

Materials of Conferences

**DEVELOPMENT OF TECHNOLOGY TO
PRODUCE NEW SORTS OF CANNED
SEAFOOD APPROPRIATE FOR INFANT
NUTRITION**

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Unlike an adult, an infant is characterized by a rapid growth of the organism and intensive metabolism. Therefore, the efficient nutrition system for infants should provide not only for availability of sufficient food, but also for its specific qualitative composition, appropriate to the gastrointestinal enzymatic potential and metabolic processes changing while the baby shifts to new food, develops physiologically, and grows.

Analysis of Russian baby food market reveals predominance of imports (69%). As to the baby food range, canned fish only makes 3%. The problem of manufacturing the baby supplement foodstuff based on the fish raw materials is not solved yet, because the only national producers of the baby canned seafood such as *Lavr-K, Ltd., Faustovo* (Federal Infant Food Factory), *Teledisk Holding Moscow Mill* only meet the demand by 2%.

The fishing industry could be a potential source of raw materials for production of baby foods with a high nutritional and biological value, because fish provides vital proteins, key amino-acids, unsaturated fatty acids, and microelements, while containing few connective tissues and producing a marked lipotropic effect. In production of the baby canned fish food products, the raw materials, semiproducts, and other materials should meet the requirements set in the current standards and specifications (e.g. SanPiN 2.3.2.1078-01 "Hygienic safety and nutritional value of foodstuff", SanPiN 2.3.2.1940-05 "Children catering", etc.) and be certified by Rospotrebnadzor for production of baby foods.

Supplies are an important factor in development and manufacture of new goods. Russia has developed guidelines on efficient use of raw fish and seafood in production of the baby canned food products which take into account the seasonality and storage life of such raw materials. The most appropriate sorts of raw fish and seafood materials for production of canned fish-and-vegetable food include frozen or chilled fish, as well as frozen skinless fillets of such fish species as cod, seabass, pink salmon, trout, hake, carp, sander, silver carp, Pacific mullet, and sea sander. These fish species have a high content of proteins and essential macro- and micronutrients and are of a high biological value.

Identifying content and balance of macro- and micronutrients in raw materials and finished baby

foods, we have used indexes of the nutrient adequacy [1]. The list of such indexes for manufacturing foodstuff for babies under twelve months has been made on a popular belief that the standard food of healthy infants is breastmilk. Therefore, the standard values of nutrient adequacy of foodstuff for babies under twelve months correspond to those characterizing ripe breastmilk. Assessment of the fatty acid balance is made with a criterion which is a specific version of the general criterion of the alimentary adequacy suggested by academicians N.N.Lipatov and A.B.Lisitsyn; this modified criterion describes the whole set and fractions of total mass of saturated, monosaturated, and polyunsaturated fatty acids in the fat stock and finished product [2]. While the child grows he needs more and more new food supplements, therefore, identification of the nutrient adequacy of food products for infants older than twelve months is based on hypothetical quasi-standards of the amino-acid and fatty-acid content of the food for the age group from eighteen months to 2^{1/2} years suggested by N.N.Lipatov [3].

Russian specialists have developed a broad variety of recipes of canned mashed and pastelike food complexes for babies: fish-and-vegetables, fish-and-cereals, fish-and-cheese products, etc. The fish component makes 10-16 % of the total weight of such canned food. Other ingredients are: various fine-cut vegetables with low content of vegetable fibre (marrow squash, cauliflower, broccoli, carrot, pumpkin, potatoes, green pea, and spinach), cereals (semolina, oatmeal, pearl barley, peeled barley, rice, maize, and buckwheat); home cheese and flavours. The finished product is ready-to-eat food, i.e. garnished fish, which satisfies the infant's demand for nutrients. The list of manufactured canned fish-and-vegetable products includes *inter alia* "Marrow squash with fish and rice", "Fish with carrots, home cheese, and buckwheat", "Marrow squash with fish and maize", "Fish with vermicelli and carrots", "Fish-and-vegetable stew", "Fish and potatoes", "Fish and broccoli", and "Fish and cauliflower".

Additionally, Russian specialists have developed recipes of baby canned fish without vegetable components. This line is especially interesting as pediatricians often recommend to give a baby monoprodukt when he tastes meat or fish for the first time. This allows mothers to identify the baby's reaction to a new food component. Therefore, canned monoprodukts are in high demand.

There are recipes of canned fish with the fish content of 45-53 %. The main raw materials are such fish species as hake, sea sander, angelfish, cod, pink salmon, and seabass, while such additives as rice-flour or buckwheat do not exceed 3%.

There are specific requirements to baby foods such as dispersion and thickness, because a baby un-

der twelve months is hardly able to ground food in his mouth, and his digestive system is not morphologically mature and fully functional yet. Knowledge of rheological behaviour of the disperse systems allows us to satisfy these requirements. We have studied rheological properties of canned fish-and-vegetable food and canned fish monoproducts to identify the effect of various factors on their stability. It is found that the optimal thickness characterizes systems with the viscosity values in the range of τ_s , Pa 350 – 900, shear stress η^0 , Pa·c 250 – 700, and the particle size of 15 - 75 μm . The specified values are "recommended parameters", which characterize the optimal thickness of the product and are used to monitor the quality under production conditions.

In order to broaden the baby food range, we make researches to develop recipes of fish soups. It is well known that soups are traditionally the main course in our country. The aim of it is to prepare the child's digestive system to protein food. Soups stimulate appetite and activate the gastric juice secretion. Fish and meat soups have a marked effect on the secretion due to the high content of extractive substances (e.g. amino acids, purin bases, etc.). there are special nutrient-technological recommendations on development of soups appropriate to the needs of young babies: the protein fraction should make 3-5 g of total mass, while dry substances in a pureed soup should make 10-15% (in traditional soup with components chopped into small bits – 5-15%), content of amino acids and fatty acids should correspond to the physiological needs of infants. According to standards set by the Federal Research Institute of Nutrition (RAS), pureed soups are introduced when a baby has attained twelve months and traditional soups/ soups with fish balls could be given to a baby from eighteen months onwards.

Our studies allowed us to develop six recipes of soups with optimal content of amino acids and fatty acids for different stages of development of the infant digestive system. The soups have good organoleptic parameters and satisfy the federal recommendations.

Introduction of the developed technologies for production of new sorts of baby canned food products will contribute to provision of babies with foodstuff appropriate to their physiological needs for nutrients and energy.

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UNLOADING GRAIN FROM BUNKER BY SPIRAL-SCREW CONVEYOR

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In bunkers spiral-screwed conveyors are applied to storage of grain at unloading in casings, and also without casings. For reduction of capacity of a drive above a spiral stabilizing plates at various height from it can be installed.

By preliminary researches it is established that grain is unloaded by spiral-screwed working body from that site of the bunker which is most removed from unloading windows. It is necessary to explain the reason of this phenomenon to that the material a screw surface of a spring moves more actively, than the material which is being above the given layer, not having thus of free space for the expiration.

Grain acts in space of a rotating spring and mixes up in an axial direction up to unloading apertures. Speed of movement of layers of grain is not identical and as a result movements of a grain stream the active layer which reason is force of internal friction is formed.

Proceeding from complex internal essence of a bulk material which separate particles are bodies, and all weight has aspiration to current, for the description of behaviour of a "current" loose material it is convenient to assimilate to its some viscous liquid with average, volumetric density and factor of viscosity (internal friction). On the basis of the accepted hydromechanical model dynamics of a loose body can be described the equations similar to equations Navie - Stoks for a viscous liquid.

The received analytical dependences allow to find distribution of speeds at movement of a grain material and to explain features of its unloading from the bunker. Also it is received, that submission of the spiral-screwed conveyor at an unloading of grain from the bunker without a casing in comparison with a casing increases due to an active layer almost twice at the same parameters of a spring and angular speeds of its rotation.

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PROBLEMS OF SECONDARY ENERGY RESOURCES SALVAGING AT PETROCHEMICAL INDUSTRY ENTERPRISES

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For petrochemical industry enterprises the main energy resources use efficiency upgrading direc-