National University of Pharmacy

Department of chemistry of natural compound and nutriciology

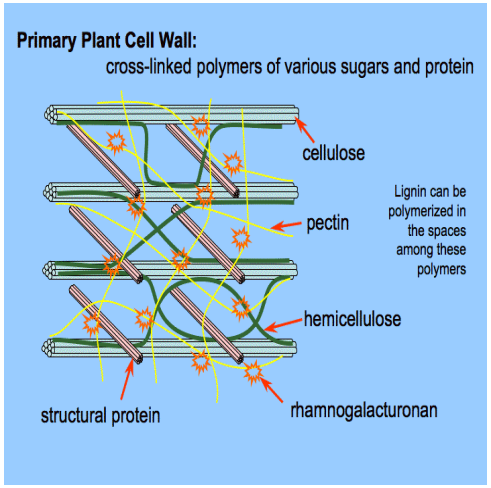
LECTURE on NUTRICIOLOGY

INGRIDIENTS of DIETARY SUPPLEMENT (2nd part)

Kharkov 2020

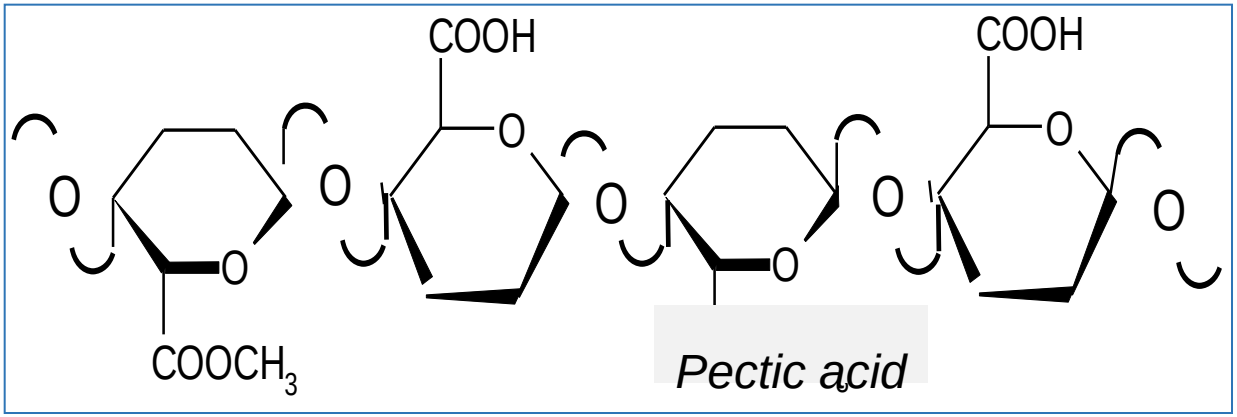
Plan

- Pectin
- Inulin
- β-Glucan
- Probiotics
- Lactulose
- Omega acids
- Fish oil
- Lecithin



Pectin

- Pectins are contained in the cells of all plants (especially juicy fruits and root vegetables) and some algae. The insoluble pectin (protopectin) included in the primary cell wall and intercellular substance, soluble pectin is contained in cell sap.
- Pectin is produced from waste fruit juice (**apple, lemon, lime, orange, tangerine**), sometimes from the waste products of **beet** sugar or sunflower oil by acid extraction and alcohol precipitation.

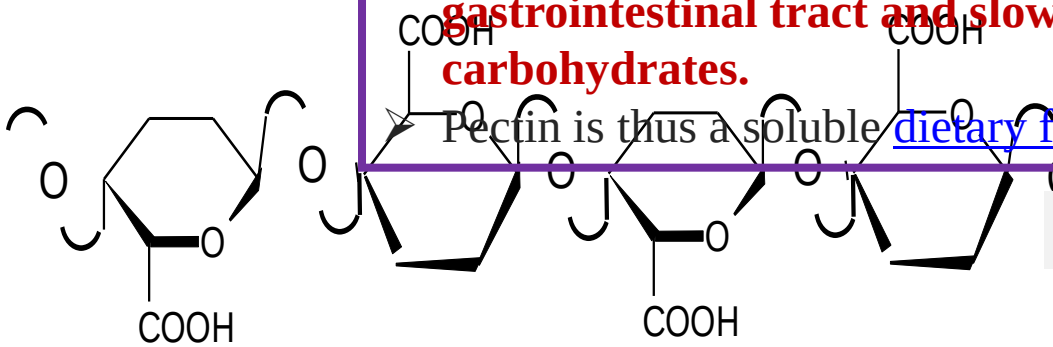


Pectic acid

PECTIN

- **Pectin** is a structural heteropolysaccharide contained in the primary cell walls of terrestrial plants. It is produced commercially as a white to light brown powder, mainly extracted from **apple, citrus fruits or beet-root**, and is used in food as a **gelling agent**, particularly in jam and jellies. It is also used in
  - **fillings,**
  - **medicines,**
  - **sweets**,
  - as a stabilizer in fruit juices and milk drinks, and
  - as a **source of dietary fiber.**

- Pectin is a natural part of the human diet, but does not contribute significantly to nutrition.
- The daily intake of pectin from fruits and vegetables can be estimated to be around 5 g (assuming consumption of approximately **500 g fruits and vegetables per day**).
- In human digestion, **pectin binds to cholesterol in the gastrointestinal tract and slows glucose absorption by trapping carbohydrates.**
- Pectin is thus a soluble dietary fiber.

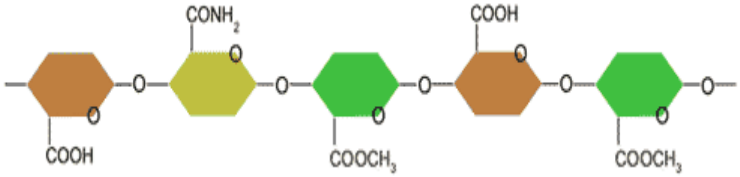


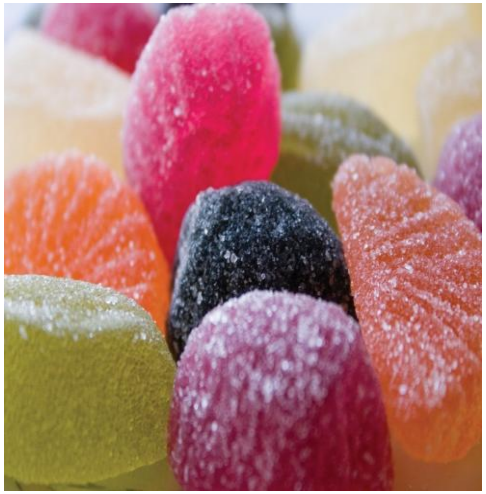
пектовая кислота

PECTIN

Pectin:

- **Apple and citrus**
- **High- esterified**
- **Low- esterified**
- **Low-esterified amidated**





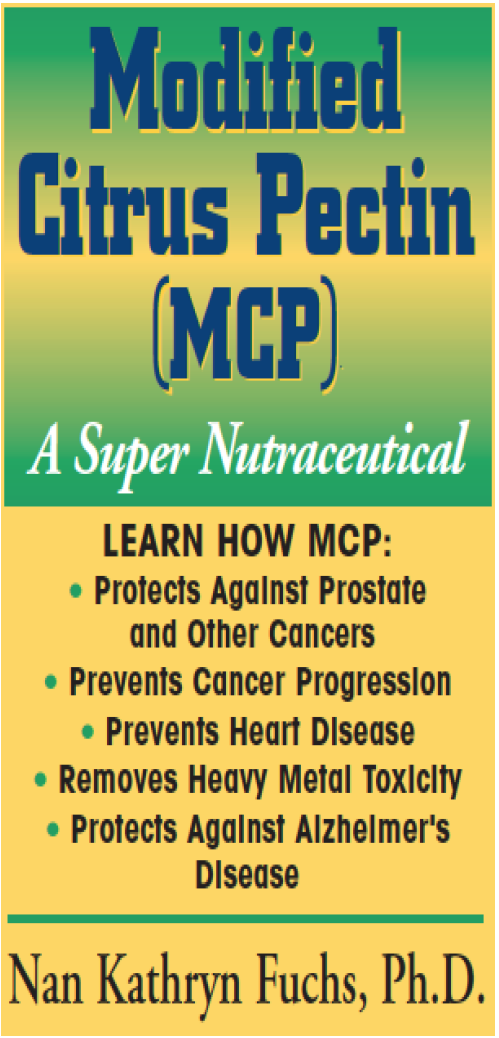
Pectin's effects

In medicine, pectin increases viscosity and volume of stool so that it is used against constipation and diarrhea.

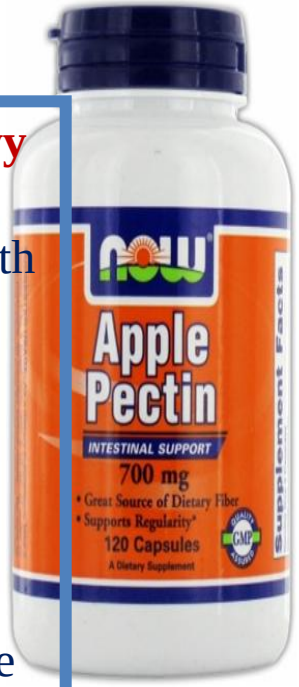
Pectin is also used in wound healing preparations and specialty medical adhesives, such as colostomy devices.

Because part of the fiber in pectin is fat soluble, it has been used anecdotally to mask THC metabolites normally excreted in urine by saturating the lipid carriers which would normally pass the metabolites.

Pectin is also used in throat lozenges as a demulcent.
In cosmetic products, pectin acts as stabilizer.



PECTIN FUNCTIONS



The complexing ability of the pectin based on its **interaction with ions of heavy and radioactive metals**. Because of this pectin, it is included in the diet of individuals in environments contaminated with radionuclides, and in contact with heavy metals.

The optimal prophylactic dose of pectin is 4 g per day, and in conditions of radioactive contamination - at least **15-16g.**

Pectins have been used in the treatment of **acute intestinal infections**, growth inhibition of microorganisms occurs within 2 hours or more. The most favorable biocenosis composition of the microbial flora in the gut is achieved by the addition of apple pectin.

Pectins enhance the effect of **anti-TB drugs.**

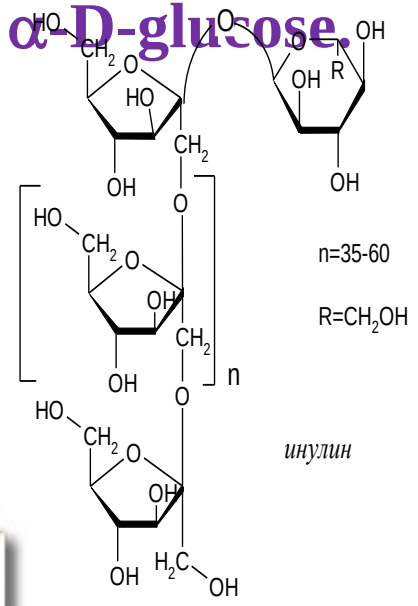
Low methoxyl pectin contribute to accelerated excretion of radioactive substances. Pectin absorbs more **lead acetate than** activated carbon.

Pectin increases their detoxifying effect in **liver diseases**.

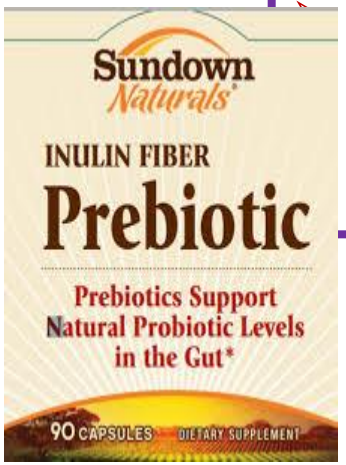
Eliminates constipation, cleanses the body, improves liver function.

INULIN

- Inulin is a linear polysaccharide, where residues β-D-fructofuranose 1,2 glycosidic bonds are linked, the polymer chain ends inulin nonreducing residue α-D-glucose.
- Plant sources:
- Jerusalem artichoke,
- Dandelion
- Artichoke,
- Garlic,
- Chicory



инулин



Artisho

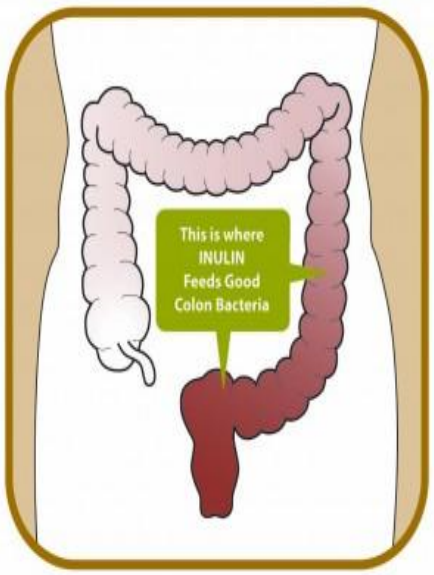
Content inulin in plants

plants	inulin , %
Jerusalem artichoke	14-19%
chicory	15-20%
garlic	9-16%
leek	3-10%
fresh onion	2-6%
barley	0,5-1%
rye	0,5-1,5%
banana	0,3-0,7%

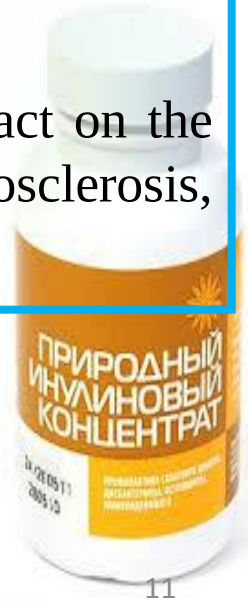
Top 10 food containing prebiotics

Food	content by weight
Raw Chicory root	64.6 %
Raw Jerusalem artichoke	31.5 %
Raw Dandelion greens	24.3 %
Raw Garlic	17.5 %
Raw Leek	11.7 %
Raw Onion	8.6 %
Cooked Onion	5 %
Raw Asparagus	5 %
Raw Wheat bran	5 %
Raw Banana	1 %

INULIN

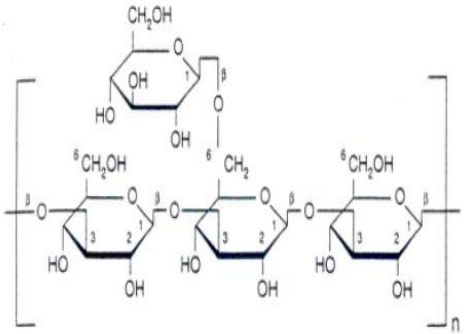


- Use of inulin **reduces blood glucose, cholesterol and triglycerides**,
- It is able to **bind harmful substances**, promotes renewal of damaged vessel walls,
- It improves blood circulation,
- It normalizes metabolism.
- Supporting the livelihoods of bifidoflora it prevents the growth of Salmonella and Colibacteria.
- Inulin exhibit immunomodulatory, antitumor and anti-inflammatory activity.
- Inulin-containing foods have a positive impact on the regulation of metabolism in diabetes, atherosclerosis, and obesity.



Ingredients of DS and functional foods

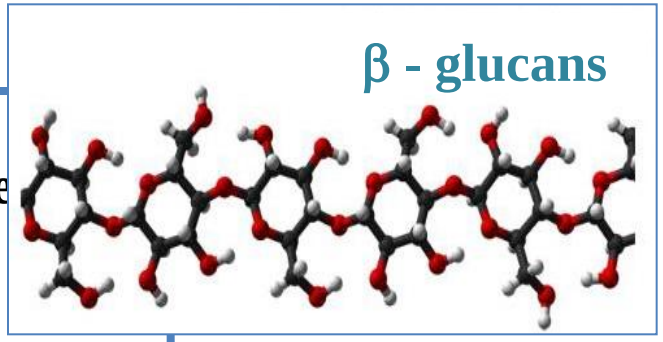
Ingredients	Sources	Effects
Food fibers		
Insoluble fibers	wheat bran	Reducing the risk of breast cancer and colon
Beta glucan	oat, mushrooms	Reducing the risk of cardiovascular disease
Soluble fibers	Fruits, vegetables	Reducing the risk of cardiovascular disease

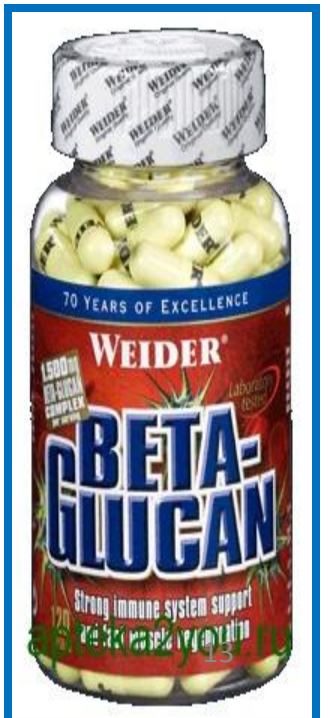


β-1,3; β-1,6 glycosidic linkage

β - glucans

- **ACTIVITY β-GLUCAN:**
- **As a result, a number of research and testing have proved the**
- **following:**
- **Beta glucan:**
- **Antitumor action weighty support the immune system during the treatment of various forms of cancer**
- **· Support the immune system against viral, bacterial, fungal and parasitic diseases, as well as physical or mental stress**
- **· Helps to selectively reduce the LDL (cholesterol, triglycidyl)**
- **· Has radioprotective action**
- **· Has antioxid**





Ingredient of DS and functional foods

Ingredients	Sources	Effects
Prebiotics, probiotics		
Fructo-oligo-saccharides	Artichoke, onion, Jerusalem artichoke	Normalization functions of the gastrointestinal tract
Lactobecterias	Yogurt, dairy products	Normalization functions of the gastrointestinal tract
Saponins	Soybeans, soy products	Reduced cholesterol

Preparations of probiotics, registered in Ukraine

Name	Content	Medicinal form
Monoprobiotics(one species of microbes certain strain)		
Lactocaps Lactobactorin	Lactobacillus Plantarum или Lactobacillus Fermentum	Capsules Lyophilized powder in vials
Probovit	L. Plantarum (споры)	Capsules
Colibacterin	E. coli M-17	Lyophilized powder in vials
Probiphor	Bifidobacterium Bifidum I	Powder particles of activated charcoal kernel
A-Bacterin	Aerococcus viridans 167	Lyophilized powder in vials
Biphidumbacter in Biphidocaps	Bifidobacterium Bifidum I	Capsules Lyophilized powder in vials
Enterozhermina	Споры Bacillus clausie	A suspension for oral administration

продолжение

Name	Composition	Medicinal form
Polyprobiotiks (containing two or more strains of the same microbial species)		
LAcidophyll	Lactobacillus acidophilus Lactobacillus rhamnosus	Capsules
Lactovit	Lactobacillus sporogenes Bacillus coagulans	Capsules
Combined (contain microbes of different species and strains)		
Biphicol	Escherichia coli M-17 Bifidobacterium Bifidum I	Lyophilized powder in vials
Linex	Bifidobacterium infantis Enterococcus faecium Lactobacillus acidophilus	Capsules
Biphi-form	Bifidobacterium longum Enterococcus faecium (лактулоза)	Capsules

продолжение

Name	Composition	Medicinal form
Saccharomycetes		
Enterol	Saccharomyces boulardii	Capsules, powder
Bacillary		
Subtilin	Bacillus subtilis 4759	Dry weight in vials

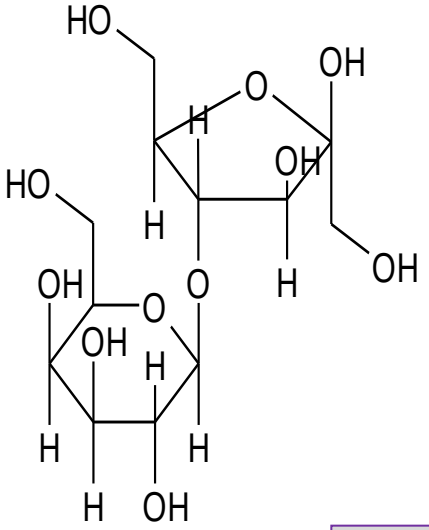
Top 3 Immunity Benefits of Probiotics

1. Balance Your System
2. Fight Bad Bacteria
3. Increased Energy

Other Amazing Benefits of Using Probiotics Include:

- Aid in digestion
- Improve resistance to allergies
- Fight yeast & fungal infections
- Prevent constipation & diarrhea
- Help fight urinary tract infections
- Improve liver function
- Improve absorption of nutrients
- Alleviate bloating & heartburn
- Prevent skin problems
- Reduce accumulation of cholesterol & plaque in the arteries
- Improve lactose digestion
- Improve tolerance to antibiotics
- Maintain a balanced pH level
- Help maintain hormone balance
- Assist detoxification
- Enhance mental clarity
- Help regulate activity of the bowels
- Inhibit formation of tumors
- Enhance calcium metabolism, helping to prevent osteoporosis

+ Many More



Lactulose DS

- Lactulose (4-O-beta-D-galactopyranosyl-D-fructose) - disaccharide consisting of galactose unit and fructose molecules, **synthetic stereoisomer lactose** - lactose. Not found in nature.
- Lactulose is used as an **osmotic laxative drug**, stimulating peristalsis, and is used for **constipation, hepatic encephalopathy**, as well as in the diagnosis of disorders of the gastrointestinal tract

Preparations prebiotics, registered in Ukraine

Name	Composition	Medicinal form
	Metabolic	
Dufalac	Lactulose	syrup
Lactubat	Lactulos	syrup
Normase	Lactulos	syrup
Lactulax	Lactulos	Powder
Lactulose	Lactulos	syrup

Ingredients of DS and functional food

Ingredients	Soureces	Effects
Fatty acids		
Fatty acids family omega ω -3, 6, 9	Fat fish of cold seas	Reducing the risk of cardiovascular diseases, improving the function of the nervous system and vision
Conjugated linoleic acid = CLA	Cheese, meat products	Reducing the risk of malignancies

Omega fatty acids

Linoleic	$CH_3–(CH_2)_4–(CH=CH–CH_2)_2–(CH_2)_6–COOH$	18:2n-6
α–Linolenic	$CH_3–CH_2–(CH=CH–CH_2)_3–(CH_2)_6–COOH$	18:3n-3
γ–Linolenic	$CH_3–(CH_2)_4–(CH=CH–CH_2)_3–(CH_2)_3–COOH$	18:3n-6
Digomogamma-Linolenic	$CH_3–(CH_2)_4–(CH=CH–CH_2)_3–(CH_2)_5–COOH$	20:3n-6
Arachidonic	$CH_3–(CH_2)_4–(CH=CH–CH_2)_4=(CH_2)_3–COOH$	20:4n-6
Docosahexaenoic	$CH_3–CH_2–(CH=CH–CH_2)_6–CH_2–COOH$	22:6n-3

Omega acids- containing foods

- FISH SOURCES:
- 1. Mackerel
- 2. Salmon?
- 3. menhaden (American herring)
- 4. Caviar
- 5. Sardines
- 6 . "White" fish (cod, etc.)
- 7. Anchovy
- 8. Herring
- 9. Tuna
- 10. Trout
- 11. Catfish
- 12. Flounder
- 13. Redfish
- 14. Halibut
- 15. Ruff
- 16. snappers
- 17. Shark
- 18. Swordfish
- 19. Shrimp
- 20. Krill
- 21. Cod
- 22. Side
- 23. Oysters
- 24. Scallop
- 25. Crab
- 26. Omar
- 27. Haddock
- 28. Mussels
- 29. Shad

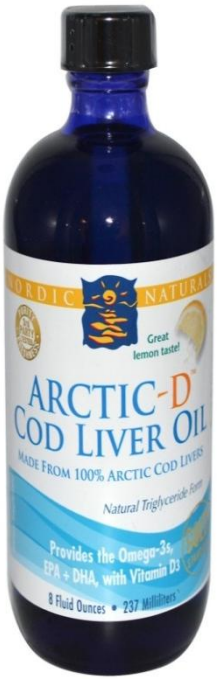
OTHER SOURCES:

Linseed oil and flax seeds
2. Chia seeds
3. Cod liver oil
4. Krill meat
5. Fish oil
6. Radishes
7. Butternut
8. Fish broth
9. Basil
10. Oregano
11. Garlic
12. canned grape leaves
13. Marjoram
14. Broccoli
15. Spinach
16. Canola oil
17. Chicken eggs
18. cauliflower

19. Brussels sprouts
20. Mustard
21. Soybeans and soybean oil
22. Cashew
23. Purslane
24. Pecan
25. Lamb
26. Veal
27. Walnuts and walnut oil
28. Brazil nuts
29. Olive oil
30. Hemp seeds
31. Pumpkin seeds
32. Cabbage
33. Tofu
34. Green beans
35. Lettuce
36. Strawberries
37. turnip

Possible effects of PUFA

- **Prevent arrhythmia,**
- **Reduce platelet aggregation**
- **Lower triglyceride levels in plasma,**
- **Relatively lower blood pressure,**
- **Reduce the level of "bad cholesterol"**
- **Modulating endothelial function,**
- **Reduce the level of eicosanoids**


NORDIC NATURALS
Great lemon taste!
ARCTIC-D
COD LIVER OIL
MADE FROM 100% ARCTIC COD LIVERS
Natural Triglyceride form
Provides the Omega-3s EPA + DHA, with Vitamin D3
8 Fluid Ounces • 237 Milliliters

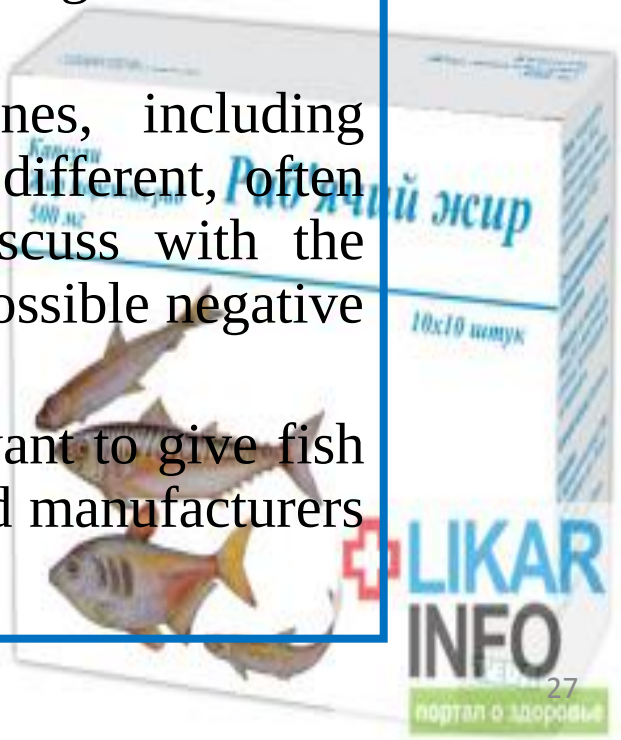

60
ONE-A-DAY CAPSULES
SEVEN SEAS
SINCE 1935
PURE
COD LIVER OIL
EXTRA
HIGH STRENGTH
OMEGA-3 FISH OIL
Contains over 200% more Omega-3†
A rich source of Omega-3 & Vitamins D+E

Fish oil Contraindication

- There are some contraindications in the presence of which eliminates the possibility of a person requires the careful application of fish oil both in pure form and in food additives:
- Allergic reaction to fish or to the substance;
- Thyroid disease;
- Kidney disease, urinary system;
- Gastrointestinal disease;
- The active form of tuberculosis;
- The high content of calcium in the
- Elevated cholesterol levels in the bl
- Pregnancy, lactation.

Fish oil Contraindication

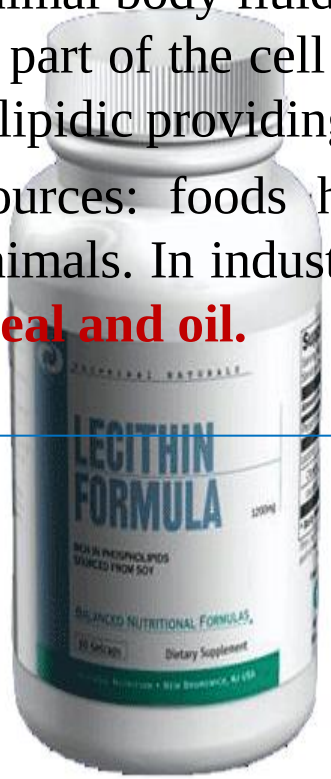
- Should limit their intake of fish oil for people **with low blood pressure**, as well as those who are taking medications that lower the pressure, because fish oil itself has similar properties.
- **Suffering from diabetes**, can be used fish oil only under the supervision of an appropriate specialist. Until now, researchers in the area have not come to a consensus that it increases the level of sugar in the blood or brings it back to normal.
- Joint use of fish oil and other medicines, including homeopathy and folk remedies may lead to different, often dangerous complications. So be sure to discuss with the doctor everything you take in order to avoid possible negative effects.
- Medical consultation is also required if you want to give fish oil to **your child**. The exact dosage and trusted manufacturers - the informatio

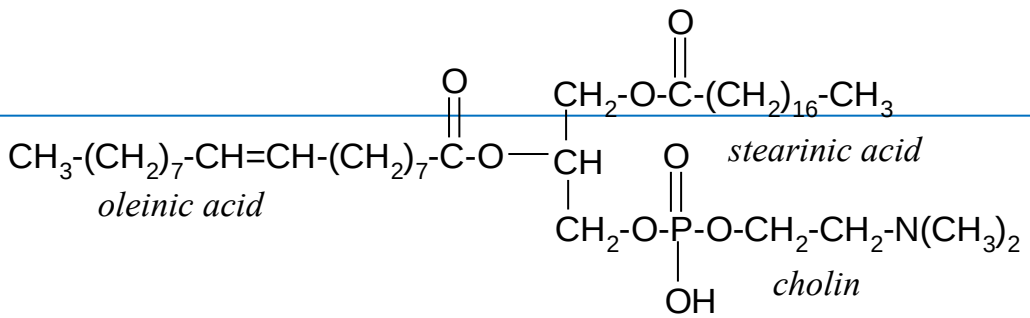


Lecithin

- Lecithins - **aminoalcohol esters** digliceridphosphoric acids and choline; are the most important representatives of the **phospholipids**. Formed by cleavage of lecithins, higher fatty acids (palmitic, stearic, oleic and arachidonic), glycerophosphoric acid and choline.

- Lecithin is found in all animal and plant tissues and in almost all animal body fluids; his lot in the brain, nerves, egg yolks, eggs, sperm. Is part of the cell membrane, is a structural component of the cell wall bilipidic providing cell homeostasis.
- Sources: foods high in fat, such as meat, poultry, fish and other animals. In industry, lecithin is extracted from by-products of **soybean meal and oil.**





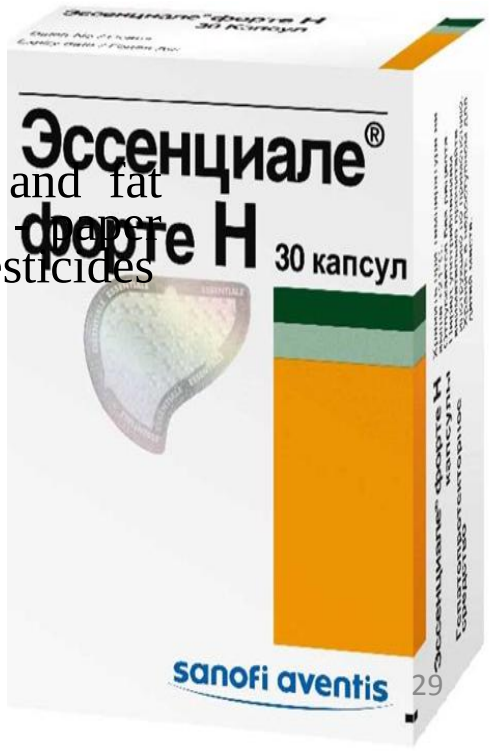
L-α-phosphatilcholin (lecithin)

Lecithin

- Lecithin is an active substance, the so-called **hepatoprotective agent**. On the basis of lecithin manufactured drugs "Essentiale Forte", "Essentiale N", "Esliver Forte".

- Lecithin - a natural emulsifier. It allows to obtain stable emulsions of oil-in water systems. It is widely used in the food industry in the manufacture of chocolate (to reduce their viscosity in the mouth and as an **antioxidant**, anti-aging products), confectionery, bakery and pasta, margarina, mayonnaise, baking bread and confectionery, wafers, and also in the manufacture of emulsions for fatbaking sheets and forms.
- To include lecithin **supplements** **E322 and E476**.

- Lecithin is widely used in the cosmetic industry.
- In the non-food applications, lecithin is used in paints and fat solvents, vinyl coatings and cosmetics. Other applications - paper processing, production of ink, fertilizers, explosives-in in pesticides



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