The medicinal research and development of seabuckthorn

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Abstract: According to historical records, China was the first to country to use seabuckthorn as a drug. In 1977, this plant was formally listed in the Chinese pharmacopoeia. Seabuckthorn contains biologically active substances with pharmacological effects on the cardiovascular and the immune system, and anti-senility, anti-inflammation and anti-radiation effect, etc. During the last ten years, research on seabuckthorn medicinal and health products has greatly advanced and many economic benefits have been gained from it in China.

Key words seabuckthorn, medicinal research, effective constituents, cardiovascular system, immune system, anti-cancer, anti-senility, anti-inflammation, anti-radiation.

The fruits of seabuckthorn (*Hippophae rhamnoides L.*) have been used as a drug by traditional Tibetan and Mongolian medicine since ancient times. It has pharmacological effects on the lungs, the stomach, the spleen, the blood circulation, which were recorded in some medicinal classics, such as Sibu Yidian [1] from the Tang Dynasty and Jing Zhu Ben Cao [2] from the Qing Dynasty. In 1977, seabuckthorn was officially for the first time listed in the Chinese Pharmacopoeia by the Ministry of Public Health [3]. Since 1985, meanwhile, medicinal research on seabuckthorn has received much attention in China. The great advances and demonstrations of its medicinal values have been seen in recent years [4, 5].

1 Origin and development of seabuckthorn medicinal products

In historical records, Chinese people were the first to use seabuckthorn as a drug. More than a thousand years ago seabuckthorn was recorded in Yue Wang Yao Zhen from the Tang Dynasty and in Sibu Yidian, whose writing was finished in the 8th century. Sibu Yidian is a classical Tibetan medical book with four volumes and 158 chapters altogether. Thirty chapters deal with seabuckthorn medicinal products, mentioning the pharmacological effects on inducing the expectoration, opening the inhibited lung energy, dispersing dampness, tonifying the YIN and strengthening the YANG. More than 60 entries refer to its capacity to strengthen the spleen and the stomach, and to promote blood circulation, to remove blood stasis, and there are 84 prescriptions with seabuckthorn, which come in the form of seven different preparations: decoction, powder, pill, medicinal extract, shortbread, ash and tincture. In the 18th century, Sibu Yidian was translated into Mongolian, and later it was translated by European countries for studying and commenting. In 1903, Sibu Yidian was published in Russia in St. Petersburg [6]. In 1952, Xu Zhonghu, an associate professor of Sichuan Medical College of China, rediscovered seabuckthorn in Tibet. Following this, the Sichuan Medical College took the lead in medicinal research on seabuckthorn, and an academic thesis was written by Xu Zhonglu et al [7]. The Preliminary Research on the Fruit Juice of Seabuckthorn was published in 1956. In 1977, seabuckthorn was for the first time listed in the Chinese Pharmacopoeia.

From 1985 to 1993, Chinese scientists were engaged in a series of scientific experiments on its

juice, oil and other extracts with analysis of its nutrient and chemical composition, pharmacodynamics and toxicology. The results have been predicated that seabuckthorn was a medicinal food containing many kinds of vitamins, trace elements, amino acids and other bioactive substances, such as ß-carotene, VC, VB1, VB2, VK1, Zeaxanthin, lycopene, flavonoids, folic acid, sitosterol, triterpene, fatty acids, tannin acid, 5-HT (5- hydroxytryptamine) and umbelliferone, etc. In the former USSR it was discovered that the fruits of seabuckthorn contained more than 190 kinds of bio-active substances, and the oil contained 106 kinds of such substances. Of these, there were 6 kinds of fat-soluble vitamins, 22 kinds of fatty acids, 42 kinds of lipids and 36 kinds of flavonoids and phenols [8]. For these reasons, it has great potential in the medical field, both as a medicine and health food. So far, the registration number of the business permit of the seabuckthorn oil has been replaced five times since the first time it was approved as a drug for production and utilization by the Ministry of Public Health of the former USSR. The medical products made from it include simple prescriptions as well as complex ones, e.g., oil solution, soft extract, membranous preparations and aerosols. Seabuckthorn oil can be used to treat burns, skin radiation lesions, cervical erosion, gastric and duodenal ulcer, etc. [9].

2 Research and development of the effective constituents of seabuckthorn

The ripe fruit of seabuckthorn is a medicinal food containing many kinds of vitamins and trace elements and other biologically active substances. Its taste is sour due to its content of approximately 2 to 3.5% organic acid. Results of chromatograghic analyses have indicated that the ripe fruit of seabuckthorn contains malic acid, oxalic acid and another unidentified acid. These organic acids have certain physiological functions: remitting the toxicity of some medicines like barbitals and antibiotics, preventing teratogenesis, damages from x-rays and side effects of oxygen therapy. There are also significant contents of carotenoids (including ß-carotene, ß-4, 4biketone-ß-carotene, ?-carotene, zeaxanthin, lycopene and polyring-lycopene), progestin, flavoxanthin, cryptoxanthin, violaxanthin, neoxanthin and VC, VK, VE, (including a, ?, ?VE) of which VC and VE are the major components of antioxidants [10].

The content of phospholipids in the ripe fruit (including lecithin, cephalin, phosphatidylinositol and phosphatidyl) is about 0.5%. These substances, as part of the membrane mitochondrion, participate in the electronic migration and the oxidative phosphorylation, can promote cellular metabolism, and have an anti-fatty liver, anti-cirrhosis effect. There is 0.09% to 0.36% betaine in the ripe fruit, which is the methylating product of glycine and has anti-ulcer, and preventative and curative effects on arteriosclerosis. Also, there are the flavonoids, whose main components are the leucocyanidin, catechin, flavonol and trace flavanone. From the flavonol, the isorhamnetin, quassin and camellin can be isolated. The flavonoids and other phenols can increase the resistance of the human body, retard osmosis of the capillary wall and prevent VC from breaking up. The physiological effects of flavonoids on the blood vessel wall require the participation of VC; their activity can stabilize VC in the body, and they can reduce VC oxidation. These substances also have the following functions: controlling arteriosclerosis, lowering the cholesterol level, turning hyperthyroidism into euthyroidism and eliminating inflammation [11].

Phenols are effective against oxidation, tumorigenesis and radiation, and can sustain the activity of many biologically active substances, e.g., the ant-tumorigenesis effect of leucocyanidin, the enhancement of X-ray effectiveness in cancer treatment by catechin, and the remarkable anti-tumorigenesis and anti-radiation effect of quassin.

Chlorogenic acid and other phenol compounds can facilitate the biosynthesis of gastric acid, stimulate gastric juice secretion, combine with taurine and take part in diuretic action and in strengthening the function of capillaries, and, at the hypophysis level, regulate thyroid function.

The seabuckthorn oil extracted from its ripe fruit contains more than 60% of palmitic and palmitoleic acid. The most active biological fractions among them are the unsponified parts, which can co-exist with VE, carotenoids, beeswax and the sterols with ß-sitosterol as majority. The ß-sitosterol is considered one of the active compounds used to prevent and cure arteriosclerosis [12].

The peel of stem and fruit contains 5-HT, a rare occurrence in the plant kingdom. The 5-HT existing in a free or grouped state, can act as a neurotransmitter and regulate human emotion, blood pressure (BP), body temperature and hormone level. It can also have important anti-radiation, anti-infection and anti-cancer functions, and can promote coagulation by transforming fibrinogen into fibrin.

The leaves and fruit contain coumarin, which can strengthen the function of the capillaries, has styptic and anti-coagulation functions, anti-spasmus, anti-vitiligo, anti-turmorigenesis, anti-numbness, anti-pyreticosis effects, and can regulate disorders of the gallbladder. There is also trierpene, whose representative is the ursolic acid which has an effect similar to that of adrenocortical hormone (ACH). It can control the actions of sodium (Na+) and chlorine (CI-) *in vivo*, but does not inhibit the metabolism of potassium, and it can cure bronzed skin (hypocorticoidism), heal wounds, ulcer and inflammation.

The leaves contain ß-amyrinoley-lalcohol acid. It can dilate the cardiac and cerebral vessels, facilitate blood circulation and slightly lower the blood pressure [13].

To sum up, seabuckthorn contains so many biologically active substances that its development for medicinal and health products has great potential.

3 Research on pharmacological effects of seabuckthorn

3.1 Cardiovascular system

The total flavonoids of Hippophae (seabuckthorn) (TFH) extracted from the leaves and fruit is a group of compounds containing seven kinds of flavonoids. Of these, the main components are isorhamnetin and quercetin. Zhang Maoshun, Wang Jialing and others [14] of the West China Medical University experimented with TFH, treating coronary heart disease using a random double blind control test. The results showed that TFH could remit angina and improve the mechano cardiography and the ischemic electrocardiogram. As for this aspect, its curative effect is better than that of isosorbide dinitrate, which might be due to the increased volume of coronary blood flow and myocardial nutritional blood flow, and the decrease of myocardial oxygen consumption and inhibition of platelet aggregation.

Wang Bingwen and others [15] of Xi'an Medical University investigated the effects of TFH extracted from the leaves of seabuckthorn on white rats' cardiac function. The internal pressure peak of the left ventriculus and its maximum rate of change (dp/dtmax) increased distinctly, the time from the left ventricle starting a contraction to the occurrence of a dp/dtmax was shortened

distinctly, the diastolic pressure of the left ventricle and the left ventricular pressure of the isovolumetric relaxation phase diminished, cardiac output, cardiac index, heart stroke index, and left ventricular power index of the myocardium increased. Further research showed that TFH could strengthen the contractility of the extra-corporeal papillary muscles of guinea pigs. The mechanism might be related to its effect on both the inward flow of extra-cellular Ca2+? of the cardiac muscles and the Ca2+? release from intracellular reservoirs.

Liu Fengming et al. [16] of the Baotou Medical College experimented on the extra-corporeal cors of white mice with arrhythmia. They discovered that TFH could prolong the time of ventricular fibrillation, postpone the atrioventricular conduction, lower the heart rate, and attenuate the myocardial contractility. In addition, TFH could slightly prolong the refractory stage (or period) of the extra-corporeal left atrium function, and counteract distinctly the action of the allorhythmia of the extra-corporeal right atrium of guinea pigs.

Chai Quiyan, et al. [17], of Shanxi Medical Institute experimented with seabuckthorn extract (SE) (extracted by alcohol) on white rats. It was shown that SE had considerable anti-mycardial-ischmia, anti-hyperlipemia and anti-fat-liver effects. Seabuckthorn oil could decrease cholesterol, triglyceride and ß-lipoprotein (LP), and counteract hyperlipemis induced by the experimental high fat diet.

Based on the above advances in research, Tongliao Pharmaceutical Factory of Inner Mongolia Autonomous Region in China began to produce Acetylsalicylic Flavonoid Tablets. In 1992, it was selected as one of the new and high grade products of the region. Based on 303 cases of clinical observation by Tongren Hospital affiliated to the Capital Medical College, Xuanwu Hospital, Friendship Hospital and four more hospitals in Beijing, the general curative effectiveness, i.e., more than 90% in the treatment of stenocardia and almost 50% in ECGs (electrocardiograms) has been proven [18]. Now this drug has been approved.

3.2 Immune System

Zhong Fei et al. [19] of the Nanjing Medical College of the Railway Ministry experimented on mice and guinea pigs with the compound extracts of *Hippophae* (CEH) (seabuckthorn). It was discovered the CEH had anti-anaphylactic effects and could strengthen the phagocytic function of the mouse macrophagocyte, increased serum-lysozyme in mice and alexin in guinea pigs. Thus it was proven that CEH can strengthen non-specific immunity functions. In mice, the serolysin level and the serum-accelerator level were distinctly increased. So was the capacity of the splenocytes to produce hemolysin and the percentage of the Stable Rosette Forming Cells (SRFC). Immune suppression caused by cyclophosphamide was counterchecked. CEH concentration was in direct proportion to its own counteraction against the interleukin-2 (IL-2) produced by the mice. It was obvious that CEH could regulate the cellular immunity and the hormonal immunity at every one the many links and levels. This provided the experimental basis for CEH to be widely used in the therapy of immune diseases.

Ren Lisa et al. [20] of Shanxi Cancer Institute experimented on mice with the bone marrow micronucleus technique. It was shown that seabuckthorn seed oil had the capacity to restore, under inhibited states of immune function, the natural killer cell level.

Li Diandong et al. [21] of the Medicinal Biotechnology Institute of the Chinese Academy of Medical Sciences researched on combining the polymerase chain reaction with the T-lymphocytes multiplication induced by the mitogen, and on seabuckthorn juice effect on secretion, which was caused by IL-2, of the old mouse's splenic lymphocytes. During senescence, the multiplication of the splenic lymphocytes and the secretion of IL-2 decrease along with the age increase. It was discovered that the multiplication index of the splenic lymphocytes of the mice, which were fed seabuckthorn juice, was higher than that of the control group at the same

age. The difference between the two was very significant (P<0.01). Therefore it was believed that seabuckthorn juice could promote the immune function in mice, whose mechanism might also be realized by the mouse gene expression.

In brief, the active principals in seabuckthorn can act as cleaning the human free radicals *in vivo*, increasing IL-2 content of old mice *in vivo* and affecting the gene expression. Thus it can promote the organic immune function. The IL-2 as immunomodulator can play an important part in strengthening the human resistance against diseases and in postponing senescence.

3.3 Anti-tumorigenesis pharmacology and development of auxiliary anti-cancer medicine.

The direct effects of seabuckthorn on the tumorigenesis, in addition to its indirect ones caused by general immunity or other mechanisms, include inhibiting action on the cancer cells and blocking the carcinogenic factors. Zhang Peizhen et al. [22] of the Gansu Cancer Institute experimented on mice transplanted tumors, including sarcoma (S180), lymphatic leukemia (P388) and B16. It was found that both intra-peritoneal injection of seabuckthorn oil and oral administration, inhibited the tumor from developing. Seabuckthorn juice can both kill the cancer cells of S180 and P388 and inhibit growth of the cell strains of the human gastric carcinoma (SGC7901) and lymphatic leukemia (L1200).

Yang Jianping et al. [23] of Shanxi Cancer Institute experimented on mice with inhibiting the Ellis-ascites carcinoma *in vitro* with seabuckthorn oil and fruit residue. The results showed that it could prolong the life of the mice with Ellis-ascites carcinoma. It was further found that bioactive substances extracted from seed oil and bagasse had cellulotoxic effects on extrinsic cell strains of human leukaemia (K562).

Tang Jing et al. [24] of Shanxi Branch of Chinese Medical Association investigated seabuckthorn juice effects on aflatoxin B1 (AFB1), the carcinogenic factor of liver cancer. They discovered that the number and area of the GCT focus, which is the hepatocyte proliferation (i.e. precancerous lesions), were reduced. Li Yong and others [25] of Shanxi Medical College reported that in simulated human gastric juice *in vitro*, the synthesis of N-nitrosomolane could be blocked by diluted seabuckthorn juice. Compared to the control group which received the same concentration of ascorbic acid, the difference in blocking the synthesis of N-nitrosomolane was significant (P<0.01), showing that seabuckthorn was superior to ascorbic acid. It indicated also the possible presence of other blocking substances. In another experiment, it was further proven that seabuckthorn juice can effectively block the synthesis, *in vivo*, of N-nitroso compounds in white rats preventing it from inducing cancers. Its effect on preventing cancers was superior to that of ascorbic acid.

To sum up, the research results showed that seabuckthorn extracts had the effect of promoting the immune function of animals with tumors, the activity of the superoxide dismutase (an oxy-radical scavenger), and could activate the phagocytosis of the macrophage. The above mentioned results showed that seabuckthorn extracts had, to a certain degree, anti-cancer effects. If an anti-cancer adjuvant (co-operative anti-carcinogen) is developed from the extract, the immunity of cancer patients can probably be strengthened and the side effects caused by chemotherapeutic agents might be decreased.

At present, research work is being carried out both *in vivo* and *in vitro*. More research should be done in the future. It is necessary to extract pure effective substances from seabuckthorn oil and to determine effective and proper applications. According to the regulations for new drugs, the second stage of clinical research should be applied for.

3.4 Anti-senilism

It is believed that senility and many lesions are closely related to peroxide effects *in vivo*. Therefore, blocking the peroxidation and elimination of the free radicals produced by the peroxidation have become the focuses of attention.

Jing Yuehua and others [26] of Shenyang Applied Ecology Institute of the Chinese Academy of Sciences discovered superoxide dismutase in seabuckthorn juice and its leaves. It acted in the same way as VC, having anti-oxidation effects and clearing away free radicals on the cellular membrane.

Rui Lixin and others [27] of Shanxi Medical College researched into the effects of seabuckthorn oil on the erythrocyte membrane G-6PD and Na-K-AtPase of guinea pigs fed seabuckthorn oil showed increased activity. The content of malondialdehyde (MDA), which is the product of lipid peroxides on the erythrocyte membrane, and the hemolysis percentage of the erythrocytes induced by MDA were significantly inferior to the groups not fed or fed with VE. Compared to the VE group at the equivalent dosage, the effects of seabuckthorn oil were superior to VE. That showed that seabuckthorn can postpone senility and prevent lipid peroxidation.

Ju Haisong and others [28] of the Inner Mongolian Medical College investigated TFH effects on active oxy-radicals. They discovered the TFH could significantly inhibit the chemiluminescence of the human polymorphonuclear leukocytes stimulated by Phorbol Myristate Acetate (PMA) and distinctly clear away the super-oxide free radicals produced by the purine oxidase system and the active oxy-radicals, including the free radicals of the superoxide negative ions and the hydroxy free radicals.

In summary it was discovered that the active compounds of seabuckthorn could promote the immune function and regulate the activity of immune cells *in vivo*, and could play an important role in promoting human resistance against diseases and postponing senescence.

3.5 Anti-inflammation and anti-radiation

Xu Mingyu et al. [29] of Xiyaun Hospital of the Academy of Traditional Chinese Medicine of China showed that seabuckthorn oil had obvious effects on anathrepis, eliminating inflammation and slough, easing pain, promoting immune function and strengthening body resistance. All this provided a scientific basis for clinical treatments of the chronic bed sore (pressure sore).

L. D. Lebedeva et al. [30] of the Chemical Institute of the Tadzhikistan Academy of Sciences injected experimental animals with seabuckthorn oil. During 20 to 30 days, the development of the artificially induced inflammation of mouse subcutaneous tissue was inhibited, and the anti-inflammation effects was strengthened.

Analyses of seabuckthorn oil in the USSR showed contents of more than 180 mg/100 g of carotenoids (lycopenes and its derivants), VE 110 mg/100 g, oleic glyceride, fatty acid, citric acid and steric acid. Among them, carotene could form VA *in vivo*, facilitate metabolic normalisation and recover injured tissue. VE proved to be an anti-senilism substance, which could control proteo-metabolism and metabolism of nucleic acid and therefore counterattack tissue senility. The unsaturated fatty acid played an important part in repairing tissue. Seabuckthorn oil was produced by the former USSR, both for oral medication and for external application. It was used to treat radiation injuries, burns, vagina mucoctis mucitis, the endocervicitis, the erosion of cervix, gastric and duodenal ulcer, and improved curative effects were obtained. These medical products had no toxic and side effects [9].

Jiang Zhenyi et al. [31] of the Second Army Medical University of China found that healing effect of seabuckthorn seed oil on the white rats gastric ulcer model caused by acetifiation and chronic reserpinization was superior to cimetidine. They further extracted and isolated the active

principles from seabuckthorn seed oil and discovered that ß-Sitosterol-ß-D-Glucosid was a constituent significant for healing the gastric ulcer.

At Xi'an Medical University, extensive studies have been carried out. Studies by Wu Airu et al. [32] on the treatment of chronic cervecitis with seabuckthorn oil and the oil embolus with seabuckthorn compounds showed that improved curative effects were obtained, with a general curative effectiveness of 97%. Che Xiping et al [33] studied seabuckthorn embolus effect on easing pain and eliminating inflammation. They found that the time of the mouse torsion reaction stimulated by the acetification decreased significantly ($P<0.05$), after the mice were enforced with the gastric perfusion. The threshold of pain value increased significantly ($P<0.05$), the development of ear inflammation was inhibited distinctly ($P<0.05$), the mouse peritonitis exudation stimulated by the acetification decreased distinctly, and it eliminated inflammation and eased pain. Li Mingzhong et al. [34] treated radiation esophagitis and other injuries in white rats with a mixture of seabuckthorn oil and other Chinese medicines, and found the anti-radiation effect of the mixture to be superior to the control groups (simple seabuckthorn oil or simple Chinese medicine). Zhang Wenlu and others [35] studied the treatment with seabuckthorn oil of acute radio-dermatitis in mice and patients with tumors (caused by radiotherapy), acute radiodermatitis, mucositis mucitis, non- radiodermatitis, ulcer, faulty union of wounds etc. Improved curative effects were obtained. Xu Hanqing and others [36] treated chloasma and chronic skin ulcer with seabuckthorn oil by oral or external application and again found improved curative effects. Fan Yulin and others [37] used seabuckthorn oil in the clinical treatment of 56 cases of traumatic perforation of the tympanic membrane. It was found that seabuckthorn oil, due to its high viscosity, could reunite the valvulae of the perforated edge, facilitate the exudation and hematopedesis of the tissue fluid of the wound, the cellular infiltration, the metabolic process of the epithelial layer of the tympanic membrane and the next two layers of cells, and the full layer hyperplastic reunion of the tympanic membrane.

They also experiment on preventing the allergic reaction to gentamycin in animals. The electorcochleogram was taken as the change index of the auditory function. It was found that seabuckthorn oil has preventative effects and could recover the normal hearing threshold, and increase iron and zinc contents in the perilymph of the deaf animals. It was believed that the preventative effects of seabuckthorn oil were related to the zinc-like effects of the zinc-regulator actions, in addition to its actions of acupuncture like, anti-allergic reaction, opsomic immunity function and improving nutrition.

B. A. Fayman [38] of the former USSR treated the postoperative wound of tonsillitis with seabuckthorn oil and it was shown that the oil could ease pain, decrease allergic reaction and facilitate exfoliation of the post-tonsillectomy nick membrane (cicatrix of tonsil).

Wang Naiwen et al. [39] of the General Medicine Administration of Inner Mongolia experimented on 190 King white rats with 60Co-?-ray and deep x-ray irradiation respectively and compared the group fed with seabuckthorn seed oil to that enforced by gastric perfusion at different dosages. It was found that the oil could obviously protect heart, spleen, liver, lungs and bone marrow.

Cheng Tijuan et al. of the Lanzhou Medical College experimented on white rats and mice with establishing liver-injury models so as to investigate the effects of seabuckthorn seed oil. The results revealed that it had improved effects on the hepatic injury caused by CCI4, alcohol and paracetamol (SGP, MDA and GSH of the hepatic injury could be improved). The results were in agreement with those of Zhao Tiande and others [40].

Hou Wenming et al. [41] of the Shanxi Medicinal Institute conducted long term toxicity tests with seabuckthorn fruit residue oil in white rats. No negative effects were observed at a dosage of up to 18g/kg, which was nearly 20 times the clinic dosage. It was believed that as long as no

denaturation occurred, the oil was non-toxic and safe to use. Due to the absence of any toxic effects, the oil could be safely used as medicine, food additive and cosmetic. Numerous experiments were made on animals regarding the anti-inflammation and anathrepsis effects of seabuckthorn oil. Reserpinization and acetification were used to create white rats gastric ulcer models. Seabuckthorn oil could heal the ulcers. By using 60Co-ray, acute roentgenopathy could be induced. X-rays can cause radiation esophagilis and radiodermatitis, and the curative efficiency of oil was considerable. Numerous animal tests and clinic applications have proven the curative effects of seabuckthorn oil on radiodermatitis, non-radiodermatitis (pressure sore), mucositis, erosion of cervix, ulcer, etc. It was shown that the oil eliminates inflammation, facilitates anathrepsis and tissue regeneration and cures ulcer. It is anticipated that many new drugs and compound preparations will be research and produced.

4. Development of medicines and health products from seabuckthorn.

The following products are already available in China:

4.1 Raw seabuckthorn such as unstrained juice, clear juice, concentrated juice, seabuckthorn fruit oil and seabuckthorn seed oil, seabuckthorn fruit residual oil, raw powder, seabuckthorn pigment, TFH, etc.

4.2 Beverage with seabuckthorn such as soft drink (including syrup), alcoholic drink (sweet wine, semi-fluid drink, wine, beer), fruit juice (clear or unstrained) aerated fruit juice, powder, nutrient solution, jam, etc.

4.3 Cosmetics with seabuckthorn such as hair shampoo, skin care cream, beauty cream, body lotion.

4.4 Medicines such as cough remedy (relieving cough, dissolving phlegm, and treating chronic tracheitis), seabuckthorn (Acetylsalicylic) Flavonoid Tablets (treating the ischemic cardiopathy and remitting the angina cordis), compound oil-embolus extractum, and capsule (for inflammation and ulcer), Healthcare Medicine, including seabuckthorn oil, instant powder or granule preparation of seabuckthorn, and seabuckthorn dried cream.

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