

УДК 664.665

## Prevention of Diabetes through use of Hypoglycemic Chinese Herbs

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*For decades, the researchers have been battling one of the life's threatening diseases that results either from insulin insufficiency or ineffective use of the produced insulin in the body – the diabetes. If not treated or controlled immediately, the diabetes can lead to a variety of painful complications, such as damage the blood vessels in eyes, kidneys, and heart. One of the preventive measures of developing diabetes is maintaining a healthy diet. However, there is no exact evidence what causes diabetes nor there an effective treatment for one. The conventional medical approach of Western medicine that involves using insulin or oral drugs to treat diabetes is incomplete and can result in long-term complications. Chinese herbal medicine has a long history of being used to diabetes. Long term consumption of food products containing Chinese herbs with hypoglycemic properties could be a viable solution for diabetic or pre-diabetic patients. The purpose of this study is to develop a process for manufacturing new bread products that contain Chinese herbs with hypoglycemic properties to lower and normalize high blood glucose and to introduce these medicinal herbs into common stream food products. The long term consumption of these herbal bread products will be advantageous over the chemical drugs in alleviating some chronic diseases caused by diabetes, while adverse effects of the herbal substances will remain minimal.*

**Keywords:** Diabetes, Traditional Chinese Medicine, Chinese herbal medicine, hypoglycemic, herbal bread product.

## Использование китайских лекарственных растений с гипогликемическими свойствами для предотвращения диабета

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*Правильное питание – одна из мер по предупреждению развития диабета. Однако, не существует прямых доказательств, что именно вызывает диабет и что является наиболее эффективным в его лечении. Традиционный подход западной медицины, включающий употребление инсулина или пероральных лекарственных средств для лечения диабета, неполон и может вызвать долгосрочные осложнения. Фитотерапия в Китае издавна применялась для лечения диабета. Длительное употребление продуктов, содержащих китайские лекарственные растения с гипогликемическими свойствами, могло бы стать хорошей альтернативой для больных диабетом или людей с преддиабетическим состоянием. Целью данного исследования стала разработка процесса производства новых хлебобулочных изделий, содержащих китайские лекарственные растения с гипогликемическими свойствами, для понижения и нормализации высокого содержания сахара в крови и внедрение использования этих растений в производство традиционных продуктов питания. Длительное употребление этих продуктов является более предпочтительным по сравнению с химическими лекарственными препаратами для облегчения вызванных диабетом хронических заболеваний, при этом их неблагоприятное воздействие будет оставаться минимальным.*

**Ключевые слова:** диабет, традиционная китайская медицина, китайская фитотерапия, гипогликемический, хлебобулочные изделия с содержанием лекарственных растений.

## Introduction

Diabetes is a chronic debilitating and life threatening disease that results either from insulin insufficiency or ineffective use of the produced insulin in the body [1].

The morbidity and mortality associated with diabetes are consequential and derive primarily from complications of longstanding hyperglycemia. Persistent hyperglycemia causes vascular complications involving large and small blood vessels, such as arteriosclerosis, glomerulosclerosis, and retinopathy. The most frequent complication of persistent, poorly controlled diabetes is the diabetic neuropathy. Diabetic neuropathy is characterized by pain and paresthesias, and is often associated with a reduction in physical activity and with sleep disturbances [2].

The intermediate conditions between the healthy state and diabetes are impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG). People with IGT or IFG are at high risk of progressing to type 2 diabetes [3]. Even though Western medicine is effective in treating diabetes and its precursor disorders, it also causes some adverse effects and potential disharmony among the internal organs [4]. The conventional medical approach of Western medicine of using insulin or oral drugs to treat diabetes is incomplete and, as a result, the person relying on them to prevent long-term complications remains at risk [5].

Chinese herbal medicines have a long history of being used to treat diabetes. There is an extensive knowledge and careful scientific research of the safety in the use for many of the herbal substances [6]. According to Traditional Chinese Medicine (TCM), diet plays an important role in maintaining health and treating disease. Long term consumption of food products containing Chinese herbs with hypoglycemic properties could be a viable solution for diabetic or prediabetic patients.

## Status of the Problem

Diabetes is one of the most prevalent chronic diseases group worldwide. According to the International Diabetes Foundation, there are more than 300 million people living with diabetes worldwide. Nearly 80 percent of diabetes deaths occur in low- and middle-income countries [1]. Per the International Diabetes Foundation (IDF), China, with 92 million diabetics, has overtaken India (80 million) as the world leader in diabetes cases. Diabetes cost the global economy at least US \$ 376 billion in 2010, or 11.6% of total world healthcare expenditure [7]. The World Health Organization estimates that by 2030, more than 366 million people will be suffering from diabetes around the world [1].

The three well-known symptoms that describe diabetes are polydipsia (excessive thirst), polyphagia (excessive hunger), and polyuria (excessive urination). High blood sugar and glucose in the urine and excessive ketone bodies in the blood and urine are markers for diabetes. If not prevented, these accumulations will produce acidosis that could result in coma and death [5].

Overtime, diabetes will affect both microvascular and macrovascular systems as well as multiple organs, including muscle, blood vessels, nerves, eyes, skin, heart, brain, and kidneys. Common risk factors for vascular disease in people with

diabetes are heart disease and stroke. Combined with reduced blood flow, peripheral neuropathy in the lower extremities increases the chance of foot ulcers, infection and potential need for limb amputation [8]. Vision threatening diabetic retinopathy is an important cause of blindness among adults of 20–74 years of age, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. One percent of global blindness can be attributed to diabetes [9] placing diabetes among the leading causes of renal failure.

An extensive research has been conducted into the possible cause of diabetes. Even though the etiology is partially understood, most of the prevalent ideas of cause of diabetes are: heredity, endocrine imbalance, dietary indiscretion and obesity, sequelae of infection, and severe and continued psychic stress. The years of the substantial scientific research has demonstrated that the diabetic condition is not simply a matter of one or two things having gone wrong. It is an unbalanced system with a multitude of metabolic variances. The conventional medical approach of Western medicine of using insulin or oral drugs to treat diabetes is incomplete and people that rely on it to prevent long-term complications remain at risk [5].

## Purpose of the Study

The purpose of this study is to develop a new baked product, such as bread, which has diabetes preventive properties. Bread remains one of the most popular and basic food products in every household, and the goal is to design and make bread that will contain Chinese herbs with hypoglycemic properties. The focus of this study is to apply the available evidence of the capabilities of Chinese herbal medicines to lower and normalize high blood glucose and to integrate these medicinal herbs into a bread-type product.

## Materials and methods

Chinese herbal medicines have a long history of being safe and effective at treating diabetes and pre-diabetes [6]. Studies of the Chinese herbal substances for the treatment of diabetes demonstrated that their mechanisms of action on the body might be multi-factorial. It has been suggested that herbs containing polysaccharides restore the function of the pancreatic tissues causing increased insulin output by the beta-cells. Other herbs have been thought to enhance microcirculation, increase the availability of insulin and facilitate the metabolism in insulin dependent processes [10]. The polysaccharide containing herbs are found to stimulate immune system and liver functions, including RNA and DNA synthesis. They also promote red and white blood cells production, increase cerebral circulation, strengthen heart muscle and reduce cardiovascular diseases [11].

According to Traditional Chinese Medicine (TCM), diet plays an important role in maintaining health and treating disease. Long term consumption of food products, in particular bread containing Chinese herbs with hypoglycemic properties, could be a viable solution for diabetic or prediabetic patients. There is a very common question among people with diabetes whether they can eat bread at all. Bread is a starchy food and consists of carbohydrates which will raise blood glucose. Having diabetes does not totally restrict one from

bread consumption; however, it limits one to about 15 gram of carbohydrates a meal.

This study under the TCM guidance will develop a herbal formula containing multiple herbal substances, such as Huang Qi (*Astragali Radix*), Sheng Di Huang (*Rehmanniae Radix*), Ren Shen (*Ginseng Radix*), Ge Gen (*Puerariae Radix*), Wu Wei Zi (*Fructus Schisandrae Chinensis*), Mai Men Dong (*Tuber Ophiopogonis Japonici*), Shi Gao (*Gypsum Fibrosum*), Zhi Mu (*Anemarrhenae Rhizoma*), Mu Dan Pi (*Mountain Cortex*), Gou Qi Zi (*Fructus Lycii Chinensis*), Fu Shen (*Sclerotium Poriae Cocos*). The herbal formula will achieve a hypoglycemic effect, and this formula will be incorporated into the new bread product. The long term consumption of the new product will be advantageous over chemical drugs in alleviating some chronic diseases caused by diabetes, while adverse effects of the herbal substances are minimal.

### Conclusions

Type 2 diabetes is one of the most rapidly increasing chronic diseases in the world which became a global public health crisis that threatens the economies of all nations. The dynamics of the diabetes epidemic are changing rapidly. Once called a disease «of the West», type 2 diabetes has now spread to every country in the world. Once «a disease of wealth», it is now increasingly common among the poor [12].

The optimal and probably the only effective strategy to reduce the increased burden of type 2 diabetes is primary prevention at the world population level [13]. Chinese herbal medicines have a long history of being safe and effective at treating diabetes and pre-diabetes [6]. Since bread is the most consumed product all over the world by almost every culture, long term consumption of food products and bread, in particular containing Chinese herbs with hypoglycemic properties, could be a viable solution for diabetic or pre-diabetic patients.

### Research Area

During the initial studies the Chinese potato (*Rhizoma Dioscoreae*) flour was selected. It contains choline, dopamine, mannan, phytic acid, non-starch polysaccharides and other elements. Experimental bread samples included from

15% to 50% of the Chinese potato flour and the control bread sample had none. As a result of the experiment it was concluded that the sample with 15% of the Chinese potato flour has demonstrated the best physical, chemical and organoleptic characteristics. Thus, the use of Chinese potato (*Rhizoma Dioscoreae*) flour in the bread production improves manufacturability and allows expanding the range of baking products for diabetics.

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