

ANALYSIS OF THE SIGNIFICANCE OF HEALTH CARE AND DEVELOPMENT OF THE SALT FOR DIABETICS

Weifeng Ji¹ Wenyan Zhang¹ Weiping Li²

1. Hebei County Health Inspection Institute, Shijiazhuang, 050071;

2. Shijiazhuang Weiping Functional Food Science & Technology Co., Ltd, Shijiazhuang, 050031

Abstract: A special kind of salt for diabetics was mainly introduced. In the article together with the significance of health care bases on the component analysis.

Key words: diabetes; salt; health care

Foreword

Diabetes is a common chronic endocrine metabolic disease. The incidence of the central link is the hyposecretion and resistance of insulin (Organization of the decline in insulin sensitivity), Emergence of blood sugar, urine sugar increased, decreased glucose tolerance, and other phenomena. The clinical performance is more drink, more food, more urine and less weight which called "a little more than 3" and other symptoms. With the people's living standards rising, diabetes has become the "Invisible killer" of human. According to the Stat. the number of diabetics has reached to 240 million in the whole world at the present. There is about 50 million in China, the incidence rate is 3.21%. And the number of patients is still increasing at an alarming rate; another 3/4 percent of diabetics are undetected (recessive). Diabetes is a disease closely contact with diet, although there is already some food developed for diabetics home and abroad, it can not be used as food for three meals a day, for example, Hypoglycemic powdered milk, Hypoglycemic biscuits, Hypoglycemic Capsules, Hypoglycemic tablets, Oral hypoglycemic, and so on. Although hypoglycemic nutrition flour for sale in the market is mainly manufactured by low-sugar

buckwheat flour or cellulose powder, but it will affect the intake of other nutritional ingredient, and the effect is not obvious. Diabetes and its complications are mostly associated with life, and threatening people's healthiness. In recent years, there has been great interest in the effect of nutrition prevention measures for the adoption of minerals and trace elements to control diabetes.

1. THE DEVELOPMENT OF THE SPECIAL SALT FOR DIABETICS.

1.1 Basis for the development

At present, the treatment of diabetes are diet and exercise therapy, psychotherapy, hypoglycemic drugs and insulin therapy, Chinese medicine and other treatments (such as acupuncture, qigong), etc. There is an old saying which says "To prevent a disease with food is better than cure it with medicine" and "To nurse one's body by food is the most important and basic method to treat diabetes". Among the treatment of diabetes trace elements is of great value and future. Salt is a necessary condiment in our daily life. Hong-jing Tao who was a famous doctor of

Liang Dynasty said "it is the only one which is indispensable among the five tastes". With the development of medicine and nutrition, it was founded that salt plays an important role in metabolism, organism growth, and normal physiological balance. However, the long-term high consumption of refined salt, can cause excessive intake of sodium which leads to the imbalance of potassium and sodium. It can cause "diseases of civilization", such as high blood pressure, cardio-cerebral vascular sclerosis, heart disease and so on. That seriously harms our health. Because Salt is an essential condiment. It has developed rapidly in recent years to be treated as an carrier to make nutrition and health care salt. At home and abroad the additives to salt are mainly calcium, zinc, iron, iodine, fluoride, hyponatremia, Fitness balance of salt and so on.

It is well known that diabetics should avoid Xian Yan (salt), because "high blood sugar" + "high blood sodium" will inevitably make the disease worse. In addition, due to glucose metabolism disorder, so is the electrolyte metabolism, as a result the educt of minerals and trace elements is more. Domestic and foreign diabetes and nutrition studies show that: the incidence and development of diabetes has some relationship with the lack of zinc and chromium. Zinc has a reputation called "the flower of life." The study found: Zinc is an important component of insulin, insulin exists in the pancreas gland in the form of Crystallization or sub-crystall zinc-insulin. Zinc directly affects the synthesis of insulin and hormone activity. The deficiency of zinc will lead to the low transform rate of original insulin, resulting in lower serum levels of insulin, muscle and fat cells to use glucose is also greatly reduced, a large number of glucose remain in the blood, so that blood sugar levels increase, that will be Diabetes. Chromium is a multi-valence element, trivalent chromium is one of the essential trace elements. Chromium and diabetes are closely related to each other, trivalent chromium is known as a central active ingredients of glucose tolerance factor (GTF), animal experiments and clinical observation show that glucose tolerance impaired, insulin function decreased and diabetes is induced when it is insufficient. The role of chromium is involved in insulin regulation on blood sugar, which may be the form of insulin-chromium-insulin receptor complex which contributing to the insulin's regulation

on glucose metabolism and blood sugar, lower Blood sugar and improve the symptoms of diabetes. Therefore, the complementary of chrome and zinc is a good way to prevent diabetes. Chromium and zinc is rich in animal liver, eggs, seafood and grains skin. The loss rate of zinc and chromium in refined rice and flour can reach to 95%, so it is better to choose brown rice or whole wheat as limited food product, at the same time, add chromium and zinc appropriately. A large number of experiments have proved that diet with high calcium, high magnesium, high selenium, high-K and low sodium can promote the secretion of insulin, improve the disordered metabolism and high blood pressure, cataracts, osteoporosis and cardiovascular disease, and other complications of diabetics.

1.2 design of formula

The purpose of this study is to develop a hypoglycemic multifunctional health care salt using salt as carrier, which is based on nutrition and functional component, to concern the nutritional needs of diabetics and physiological characteristics, to balance the ratio of sodium and potassium, to supply magnesium, zinc, calcium, iodine, selenium and Trivalent chromium, which has hypoglycemic function, and can prevent high blood pressure, cancer, osteoporosis, cataracts, and other complications of diabetes. Because it is based on the nutritional health, so the nutrients must have the appropriate application form, the ideal stability, enough weight to add the loss in the processing and storage. Additions mustn't affect the appearance, taste and consumption methods, conducive to the cooking process. Enhancer and other accessories must comply with the National Institute of Standards and Technology. The design should be simple, practical, economic, feasible, and easy-to-promotion.

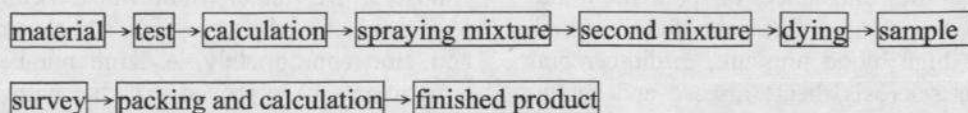
1.3 Production Process

Functional health salt can choose different methods of production according to different materials, the main method is dry mixing, soaking, spraying and so on. Spraying and mother salt mixing method is usually used at present. If the additive is tittle and easily dissolved in water, spray method will be better. Also we can prepare mother salt using spraying method firstly, and then choose mother salt mixing method, such as the production of seleniferous salt, iodized

salt. Diabetes specified salt is a admixture of the glucose tolerance factor (GTF)-trivalent chromium, selenium, zinc, iodine, and low sodium complexed salt, that is composed of refined salt, Potassium chloride, Magnesium Sulfate and calcium. It can be used to prevent diabetes and its complications. Mixing

uniformity is a key point in the production. We must be carefully in the process of testing and monitoring.

We choose dry mixing and spraying to obtain mother salt at first, and then there is a second full hybrid mixing, its production process is as follows:



1.4 The standard of quality

no peculiar smell.

1.4.1 Oranoleptic indicator: white or yellowish, no visible contamination, salt taste,

1.4.2 Physical&Chemical Control

Item Name		limited value
Physical items	whiteness \geq	65
	granularity (1.25mm cup product)	All passed
Chemical items(wet bases)	Sodium Chloride (%)	55~80
	Potassium chloride (%)	15~30
	Magnesium sulfate heptahydrate (%)	6~12
	water insoluble matter (%) \leq	0.20
	free water (%) \leq	1.00
	Ca (%)	0.5~3
	Cr ³⁺ (mg/kg)	5~100
	I (mg/kg)	30 \pm 10
	Zn (mg/kg)	120~1000
harmful element	Se (mg/kg)	3~15
	F (mg/kg) \leq	5.0
	AS (mg/kg) \leq	0.5
	Pb (mg/kg) \leq	1.0

1.5 Outcome measurement

The diabetes-specific salt we have developed measure up to the standards above, and passed the test of the authority

department.

The result is as follows:

granularity (1.25mmcup product)	Sodium Chloride %	Acid insolubles %	loss on drying%	K g/kg	Mg g/kg	Ca g/kg
All passed	67	< 0.1	8	102	7.8	8.6
Cr ³⁺ mg/kg	I mg/kg	Zn mg/kg	Se mg/kg	F mg/kg	As mg/kg	Pb mg/kg
24	20	130	5.5	3	< 0.1	< 0.1

2. ANALYSIS OF THE SIGNIFICANCE OF THE DIABETES SPECIFIC SALT

2.1 mechanism of action

The chemical composition of salt is

sodium chloride, we can know from the medical theory that sodium is a main caution of electrolyte existed in extracellular fluid (plasma and interstitial fluid, including lymph). It is a main pillars to maintain the cell fluid volume and osmotic pressure, It is

very important in Muscle contraction, heart pulse, blood circulation, nerve transmission of information, carbohydrate and protein metabolism, acid-base balance of body fluids. Chlorine also has the function of maintain the acid-base balance and osmotic pressure.

The study found that the content of trace elements in diabetic patients changed obviously is due to the strict control of diet, gastrointestinal disorders, high-sugar permeability of the diuretic effect, the urine protein loss and other reasons. Most studies show that chromium, zinc, selenium, manganese, iron content decreased significantly. The change of trace elements and blood glucose and other biochemical indicators are closely contacted with the rise of blood glucose, and the decline of serum chromium, zinc, selenium content will be lower. The content of selenium, chromium, zinc lever of Diabetics with complications is lower than those without complications significantly. It was found that diabetes complication rate can be estimated with the standard deviation of normal human serum. For example, if serum zinc is lower than the normal value of a standard deviation, the risk of kidney complications and cardiovascular disease will be up to 70% or 60%. If serum chromium is lower than the normal value of a standard deviation, the rate will be 71% or 77% of the risk of complicated by kidney disease and diabetes retinopathy.

A large number of experiments has proved that: diet with high calcium, high magnesium, high selenium, high-K and low sodium can promote the secretion of insulin, and can do good to metabolism and ameliorate high blood pressure, cataracts, osteoporosis and obesity etc of diabetics.

2.2 Analysis of health care significance

A number of studies show that the trace elements play an important role in the incidence development, prevention, treatment of diabetes. Its harm caused by short of it has been recognized prevalently by people, so that clinically complexing agent of more variety trace elements is used as a nutritional supplement to the patients.

2.2.1 Chromium

Chromium is an element that is concerned and used in the clinical trial most. The use of chroma-pak has been widely accepted by diabetics. Chromium is the regulatory factor of glycometabolism and the

lipid metabolism. The lack of chromium can lead to blood lipid rising, triglyceride increasing, fatty liver and coronary heart disease etc. What's more, the ability to remove the cholesterol decreased and cholesterol aggrades in the blood vessels that can cause arteriosclerosis, the deposition in the coronary artery leads to coronary heart disease. If in the cerebral artery it will occur that stroke, eyeground arteriosclerosis, blindness. Crura arteriosclerosis may cause necrosis of the limbs. Kidney arteriosclerosis can cause uremia. Aggrading in the small blood vessels would cause micro-cycle obstacle and peripheral neuritis. The vascular esion is the basis of others.

Chromium is very important in the incidence and development of diabetes. Clinical studies have proved that the supply of chromium or glucose tolerance factor (chrome) can improve glucose tolerance of diabetics, as well as lower blood sugar, blood fat, increase insulin sensitivity. Chromium can dissolve atherosclerotic plaque, improve blood supply, all illnesses will improved as a result. The best activity of insulin needs chromium. Chromium requirement relates to glucose tolerance, the dose should be 200 μ g Cr /d and above for those diabetics. A double-blind study of 180 cases of type 2 diabetes had shown that the patient's blood sugar, insulin, cholesterol and glycated hemoglobin levels have been significantly improved after 4 months chromium supply. The level of Chromium decrease with age. So, it has some benefits for the normal elderly to add some chrome. After 6 healthy volunteers whose chromium are adequate taking chromium (200 μ g Cr/d) for 5 weeks , their serum chromium nearly increased to double times, for 6 weeks, the fasting blood insulin levels reduced by 28%, exogenous insulin sensitivity increased significantly.

2.2.2 Zinc

Zinc has the reputation of "the flower of life." Zinc is an important component of insulin, each of insulin molecules has two atoms of zinc, and insulin exists in the pancreas gland in the form of Crystallization or sub-crystal zinc-insulin. Zinc directly affects the synthesis, storage, secretion and the integrity of the structure and its activity. Zinc is also the cofactor of a number of glucose metabolism enzymes. It can adjust the level of insulin and its receptor, and can reclaim the abnormal glucose tolerance. The

zinc deficiency of diabetes has long been recognized. The study of zinc metabolism on type 2 diabetes has show that the level of their urine zinc is obviously high and it has a positive correlation to blood glucose.

Zinc can speed up the healing of wounds or ulcers. Clinical study also shows that zinc can accelerate the healing of the lower extremities ulcers of elderly diabetics.

2.2.3 Selenium

Selenium plays an important role not only in cancer, cardiovascular disease but also in the treatment and prevention of diabetes and its complications. Diabetics may be blindness due to retinal microvascular disease. According to the study selenium-containing GSH-Px can reduce oxidative damage, it is expected to cure blind people caused by diabetes through the selenium supplement. Se also contributes to peripheral neuritis.

2.2.4 Magnesium

Modern studies suggest that magnesium belonging to the cell activator. Magnesium can repaire or protect the biological functions of pancreatic islet β cells, improve the quality and number of insulin receptors; at the same time reduce insulin resistance, regulate blood sugar, as well as to maintain normal blood lipid levels. Diabetics often have disorders of magnesium metabolism (magnesium deficiency), it is generally believed that high blood sugar, urine sugar leads to osmotic diuresis or suppress magnesium reabsorption in renal tubulars, a result of increasing the emission of urine magnesium. At present, magnesium supplement is recognized as an effective measure to the prevention and treatment of diabetes. Another showed that hypomagnesemia have a certain impact on the incidence and development of high blood pressure and ischemic heart disease. The rate of hypertension, coronary heart disease of diabetics was significantly higher than others.

In addition, dietary calcium plays such as equally significant role in preventing osteoporosis, high blood pressure complications.

3. EVALUATION OF DIABETES-SPECIFIC SALT'S SAFETY

3.1 Toxicity of chromium and amount of additives

Trace element chromium has many valences, the common price is 3 and 6. Trivalent chromium is essential to the human body, but chromium 6 is poisonous, can not eat. Human clinical trials showed that daily intake of trivalent chromium for 1000 μ g is absolutely safe. In China's health standards the ADI of chromium is 1000 μ g/d. FDA of America maded in 1994 ordain the intake to an unobserved level: trivalent chromium to 1000 μ g/d, this can reduce the incident rate of type 2 diabetes of the adult. Chromium in the diabetes specific salt that we have developed is 5~100mg/kg. If per person daily intake is 10g, the intake of chromium is 50~1000 μ g/d, therefore, it is relatively safe.

3.2 Toxicity of selenium and amount of additives

The volume of food safety of selenium carried out by Chinese Academy of Preventive Medicine, Nutrition and Food Hygiene is so far the only human experimental studies, tolerable upper intake level recommended by the Institute of Nutrition is 400 μ g/d. Diabetes-specific salt we have developed contains 3~15mg/kg. If per person daily intake is 10g, it will be 30~150 μ g/d, far less than the tolerable upper intake level. We use 15mg/kg selenium salt to prevent Keshan disease in China for almost 10 years, well, no side effects and toxicity was found. In addition the consumption of salt is relatively constant, so the selenium intake is relatively easy to control.

4. ANALYSIS OF THE BENEFIT OF DIATETICS SPECIFIC SALT

On the basis of the use of raw materials, equipment, power, the cost is 2,500 Yuan/ton, the price is 100,000 Yuan/ton. The hypoglycemic products in the market is expensive, the daily cost is about several or tens Yuan. If 5-10g diabetes-specific salt per person per day, it costs only 0.5-1 Yuan which can be achieved. This shows that the salt Diabetics specific cost-effective and high value-added.

The potential consumption of diabetes-specific salt amounted to 50 million, involving tens of thousands of households. Calculating as 1% of the market share, 1 kilogram per person per year, the amount will up to 500 tons, the output value is 50 million Yuan, each other of profit and tax will be 10

million Yuan. The social benefit is obvious because it is beneficial for the diatetic's health, relief pain, preventing diabetes and its complications, medicine expenses.

4.1 Diabetes-specific salt take the place of the traditional salt. It can supply chromium, zinc, selenium, iodine, and other trace elements. And it can add calcium, magnesium and other elements. At the same time it has care function to human health because it can lower the intake of sodium, advance the intake of potassium.

4.2 Diabetes-specific salt answers for human nutrition needs and physical characteristics of diabetes. It can be long term consumption because it is cheap and non-toxic.

4.3 Diabetes-specific salt can not only lower blood sugar but also help to improve its complications, such as high blood pressure, cardiovascular disease, osteoporosis, cataracts, kidney disease, etc. It has wide developing foreground and obvious benefit both to society and economic.

References

- [1] Wen Chi-mei, Chen Junshi (translation). Modern Nutrition [M]. Beijing: People's Health Publishing House, 1998.
- [2] Li Weiping. An innovative salt for decreasing the blood-sugar and its preparation method[P]. ZL98120142.3 ,2002-09-11.
- [3] Li Weiping. Development of functional salt [J]. Journal of Salt and Chemical Industry, 1997, (5) ,23-25.
- [4] Fu Wai editor. Trace elements and clinical application[M]. Beijing: China Medical Science and Technology Press, 1997.