

# THE POSSIBILITIES OF APPLICATION OF SEAL BLUBBER OILS IN PRESCHOOL AND SCHOOL AGE CHILDREN NUTRITION

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Lipids provide about 30% of organism energy and are of great importance for the growth, development and metabolic processes of a child. They are the source of fat-soluble vitamins and polyunsaturated fatty acids (PUFAs), which are an important essential factor of nutrition. Omega-6 and omega-3 PUFAs play a central role in the normal development and functioning of the brain and central nervous system. Various vegetable oils such as sunflower and corn oils are sources of  $\omega$ -6 PUFAs, whereas omega-3 PUFAs (eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids in particular) are only found in fish and marine mammals oils.

According to the norms of physiological requirements the intake of fat for children at the age from 1 to 14 y.o. should be from 40 to 80 g/day with 5–10% of PUFAs from this quantity. The dietary amounts of  $\omega$ -6 and  $\omega$ -3 fatty acids are important: the recommended ratio is around 5÷10 : 1. The best way to provide optimal fatty-acid balance in nutrition of preschool and school age children is the enrichment of their diet with oils of marine species. We suggest to use seal blubber oil in a balanced composition with sunflower oil as various dressings and sauces for salads.

The seal oil, made by cold extraction technology, developed in laboratory of fodder products and biologically active substances, has high quality indicators and less expressed smell in comparison with fish oil. The analysis of physicochemical indicators of oil (Table 1) has shown its conformity to requirements of GOST 8714–72 and SanPiN 2.3.2.1078-01.

**Table 1. Seal oil physicochemical parameters**

Indicator	Unit of measure	Result of the analysis	Characteristic and norm
Color of oil		light yellow	from yellow to light brown
Oil transparency		transparent	transparent
Saponification number	KOH	184	not normalised
Mass concentration of unsaponifiables	%	0.4	2.5
Peroxide number	%J <sub>2</sub>	0.09	10
Mass fraction of moisture	%	0.18	0.5
Acid number	mg KOH/g	0.67	4
Mass fraction of non-oily admixture	%	0.14	0.2

The results of study of fatty acid composition of seal blubber oil are presented in Table 2.

**Table 2. Fatty-acid composition of seal blubber oil, %**

Fatty acids	Acids content
C 14:0 myristic acid	3.52
C 16:0 palmitic acid	7.55
C 16:1 palmitoleic acid	24.85
C 16:3 hexadecatrienoic acid	1.57
C 18:0 stearic acid	2.16
C 18:1 oleic acid	22.81
C 18:2 linoleic acid $\omega$ -6	1.05
C 18:3 linolenic acid $\omega$ -3	0.95
C 18:4 octadecatetraenoic acid	0.30
C 20:1 eicosatic acid	2.01
C 20:4 arachidonic acid $\omega$ -6	0.15
C 20:5 eicosapentaenoic acid $\omega$ -3	10.39
C 22:1 docosenic acid	1.05
C 22:5 docosapentaenoic acid	6.03
C 22:6 docosahexaenoic acid $\omega$ -3	8.57
Sum of saturated acids	13.23
Sum of monounsaturated acids	50.72
Sum of polyunsaturated acids	29.01

It was shown that more than 18% of seal lipids composition is presented by biologically active PUFAs (eicosapentaenoic and docosahexaenoic acids).

Refined deodorized sunflower-seed oil destined for children nutrition was used for manufacturing of compositions with the seal oil. Compositions were designed in laboratory conditions and contained sunflower-seed oil and seal oil in the ratio 1:1, 1:2, 2:1, and 5:1. Taking into account that the vegetable oil expense for salads dressing makes 3,5 g for the portion, degree of satisfaction of daily requirement of children in PUFAs when using salad sauce with the seal oil in various ratios has been defined (Table 3).

**Table 3. Polyunsaturated fatty acids content in salad dressing with seal oil, g**

Indicator	Average required daily intake for the children from 3 to 7 y.o.	Content in 1 portion with the ratio sunflower seed oil : seal oil			
		1:1	1:2	2:1	5:1
Fat	60	3,5	3,5	3,5	3,5
Saturated fatty acids	-	0,47	0,47	0,48	0,48
PUFAs	10–20	1,55	1,37	1,73	1,91
$\omega$ -6	8–18	1,05	0,72	1,39	1,72
$\omega$ -3	1,6–2,0	0,35	0,46	0,24	0,12
Ratio $\omega$ -6/ $\omega$ -3	5:1 ÷ 9: 1	3:1	2:1	6:1	14:1

The optimal ratio between sunflower-seed oil and the seal oil is 2:1 since thus the requirement in polyunsaturated fatty acids is satisfied on 12% with a ratio of  $\omega$ -6 :  $\omega$ -3 equal 6 that is most near optimal. The degustation evaluation has shown that the composition from sunflower-seed oil and the seal oil in the ratio 2:1 had good organoleptic characteristics.

To improve the composition flavouring characteristics CO<sub>2</sub>- extract of fennel in quantity of 0,1% to weight of the sample was offered to use.

On the basis of the carried out researches following requirements to quality and safety indicators of the seal oil and salad dressing on its basis, intended for various groups of children's and dietary products have been offered (Table 4).

**Table 4. Quality and safety indicators of seal oil and salad dressing on its basis**

Name of an indicator		Seal oil	Salad dressing from sunflower seed and seal oils
<b>Toxic elements, mg/kg</b>			
Lead		0,2	0,2
Arsenic		0,1	0,1
Cadmium		0,1	0,05
Mercury		0,1	0,05
<b>Pesticides, mg/kg</b>			
DDT and its metabolites		0,1	0,1
Hexachlorocyclohexane and its isomers		0,01	0,01
Polychlorinated biphenyls		2,0	1,0
<b>Radionuclides, Bq /kg</b>			
Caesium-137		60	60
Strontium-90		80	80
<b>Oxidising spoilage indicators</b>			
Saponification number, mg KOH/g, less then more		2,0	1,5
Peroxide number, mmole O <sub>2</sub> /kg, less then		5,0	4,0
Contents of PUFAs, %, not less then		25	35
<b>Microbiological indicators</b>			
Quantity of mesophilic aerobes and facultative anaerobes, CFU /g, less then		500	100
Weight of a product, g. in which are not supposed	Colon bacillus bacteriums (coliform)		1,0
	S. aureus		1,0
	Pathogenic, including salmonellas		25
	Mould		20
	Yeast		1,0

Biological value and influence of the seal fat and mixture on its basis on indicators of lipid metabolism of experimental animals has been studied. Tests were carried out on white male rats of Vistar line with initial weight of a body 100±5 g. Depending on a diet the animals were divided into 3 groups (each of 10 rats) fed by:

- the seal oil;
- the salad mixture (the seal fat : sunflower-seed oil with a ratio 2:1);
- the control (the lard + sunflower-seed oil 1:1).

At the end of the experiment the animals were subjected to postmortem examination of internal and determination of biochemical and physiological indicators. It was established that the seal oil and the salad mixture did not exert negative influence on the vital functions of the experimental animals.

Inclusion of the seal oil in the diet of experimental animals reduced the cholesterol level in the blood, accompanied by the increase of the general cholesterol in animals' liver. This dependence was less expressed in case of salad mixture.

The contents of  $\omega$ -3 fatty acids increased with simultaneous decrease of  $\omega$ -6 fatty acids in liver and erythrocytes of experimental animals under the influence of the seal fat in comparison with the control. The character of these changes was less expressed in the group of the animals fed by the salad mixture.

Erythrocytes hemolytic resistance of rats fed by the salad mixture was increased in comparison with the same of the rats on seal oil diet that testifies the positive influence of the sunflower-seed oil addition in a fatty composition.

In conclusion we consider that inclusion of salad dressings with seals oil in the diet of preschool and school age children, as the balanced product, which can satisfy the daily requirements of the children in the essential fatty acids is highly perspective.

## CONCERNING THE SANITARY AND MICROBIOLOGICAL TESTS OF MUSSELS FROM THE WHITE SEA

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In the last decade the issue of studying sanitary and microbiological condition of mussels from the White Sea, which are excellent foodstuff, is becoming urgent, as well as the influence of the mussels on the coastal areas of water.

During the research much attention was paid to studying vibriosis, a dangerous bacterial disease of fish and hydrobiontes in sweet, salty and sea water.

The causative agent of vibriosis in warm water is the culture of strain – *Vibrio anguillarum*, the causative agent of vibriosis in cold water or the “Hitra” disease is *Vibrio salmonicida*.

During the research classical microbiological and serological methods were used.

Sampling was made in accordance with State Standard Specification 7631–85 “Fish, sea mammals, sea invertebrates and products of their processing. Rules of acceptance, organoleptic methods of quality rating, methods of sampling for laboratory research” and in accordance with “Methodological recommendations concerning veterinary and sanitary rating of mussels, which are used in food industry”.

Sanitary and microbiological researches have been done in accordance with State Standard Specification 51921–2002 “Foodstuffs. Methods of isolation and identification of *Listeria monocytogenes* bacteria”, in accordance with the Instructions of sanitary and microbiological control of mussels in areas of their breeding and at processing enterprises and of cleaning mussels from bacterial pollution (Puchenkova et al., 1988) and in accordance with the requirements of Sanitary Rules and Standards 2.3.2.1078-01 for alive mussels.

A Russian agglutinating serum, obtained by hyperimmunization of rabbits with antigen from *Vibrio anguillarum* strain, has been used for diagnosing the causative agent of vibriosis in warm water, for diagnosing the causative agent of vibriosis in cold water *Vibrio salmonicida* strain has been used.

In 1983 scientific and production plantation in Sonostrov's area of the Kandalakshskiy Bay of the White Sea was brought into operation.

Since 1997–2002 "VNIRO" researched sanitary and epizootic condition of *Mytilus edulis* mussels in that area (Melnikova, Bezgachina, Kozitskiy, 1999; Melnikova, Bezgachina, Kozitskiy, 2000; Melnikova, Bezgachina, Kozitskiy, 2000, Bezgachina, Kozitskiy, Melnikova, Storozhuk, Sokolovskaya, 2003).