at 0^0 C in the dark - 180 days. Adding of conventional antioxidants to fats increased the terms of their storage by 2-4 times depending on the used antioxidant.

The content of linoleic and linolenic acids in the horse's fat is many times greater than in beef and pork fat. This particular feature of horse fat was the basis for the identification of horse meat as horse meat can be distinguished from other kinds of meat by a significant content of linolenic acid.

Unsaturated fatty acids are essential for the organism to be involved in the formation of important compounds and structures that are essential for the normal functioning of the body. These acids are included in the various phospholipid membranes. Essential fatty acids act as precursors for the formation of an entire group of biologically active

substances - prostaglandins. Prostaglandins affect the cardiovascular system, smooth muscles.

According to the formula of balanced nutrition ratio between PUFA, monounsaturated fatty acids and saturated should be - 1:6:3. A team of researchers calculated the actual diet of the population in which linoleic, linolenic and arachidonic acids were, respectively: 9.8, 0.5 and 0.48 g [10,11].

Fats are also good solvents of fat-soluble vitamins A, E and K [12, 13,14].

Raw horse fat has a peculiar, pleasant odor. Consistency of crude fat is soft, it melts in the palm of your hand. Its color ranges from pale yellow to yellow. Fatty tissue after cooking has a pleasant smell and taste, its use, even in its pure form does not cause feelings of disgust. The fat of the withers (stings), lumbar and sacral has especially high taste quality [15,16,17].

Horse fat is also characterized by the content of cholesterol. According to K. Petrovsky (1965) beef fat contains 75 mg%, mutton fat - 29 mg% and pork fat - 74,5-126 mg% cholesterol. The cholesterol content in the horse fat is of biological interest to technologists and food producers in the creation of health-care products.

3. Conclusion.

Plural conclusions Thus, from the above literature data it can be concluded that in creating products for dietary food the aim of achievement of their specific biological and nutritional value through the efficient use of protein, fat components of meat, raw milk in combination with products of plant origin should be considered the main.

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