Sodium, potassium and chloride ion activity in rats on long-term feeding with coconut oil or butterfat

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Lipid serum, peroxidation and activity glutathione peroxidase in rats on long term feeding with coconut oil or butterfat

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Hypolipidemic foods in China

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With the changes in dietary pattern in China, in recent years, hyperlipidemia has become an important problem in the pathogenesis of chronic degenerative diseases, especially the cardio-vascular-diseases. From studies on laboratory animals and people with hyperlipidemia, a number of hyperlipidemic foods and beverages have been identified, of relevance to traditional Chinese food culture. Their absence from the diet may, in part account for the increasing prevalence of hyperlipidemia in China.

The most important groups of foods used in China with hypolipidemic effects include:

- **Cereals**: oats, rye, brown rice, millet, buckwheat, wheat germ, maize germ.
- **Beans**: soy, broad bean, navy bean, soybean, bean, broad bean, mung bean, adzuki bean, pinto bean, fava bean, lentil, kidney bean, **mung**.
- **Vegetables**: garlic, celery, onion, spring onion, chives, pepper.
- **Nuts and seeds**: peanut, walnut seed. Splitter pea (Rosa incana), pistachio (Achi nius chinesis), **hazelnut**.
- **Oil**: soybean oil, rice bran oil, tea seed oil, peanut oil, grape seed oil, oil fish, soybean phospholipid.
- **Others**: tea, brown sugar, C-erithric acid, aspartic acid, egg.

The present enquiry into a range of factors in foods which may influence lipoprotein metabolism encouraging new ways of thinking about the pathogenesis, prevention and management of disorders and their sequelae.

Key words: Traditional foods, hypolipidemic, China, cereals, dietary fibre, beans, edible oils, fungi, algae, vegetables, fruit, tea, chocolate, onion.

Introduction

In 1992, a nationwide nutrition survey was performed in China. The dietary pattern of Chinese had changed dramatically since 1982. Percentage of energy from cereals, beans, and tubers decreased while that from animal foods and pure energy foods increased. This change is typical for most countries in economic transition when living standard rises in line with development of the national economy. Now, dietary fat provides 22% of energy intake on average, 28.4% in urban and 18.6% in rural areas, whereas in 1982 it was 17.2% of dietary energy intake. In 1982, 32% of China’s cities the fat: energy ratio has even reached more than 33%. In the meanwhile, the mortality from cardio-vascular-diseases in cities has also increased from 72.92/100,000 in 1963 to 207.76/100,000 in 1992. As causes of total death, these diseases were 13.6% in 1962 and 35.8% in 1992. As hyperlipidemia is one of the important risk factors, the prevention and treatment of hyperlipidemia has become an important problem for both community nutrition and clinical nutrition. Rather than various synthetic hypolipidemic drugs, Chinese prefer traditional medicines or foods of popular legend for good and little side effect. The research into hypolipidemic foods in China is predicated on this background and has shown considerable promise.


1. Dietary intervention for hyperlipidemia

(1) Animal screening experiments. At the Institute of Hygiene and Environment Medicine, in Tianjin, Prof Sun Mingyang and his colleagues first screened 84 kinds of Chinese food for hyperlipidemic effects by animal experiment 1. Male rats (220-270g) were used and a high-fat intake model was produced by feeding a ration containing lard 5%, cholesterol 1.5% and bile salt 0.5%. The test food was frozen dried and mixed with the high-fat ration at 10%. The experimental period used was 4 weeks. Serum cholesterol and the area for liver cholesterol and fat were determined at the end of 4 weeks. It was found that 23 test foods could prevent hypercholesterolemia, and some were also effective in preventing the increase in liver cholesterol and fat. Individual foods were then studied further in humans. For example, in pair-fed rats, after feeding high the fat ration, mushrooms were found to lower the serum cholesterol. Then, 14 patients were given 10g mushroom daily, and both serum cholesterol and triglyceride decreased after 14 days, and, to a greater extent, after two and three months.

(2) Human intervention study with composite diet. 43 male hyperlipidemics with serum cholesterol more than 230 mg% (6.0 mmol/l) and triglyceride more than 150 mg% (8.3 mmol/l).

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(1.7 mmol/L) were given a diet composed of hypolipidemic plants, including green beans, mushrooms, nuts and aquatic products. The diet was kept at 3600-4000 kCal and high fat (36-43 fat - energy %), with 760-1000 mg cholesterol daily. Daily energy expenditure was 3200-3300 kcal. Serum cholesterol and triglyceride lowering was significant after one month and continued for the three months of observation.3

The hypolipidemic foods were:

**Plant foods**

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Animal foods and seafoods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread bean*</td>
<td>Crisp ear</td>
</tr>
<tr>
<td>Garlic</td>
<td>Green croaker</td>
</tr>
<tr>
<td>Hsinyeh bean*</td>
<td>Mussel</td>
</tr>
<tr>
<td>Kidney bean**</td>
<td>Pork heart</td>
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<tr>
<td>Mushroom</td>
<td>Prawn</td>
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<tr>
<td>Peanut seed</td>
<td>Scallop</td>
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<tr>
<td>Phaeoulus L.</td>
<td>Sunflower</td>
</tr>
<tr>
<td>Red bean*</td>
<td>Turtle**</td>
</tr>
<tr>
<td>Soybean</td>
<td>Walnut seed</td>
</tr>
<tr>
<td>Yellow soybean*</td>
<td><em>Also prevents an increase in liver cholesterol</em></td>
</tr>
</tbody>
</table>

**2. Cereals**

*(1) Comparison of rice, corn, millet, oats and wheat flour.* A hypolipidemic model was induced by feeding rabbits a basal ration plus 0.5% cholesterol. Cereals were given in place of 50% of the basal ration. The experimental period was 3 months. Compared to control, serum cholesterol was decreased with all 5 kinds of cereals but serum HDLC (high density lipoprotein cholesterol) was increased only with millet, oats and wheat flour. Myocardial cholesterol was also lower with millet or oats. The percentage of atheroma in the aorta was lower in the group given oats.4

*(2) Effect of naked oats. The effect of naked oats (Arvena striva L. var. marda Mords.) on blood lipids was studied in rats on a high lipid ration. 6 g cooked oats were given daily to rats. The serum TC (total cholesterol), TG (triglycerides), LDLC (low density lipoprotein cholesterol) and AI (atherogenic index) were significantly decreased while HDLC and AI (atherogenic index) increased.5

*(3) Clinical use of bitter buckwheat. Bitter buckwheat is used in traditional Chinese medicine for treating diabetes. With the high fat rat model, the hypolipidemic effect of buckwheat was evident at 30 days.8 Eight NIDDM patients with hyperlipidemia were given buckwheat flour (20g/d) in the form of noodles for 30 days; both serum TC and TG were decreased as well as fasting blood and urine sugar.6

*(4) Wheat germ and maize germ.* The hypolipidemic effect of these cereals was studied in a high fat model with quails, and the serum TC and LDLC were as low as those in a group given inositol nicotinate. The serum HDLC and the severity of fatty liver were even better than the latter. Subsequently, 40-50 g maize germ flour was given to 83 patients with hyperlipidemia patients.8 Both serum TC and LDLC were decreased while HDLC and the relative activity of lecithin cholesterol acyltransferase (LCAT) increased compared with wheat flour.8

**3. Dietary fibre**

*(1) Comparison of different fibres. Dietary fibre of various types are known for their hypolipidemic effects. We compared four kinds of dietary fibre (konjac, psyllium, alggin and agar) in the high fat rat model, and found that liver TC and volume density of liver cells decreased in the konjac and alggin groups and number density of liver cells increased in the experiment at 9 weeks. There was little change in the psyllium and agar groups.9,10 The absorption of calcium and trace elements was not influenced by ingesting konjac.9

*(2) Human study of konjac. Konjac powder contains mainly glucomannan. 66 hyperlipidemia patients were given 5 kg konjac powder daily in the form of noodles, bread and cakes for 45 days. Their dietary intake of energy was 2260-2400 kCal, the fat 32-35%. Serum TG, TC, LDLC, HDLC and apo AI all improved, but apo B100 was not changed. Konjac foods are used in China in obese and diabetic patients as a blood lipid reduction in body weight, body fat and blood sugar have been reported.10

*(3) Use of "soy dregs" fibre. Soy dregs fibre contains 49.3% insoluble dietary fibre, which is soluble dietary fibre. In an 8 week experiment, the rats fed with 8% soy dregs fibre had lower serum TC and LDLC compared with the control high fat group, but serum TG and HDLC were unchanged.11

**4. Beans**

*(1) Soybean. Male rats were given high fat ration containing 25% protein of three kinds, casein, soybean protein and peanut protein for 4 weeks. Serum TC, TG, VLDLC + LDLC were decreased while serum HDLC and LCAT activity were increased in the groups of soybean protein and peanut protein compared with casein.12 In another experiment, a high fat ration containing 18% defatted soybean flour was fed to rats for 2 months when serum TC decreased by 23.8% more than the control group.13 Moreover, soybean increased the combination of LDL receptors to LDL in liver cells, and serum VLDLC + LDLLC declined. Soybean protein increased LCAT activity, with accelerated removal of cholesterol from tissues.14

*(2) Soybean phospholipid. Male rats were given a high fat ration and 10% soybean phospholipid for 6 weeks. Serum TC and TG were decreased significantly compared with 10% lard. Serum HDLC and HDLC were increased while HDLC-C was not changed. Serum LCAT and plasma lipoprotein lipase (LPL) activity increased, but plasma hepato-endothelial lipase (HIL) activity decreased.15

*(3) Mung beans. Mung bean powder (70%) was given to rats fed with a high fat ration for 2.5 months. The increase of serum TG was significantly lower than with control.16 With 6 months therapy, the lesions and the degree of occlusion of coronary arterioles were less in the mung bean group than in the controls. When 115 hyperlipidemia patients were given 30 g mung bean powder b.d. and the bats stimulate function, TG and lipoprotein were decreased for 1-3 months treatment.17

**5. Edible oils**

*(1) Commonly used edible oils. 12g soybean oil, rice bran oil or rapeseed oil was given daily to rabbits fed with the high lipid ration. The degree of occlusion of coronary arterioles was less in all groups at the end of 3 months compared with control, but TC concentration of heart, liver and aorta was decreased only in the group fed soybean oil. In another experiment, a ration containing 11% edible oil was given to rats after a daily dose of olive oil; the serum TC and LDLC at the end of 3 months were lowest and the serum HDLC the highest in a group given sesame oil, the next most pronounced effects in the group given teared oil and, next soybean oil. Serum TC remained high in groups given peanut oil or lard. Serum MDA (malonyl dialdehyde) was high in all groups because most edible oil is rich in PUFAs, except for the MUFAs, rich teased oil group in which serum MDA and fluorescence polarisation of biological membranes were lowered indicating better membrane fluidity.18

*(2) Rubber seed oil. The hypolipidemic effect of rubber seed oil was studied in monkeys. 10 Rhesus monkeys were fed with the high fat ration and 20 ml rubber seed oil daily for 10 months; the serum and aortic TC were lower and serum HDLC higher than the control. The thickness of atheroma in aorta and the frequency and severity of coronary artery lesions were less.19

There is less hypolipidemia in people taking rubber seed oil compared with those taking palm oil.20

Similar experimental animal studies showed hypolipidemic effects of group seed oil and Saviola Siva Palm seed oil and similar arterial results were obtained.21,22

*(3) Fish oil. Male rats were fed the fat lipid ration and 1 ml concentrated fish oil which contained 5% EPA + DHA daily for 3 months. Serum TC was decreased by 24.5% and HDLC increased by 30% as compared with the high fat control.23 Its therapeutic effect was shown in 204 hyperlipidemia patients who took 3g fish oil (containing 1.2g EPA and 2.6g DHA) daily for 10 weeks. Serum TC, TG, and apo B declined and HDLC rose significantly. In vitro thrombosis was also reduced.24

**6. Fungi and algae**

*(1) Auricularia. Besides the common Chinese mushroom which is known for its hypolipidemic effect, Auricularia is a group of edible funghi commonly used in China.25 The polysaccharide from Auricularia Polytricha Suec. has been shown to have hypolipidemic effect, if given to mice on a high fat diet, at daily doses of 30 or 50mg/kg bw (body weight) for 10 days. Serum TC, TG, LDLC decrease and HDLC increases compared with the high fat control. A similar effect was found in rats at higher dose, 100 or 150mg/kg bw.26

*(2) Algae. Enteromorpha Proliferia. given at 10% of the high fat ration to male rats for 30 days, decreased serum TC, LDLC, VLDLC and increased HDLC compared with control.27 The incorporation of weight gain was also decreased. In another study, serum TC after feeding 10% powder with a high fat ration for 4 weeks.28 Laminarin sulfate has hypolipidemic and antiagulation effects clinically.29

*(3) Laver. The polysaccharide isolated from Porphyra yezoensis Ueda was given to a high fat rat model, 75mg/kg bw for 8 days. Serum TC and TG were decreased as compared with the high fat control.30 Porphyra polysaccharide also lowered blood sugar, was antiagulation and anti-aging; increased myocardial contractance, enhanced serum protein synthesis, enhanced immune function and limited tumour growth in animal experiments.31

**7. Vegetables and fruits**

*(1) Celery. Rabbits were fed 0.1 kg celery/kg bw or 30 ml celery water extract/ kg bw/d (containing 50g celery) besides a high fat ration for 30 days. Serum TG and LDLC were lowered as compared with the control.32

*(2) Garlic. Allium sativum L.). Rabbits were fed 2g garlic per day in addition to a high fat ration for 30 days. Serum TC and TG were lowered as compared with the high fat control, but the garlic if stored over 7 months showed no effect.33 Similar observations have been made on rabbits by giving 1 mg allilic anilis/c kg bw/day for 90 days.34

*(3) Onion. On a high fat diet, there are significant differences in blood cholesterol between onioon-eating and non-onion-eating subjects. In clinical observations on persons eating 50g onion a day for one month, 39 out of 43 cases with hypercholesterolaemia experienced a decline in cholesterol (91%) and 14 out of 25 cases with coronary artery disease had electrocardiographic improvement (56%).35

*(4) Splinter pear. (Rosa vosburgii Thurt). Splinter pear is a wild fruit, rich in vitamin C (2400 mg%) and flavonoids. 6.4g pear juice/ kg bw/d were fed to quails, weightings 80-100g, in addition to a high lipid ration for 13 weeks. Plasma TC and plasma TC/ HDLC were significantly lowered compared with the high lipid controls. The liver weights/ body weight (%) and arteriosclerosis incidence were also decreased.36

*(5) Kowfruit also known as "Chinese gooseberry". Acting as an antihypertensive, the pulp of the kowfruit, which is a wild fruit, was given at 670 ml daily in 11 old men for 14 days while sugar-containing beverage was used as control in another 11 old men. Serum cholesterol as well as MDA was reduced at the end of the experiment, but serum triglycerides were unchanged.37

**8. Other foods**

*(1) Tea. The polysaccharide isolated from green tea has proved to have anti-hypolipidemic effects both in mice
(1.7 mMol/L) were given a diet composed of hypolipidemic foods, including beans, mushrooms, nuts and aquatic products. The diet was kept at a high fat (3600-4000 kCal) and high fat (36-43 % energy), with 760-1000 mg cholesterol daily. Daily energy expenditure was 3200-3300 kcal. Serum cholesterol and triglyceride lowering was significant a month and continued for the three months of observation.

The hypolipidemic effects were:

**Plant foods** Animal foods and seafoods

- **Bread**
  - Cruncarp
- **Graves**
  - Greater croaker
- **Garlic**
  - MusSEL
- **Hyscinth bean**
  - Pork heart
- **Kidney bean**
  - Prawn
- **Mushroom**
  - Scallop
- **Peanut seed**
  - Dried pomfret
- **Phaeoleus L.**
  - Turtle

**Red bean**
- *Young soya bean*
  - *also prevents an increase in liver cholesterol*
  - *also prevents an increase in liver cholesterol and liver fat*

**2. Cereals**
(1) **Comparison of rice, corn, millet, oats and wheat flour.** A hypolipidemic model was induced by feeding rabbits a basin ration plus 0.5% cholesterol. Cereals were given in place of 50% of the basin ration. The experimental period was 3 months. Compared to control, serum cholesterol was decreased with all 5 kinds of cereals, but serum HDLC (high density lipoprotein cholesterol) was increased only with millet, oats and wheat flour. Myocardial cholesterol was also lower with millet or oats. The percentage of atheroma area in the aorta was lower in the group given oats.

(2) **Effect of naked oats.** The effect of naked oats (Avena strata L. var. muda Morda) on blood lipids was studied in rats on a high fat ration. 6 g naked oats flour were given daily to rats. The serum TC (total cholesterol), TG (triglycerides), LDL (low density lipoprotein cholesterol) and AI (atherogenic index) were significantly decreased while HDLC and AA1 (anti-atherogenic index) increased.

(3) **Clinical use of bitter buckwheat.** Bitter buckwheat is used in traditional Chinese medicine for treatment of high fat models. With the high fat rat model, the hypolipidemic effect of buckwheat was evident at 30 days. Eight NIDDM patients with hyperlipidaemia were given buckwheat flour (20g/d) in the form of noodles for 30 days; both serum TC and TG were decreased as well as fasting blood and urine sugar.

(4) **Wheat germ and maize germ.** The hypolipidemic effect of wheat germ was studied in a high fat model with quails, and the serum TC and LDL were as low as those in a group given inositol nicotinate. The serum HDLC and the severity of fatty liver were even better than the latter.

3. Dietary fibre (1) **Comparison of different fibres.** Dietary fibre of various types are known for their hypolipidemic effects. We compared four kinds of dietary fibre (konjac, pectin and agar) in the high fat rat model, and found that liver TC and volume density of liver cells decreased in the konjac and algin groups and number density of liver cells increased in the konjac group at 9 weeks. There was little change in the pectin and agar groups. The absorption of calcium and trace elements was not influenced by ingesting konjac.

(2) **Human study of konjac.** Konjac powder contains mainly glucomannan. 66 hyperlipidemia patients were given 5 g konjac powder daily in the form of noodles, bread and cakes for 45 days. Their dietary intake of energy was 2260-2400 kcal, the fat 32-35%. Serum TG, TC, LDL, HDLC and apo AI all improved, but apo B100 was not changed. Konjac foods are used in China in obese and diabetic patients. A reduction in body weight, body fat and blood sugar has been reported.

(3) **Use of "soy dregs" fibre.** Soy dregs fibre contains 49.3% insoluble dietary fibre. A study of polo soluble dietary fibre. In an 8 week experiment, the rats fed with soy dregs fibre had lower serum TC and LDLC compared with the control high fat group, but serum TG and HDLC were unchanged.

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(2) **Soybean phospholipid.** Male rats were given a high fat ration and 10% soybean phospholipid for 6 weeks. Serum TC and TG were decreased significantly compared with 10% lard. Serum HDLC and HDLC were increased while LDL-C was not changed. Serum LCAT and plasma lipoprotein lipase (LPL) activity increased, but plasma heptano-endothelial lipase (HELP) activity decreased.

(3) Mung beans. Mung bean powder (70%) was given to rats fed with a high fat ration for 2.5 months. The increase of serum TC and TG was lower than with the control. With 6 months therapy, the lesions and the degree of occlusion of coronary arteries were less in the mung bean group than in the controls. When 115 hyperlipidaemia patients were given 30 g mung bean powder b.i.d. and the banana fibres for 4 weeks, TC decreased by 25%, TG by 20%, and lipoprotein were decreased after 1-3 months treatment.

5. Edible oils
(1) **Commonly used edible oils.** 12g soybean oil, rice bran oil or rapeseed oil was given daily to rabbits fed with the high lipid ration. The degree of occlusion of coronary arteries was less in all groups at the end of 3 months compared with control, but TC concentration of heart, liver and aorta was decreased only in the group fed soybean oil. In another experiment, a ration containing 11% edible oil was given to rats fed with a daily dose of 1000 mg cholesterol; the serum TC and LDL at the end of 3 months were lowest and the serum HDLC the highest in a group given sesame oil, the next most pronounced effects in the groups given teased oil and, next soybean oil. Serum TC remained high in groups given peanut oil or lard. Serum MDA (malonyl dialdeyde) was high in all groups because most edible oil is rich in PUFAs, except for the MUPA, rich in saturated oil group in which MDA and thiorosulphate of biological membranes were low indicating better membrane fluidity.

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Similar experimental animal studies showed hypolipidemic effects of grapse seed oil and Swaeke Sula Fall seed oil and similar arterial results were obtained.

(3) **Fish oil.** Male rats were fed the fat lipid ration and 1 ml concentrated fish oil which contained 59% EPA + DHA daily for 3 months. Serum TC was decreased by 50% and HDLC increased nearly 70% as compared with the high fat control. Its therapeutic effect was shown in 204 hyperlipidemic patients who took 5g fish oil (containing 1.2g EPA and 2.6g DHA) daily for 10 weeks. Serum TC, TG, and apo B declined and HDLC rose significantly. In vitro thrombosis was also reduced.

6. Fungi and algae
(1) **Auricularia.** Besides the common Chinese mushroom which is known for its hypolipidemic effect, Auricularia is a group of edible fungus commonly used in China. The polysaccharide Aparcularia Auricularia Polysaccharide has been shown to have hypolipidemic effect, if given to mice on a high fat diet, at daily doses of 30 or 50mg/kg body weight (bw) for 10 days. In control group, TC, TG, LDL, HDLC and TG decreased with the high fat control. A similar effect was found in rats at higher dose, 100 or 150mg/kgbw.

(2) **Algae.** Enteromorpha Proflora, given at 10% of the high fat ration to male rats for 30 days, decreased serum TC, LDL, HDLC and increased HDLC compared with the control group. The increase of HDLC was also significant. The serum TC after feeding 10% powder with a high fat ration for 4 weeks. Laminarin sulfates has hypolipidemic and antiagulation effects clinically.

(3) **Laver.** The polysaccharide isolated from Porphyra yezoensis Ueda was given to a high fat rat model, 75mg/kg bw, for 8 days. The effect of HDLC was also decreased as compared with the high fat control Porphyra polysaccharide also lowered blood sugar, was antioxidagant and anti-aging; increased myocardial contractination, enhanced protein synthesis, enhanced immune function and inhibited tumour growth in animal experiments.

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(2) **Garlic.** (Allium sativum L.) Rabbits were fed 2g garlic per day in addition to a high fat ration for 30 days. Serum TC and LDL were decreased compared with the high fat control, but the garlic if stored over 7 months showed no effect. Similar observations have been made on rabbits by giving 1mg allilin/kg bw/day for 4 months, no matter whether the allilin was extracted or synthesized.

(3) **Onion.** On a high fat diet, there are significant differences in blood cholesterol between onion-eating and non-onion-eating subjects. In clinical observations on persons eating 50g onion a day for one month, 39 out of 43 cases with hypercholesterolaemia experienced a decline in cholesterol (91%) and 14 out of 25 cases with coronary artery disease had electrocardiographic improvement (56%).

(4) **Squint pear.** (Rosa vorvurgini Turti). Squint pear is a wild fruit, rich in vitamin C (2400 mg%) and flavonoids. 6.4g pear juice/ kg bw/d were fed to quails, weighing 80-100g, in addition to a high lipid ration for 12 weeks. Plasma TC and plasma TC/HDL were significantly lowered compared with the high lipid controls. The liver weight/ body weight (%) and arteriosclerosis incidence were also decreased.

(5) **Kiwifruit also known as "Chines gooseberry".** Actinidia deliciosa (Buckland) showing that kiwifruit, which is a wild fruit, was given at 670 ml daily to 11 old men for 14 days while sugar-containing beverage was used as control in another 11 old men. Serum cholesterol as well as MDA was reduced at the end of the experiment, but serum triglycerides were unchanged.

8. Other foods
(1) **Tea.** The polysaccharide isolated from green tea has proved to have anti-hypolipidemic effects both in mice
and rats. Serum TC was lowered 17%, serum TG lowered 23%, LDL lowered 29% and HDL increased 26% if tea polyphenol was given 450 mg/kg for 10 days in hyperlipidemic rats6. Tea polyphenol might increase the activity of LDLP and so lower LDL7. Tea polyphenol might combine with apo A-I and the concentration of apo A-I change to be more effective in activation of LCATs.

Tea polyphenol also has an effect in lowering TC, TG, LDL and increasing HDLC in hyperlipidemic rats if given 1% or 2% for 6 weeks. It also has an anti-coagulant effect.

(2) Chromium containing food. After feeding hyperlipidemic rats with Cr-enriched yeast containing 18μg Cr/kg bw d for 80 days, there is a preventive effect against an increase in TC, TG, LDL and decrease in HDLC, and a therapeutic effect if Cr-enriched yeast 10μg Cr/kg bw d is fed for 40 days. Crt-enriched yeast can also decrease serum TC, TG, LDL and increase HDLC in NIDDM patients with hyperlipidemia8. Brown sugar contains chromium, about 0.24-0.35 μg/g, and its lowering effect on serum TC and TG is seen in hyperlipidemic rabbits if fed 4g/kg bw d for 75 days. It also reduces atheroma area and aortic thickness9.

(3) Iodine-enriched eggs. Iodine-enriched eggs are prepared by feeding hens with iodine-enriched feed. Forty-nine hypercholesterolemic patients were given one egg daily, containing 1400-1600 μg iodine, for three months. Serum TC decreased. Similar effects were shown in lowering blood and urine sugar and lowering systolic blood pressure in NIDDM and in hypertensive patients respectively. In another study, 46 patients with low HDLC ate iodine-enriched eggs for 1-2 months and HDLC increased10.

Hypolipidemic foods in China
Gu Jingfan

中國的降脂食品
摘要
隨著近年來中國膳食模式的改變，高脂血症已成為慢性退行性疾病。特別是心腦血管病發病機制的關鍵問題。作者從實驗學和人體高脂血症的研究。闡述了一些與傳統中醫概念有關的降血脂食物和飲料。這些食物在膳食平衡中，也會增加高脂血症病患的治療預後。

中國幾種具有降血脂的食物包括：
谷類：燕麥、油麥、小米、蕎麥、玉米等；
豆製：大豆、菜豆、菜豆（Hacyntho），紅豆，小豆，綠豆，Phacolus L，大豆等；
水果：果、大黃、魚，鯽魚，鰤魚，尤魚，淡漁，扇貝，海鱺。
蔬菜類：番茄，蘑菇，海草，菱角；
蔬菜類：大蒜，芹菜，洋蔥，葱，香菜，胡椒；
藥果和：花生，胡桃，堅果，核桃，核桃，
果類：葡萄，柿，茶籽，茶籽，棗糕，葡萄籽，魚籽，大豆磷脂；
其他：茶，紅糖，鎂化酶素，礦物質。
目前作者正在探討一些食物中對肝臟脂質代謝的影響，以期獲得對肝膽類疾病治療的基礎和預防的新的方法。

參考文獻
Hypolipidemic foods in China

Gujing Jin

中国的降血脂食物

摘要

随着近年来中国膳食模式的改变，高血脂症已成为慢性进行性疾病，特别是心脑血管疾病发病机制中的重要问题。作者由实验资料和人体高血脂症的研究，鉴定了一些与传统中食物关系有关的降血脂食物和饮料。这些食物在膳食中占比例小，也可能增加高血脂症患者。

中国几类具有降血脂的食物包括：
谷类：燕麦，油麦，小麦，精麦，小麦芽，玉米芽；
大豆：大豆，菜豆，黄豆(Haichin)，红豆，绿豆，Phaseolus L，大豆渣；
水果：樱桃，大黄鱼，鲫鱼，鲤鱼，鱼，蛋类，玻璃，扇贝，鲍鱼；
蔬菜类：香蕉，蒜苗，海豆，菱角，
蔬菜类：大蒜，芹菜，洋葱，葱，香菜，胡萝卜，
坚果和水果：花生，木瓜，胡桃，核桃，橄榄；
油类：大豆油，米油，茶油，橄榄油，菜籽油，葡萄籽油，鱼油，大豆磷脂；
其他：茶，红茶，西红柿，乳酸菌，奶酪等。
目前作者还观察到一些食物在某些方向影响脂肪代谢的有关因素，通过获得对临床疾
病的处理和预防的新方法。

References