Grains and Cereals in Type 2 Diabetes: An Integrative Approach to Research reasonable application

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Grains and cereals: the integrative approach to evidence-based application for patients with type 2 diabetes

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RESUME

We analyzed ideas about the causes of type 2 diabetes in current medical practice and in world Traditional medical systems and we have identified partial matches of views.

At the same time, the Western medicine does not take into account the violation of the Energy potential of the organism, in particular, the depletion, or reduction in the quality and/or quantity of Qi as a cause of diabetes. Unlike Western medicine, traditional world medical practice widely uses the grains and cereals for the prevention and treatment of type 2 diabetes (including constitutionally conditioned) because of their harmonizing properties, "characters" and "tastes". Thus, from the standpoint of integrative (holistic) medicine, cereals and grains are promising sources of macro- and micronutrients for food matrices in the development of specialized dry multi-component soluble food products for patients with type 2 diabetes.

keywords:grains, cereals, specialized food products, type 2 diabetes, Traditional Chinese Medicine, Tibetan Medicine, Ayurveda, the Traditional Medicine System.

SUMMARY

As a result of the information and analytical study, partially coinciding ideas about the causes of type 2 diabetes mellitus (DM) in modern academic medical practice and in the main traditional medical systems of the world were revealed. At the same time, the so-called "Western" medicine does not take into account the causes of this disease, caused by violations of the body's energy potential, in particular, depletion or decrease in the Quality and/or Quantity of Qi. Unlike "Western" dietology, the world's traditional medical practice widely uses cereals and cereals for the prevention and treatment of type 2 diabetes (including constitutionally determined) due to their harmonizing properties, "characters" and "tastes".

Thus, from the standpoint of integrative (holistic) medicine, cereals and cereals are promising sources of macro- and micronutrients for creating food matrices for dry multicomponent instant mixtures in the development of specialized food products for patients with type 2 diabetes. When choosing specific grain crops as promising sources of macro- and micronutrients for creating food matrices, one should take into account the ratio between the content of various classes of carbohydrates, vitamins (in particular, B1), vital macro- and microelements.

Key words: cereals, cereals, specialized food products, diabetes mellitus 2 types, traditional Chinese medicine, Tibetan medicine, Ayurveda, traditional medical systems.

Introduction

In the diet of a modern person, every year there are fewer foods in their natural form and more culinary processed products that require a significant amount of oil for cooking, as well as industrial dishes rich in

easily digestible carbohydrates. A negative contribution to the development of metabolic diseases is also made by the popularization of "fast food" (fast food), high-calorie drinks and leisure computerization [39]. All these factors are responsible not only for the increase in the number of obese people, but also for the ever-increasing number of patients with diabetes mellitus (DM), especially type 2 diabetes.

In Russia, as in other countries of the world, there is a significant increase in the prevalence of this disease. According to the Federal Registry of DM, in 2016, 4.35 million patients with DM were registered in the dispensary, of which 4 million people had type 2 diabetes. However, the actual number of patients with DM is more than 2 times higher than the officially registered number and is at least 8–9 million people (about 6% of the population) [3]. Therefore, expanding the range of food products for patients with DM 2 at the expense of domestic specialized food products (SPF) containing micronutrients that have a pronounced physiological effect on the body is an urgent task.

When developing a SPP for patients with type 2 diabetes (Russian Science Foundation grant No. 14-36-00041), we faced the problem of choosing cereals and cereals for creating food matrices for dry multicomponent instant mixtures with a modified carbohydrate profile, since the modern approach to the use of cereals and cereals is reduced to to a reasonable restriction of the amount of carbohydrates in the diet of such patients [12, 55].

From the standpoint of academic medicine, modern ideas about healthy optimal nutrition are mainly based on two main laws: 1) the correspondence of the energy value of the daily diet to the daily energy consumption of a person, 2) the correspondence of the chemical composition of the daily diet of a person to his physiological needs for food and minor biologically active substances (BAS) [45, 46, 48]. In the light of recent nutritional data, it is recommended to preferentially use foods with a low glycemic index (GI) in the diet and reduce the GI of the diet by enriching the diet with nutrients that reduce postprandial glycemia [47, 49]. With a relatively high energy value (more than 300 kcal/100 g), cereals and cereals do not belong to the category of products with an optimal GI for inclusion in the SOP for patients with diabetes. However,

In most TMS, food is historically regarded as the most important therapeutic agent and a source of biologically active substances (BAS), which have a pronounced physiological effect on the body. At the same time, the effect of food products can be both positive and negative, depending on the specific nosological form (or symptom complex), stage of development of the process, individual characteristics of the organism, region of residence, seasonality, compatibility with other components of food and drugs [18, 25] .

From the point of view of various TMS (Ayurveda, Unani, Siddhi, traditional Chinese, Korean (Korean), Tibetan medicine, etc.), based on their own theoretical concepts, harmonious nutrition implies such a choice and combination of food products, in which the energy balance of the body is restored and / or is preserved [1, 15, 18, 26, 37, 41, 53]. From the point of view of traditional dietology, the thermal and taste classifications of products adopted in various TMS are based on their energy effect on the body and must be taken into account in the process of drawing up a plan of therapeutic measures. At the same time, the Qi-restoring effect of many “neutral” and “sweet” foods, which include most cereals and cereals, manifests itself much faster than long-term attempts to improve health without taking into account these properties of food [18, 25–27, 38, 53].

A preliminary analysis of bibliographic sources made it possible to establish that today there is no systematized information about the traditions of the use of cereals and cereals in DM in various TMS of the world. Therefore, we considered it appropriate to study the therapeutic and prophylactic properties of cereals and cereals in DM from the standpoint of traditional medicine.

The purpose of this study is to identify, analyze and summarize information about the therapeutic and prophylactic properties of cereals from the standpoint of the world's main TMS to justify the possibility of an integrative approach to their use in type 2 diabetes.

Materials and methods of research

The objects of the study were bibliographic sources (monographs, scientific periodicals, reference books, dissertations, abstracts of dissertations and textbooks) and thematic Internet resources containing translations of ancient treatises of the main TMS of the world. The following research methods were used in the work: information-analytical, historical, content analysis, systematization.

Research results and discussion

1. Terminology: cereals, cereals, cereals, whole grains Terminological confusion in terms of manufactured products based on cereals and other cereals, whole grains, polished and other cereals, cereals and legumes, is often found in publications. In accordance with the current regulatory documents and generally accepted terminology, in this work we used the following terminological units.

A cereal crop is a plant belonging to the Cereal family, grains (wheat, rye, barley, oats, corn, rice, millet), which are widely used for human nutrition and for animal feed [35].

Groats - a food product consisting of whole or crushed grains, not only cereals, but also other grains and legumes, for example, from peas, i.e. groats are not only whole, but also crushed (crushed groats are called chaff), and a flattened kernel of cereal grains, buckwheat fruits or seeds of legumes [9, 13, 22]. In Russia, cereals are traditionally produced from millet grain (millet polished), buckwheat (ground and prodel), rice (grinded, polished and crushed), oats (uncrushed, polished, flattened, oatmeal, petal flakes and oatmeal), barley (pearl barley, barley), wheat (semolina, Poltava, Artek), corn (polished, cereals for flakes and sticks), peas (whole shelled polished and chopped polished) and other crops.

The nutritional value of cereals is determined not only by the type of grain or leguminous crop, but also by the features of the technological process during their production. This process includes purification of grain from impurities, hydrothermal treatment in steamers and dryers, sorting into fractions according to grain size, hulling in hullers (removal of shells), separation of husks, farinaceous and crushed particles from hulled grains; some cereals are subjected to grinding and polishing [13, 22]. During the processing of grain, the germ is removed, the presence of which in cereals reduces their storage stability and, accordingly, the shelf life [23]. Thus, cereal crops are all those plants that produce grain, which is mainly used for making cereals [24].

A complex of agrotechnological measures aimed at growing grain is called grain production [34].

Cereal production is a branch of the food industry, which is engaged in the manufacture of cereals and cereal products from grain of various crops. The basis of the technological process of cereal production is the mechanical separation of the shells (the so-called integumentary tissues) of the grain and the subsequent processing of the cleaned kernel and cotyledons. The technique for separating the shells depends on the anatomical features of the grain, for example, on the strength of the core and shells, the degree of their attachment to the core [42–44]. The general scheme of the technological process consists of several stages. These are cleaning of grain from impurities, sorting by size, peeling (separation of shells), processing of the kernel (crushing, grinding, polishing, flattening) depending on the type of grain and the variety of the resulting cereal. Many cereal factories are equipped with special equipment, allowing them to implement a more complex scheme for processing grain into cereals compared to standard schemes. Using the example of buckwheat, one can see that as a result of hydrothermal treatment, the strength of the kernel increases, and its shells become more brittle and easier to separate, the stability of cereals during storage increases [19, 42], the nutritional qualities of cereals improve and the cooking time from them decreases [19, 23].

Whole grains and products are whole grains or products made from it, containing all the natural constituents and nutrients of the original seed (grain) in their natural (natural, or native) proportions. To qualify a product as a whole grain, or as a whole grain, it must contain 100% of all the constituents of the original grain, that is, all bran, germ and endosperm in native ratios [57, 62].

In accordance with the decision of the International Council on Whole Grains (Whole Grains Council) (May, 2004) [62], whole grains include: amaranth, barley, buckwheat (buckwheat), corn, including whole corn flour and popcorn, millet, oats, including oatmeal, quinoa, rice (both brown and colored), wild rice, rye, sorghum (also called milo), teff, triticale, wheat, including its various types (such as spelt and spelt), varieties and forms (such as bulgur and crushed wheat groats) [62]. The list is not exhaustive and contains only the grains most familiar to the consumer in different countries. Amaranth, quinoa, and buckwheat do not belong to the botanical family Poaceae, but these so-called "pseudo-grains" are listed along with true cereals because their nutritional profile, preparation and use are similar to cereals. Oilseeds and legumes are not considered whole grains by the Whole Grains Council [62], AACC International [57], or the FDA (USA).

2. Basic principles of including cereals and cereals in the diet of patients with type 2 diabetes in modern clinical practice

In modern dietology, the most important principle of therapeutic nutrition for patients with diabetes is the exclusion from the diet of foods and dishes rich in easily digestible carbohydrates: sugar, honey, jam, chocolate, cakes, cookies, marmalade, as well as semolina and rice cereals. These products are used only for the relief of sudden hypoglycemia, as well as in the treatment of ketoacidosis [12]. Diet therapy, as a necessary component of the treatment of type 2 diabetes with any type of drug hypoglycemic therapy [2], is based on the principles of strict control of the energy value of the diet, the quantitative content and qualitative composition of protein, fat, carbohydrates, dietary fiber, adequate content of vitamins, macro- and trace elements that meet the needs of each individual patient [4, 59, 60]. At the same time, not even the GI of carbohydrates (source or type) is of greater importance, and their total amount in food or snacks. Although the use of low GI diets may reduce postprandial hyperglycemia. To date, there is no sufficient reason to recommend low GI diets to diabetic patients [12].

Cereals from cereals and other cereal crops are high-carbohydrate foods with a starch content of 55.4% in buckwheat [19] to 78% in brown rice and sugars - from 1.3% in brown rice to 2.3% in brown rice. maize [20, 63]. At the same time, the total content of carbohydrates varies from 71.5% in buckwheat without heat treatment to 80% in long-grain rice [61].

Due to the relatively high content of carbohydrates, the modern "Western" approach to the prevention and treatment of diabetes significantly limits the use of cereals in the diet of patients with type 2 diabetes, which is in clear contradiction with traditional medical ideas about the causes of the corresponding metabolic disorders, metabolic diseases and dietary recommendations for patients with type 2 diabetes and patients with glucose tolerance [16, 17, 26, 27, 40, 41, 53, 50, 58].

3. Causes and basic principles of DM treatment from the standpoint of traditional medicine

The main cause of DM 2 and other metabolic diseases, from the standpoint of Oriental medicine, is a violation of energy metabolism in the body, caused, among other things, by untimely and unbalanced consumption of products of the wrong taste (sweet, bitter, sour, salty, spicy), an incorrect balance energetically "hot", "cold" and "neutral" foods, as well as constitutional and

seasonal inconsistency of food and its excessive consumption [18, 33, 40, 53].

3.1. Traditional Chinese medicine. Traditional Chinese Medicine (TCM) proceeds from the fact that under normal conditions of life, the cause of almost any pathology on the physical, emotional or mental level is exhaustion, or a decrease in the Quality and / or Quantity of Qi. At the same time, Qi depletion can manifest itself as two pathologies: 1) If the Qi amount is reduced, this will cause Qi stagnation; 2) If the Quality of Qi is depleted, it can lead to the penetration of an external climatic factor [5, 7]. In addition, almost all TMS of the world proceed from the constitutional conditionality of certain violations in the intake and circulation of Qi [14].

For a long time, the main argument against the reality of the concepts adopted in TCM about the basics of the life support of the human body, on which the entire system of diagnostics and treatment is based (i.e., to deny the scientific nature of the theory of TCM), was the lack of evidence of the material nature of the vital energy Qi [25]. The results of experiments performed on the latest equipment demonstrated not only the existence of Qi (its materiality), but also proved the possibility of its radiation by a person [25, 29]. In the late 1990s, it was shown in China that Qi, as the main category of TCM, has an electromagnetic nature and can be measured. Subsequently, this was confirmed by numerous studies by Western scientists [25, 56].

From the standpoint of TCM, the root causes of diabetes can be an excess of “internal heat” and “impaired intrahepatic balance of Yin and Yang”, syndromes that fully fit into the theory of “dysfunction of the Qi mechanism” [5, 32, 33, 40, 51, 54]. Treatment involves diet therapy (with a predominance of products of "cooling" and harmonizing action), regulation of the immune and endocrine systems; restoration of the functioning of peripheral glands, central nervous system, pituitary gland and hypothalamus; the inclusion of agents that improve enzymatic processes, angioprotectors, choleretic and hepatotropic properties; detoxification procedures and detoxifying herbal ingredients, since under-oxidized fats, nitrogenous substances accumulate in the body of patients with diabetes, there are signs of lactic acidosis [33].

One of the rational ways to prevent the development of impaired glucose tolerance in TCM is the use of energy-intensive "live" products based on whole grains and cereals, since excessive craving for sweets indicates a lack of energy in the body and a lack of spleen function. It is optimal to use cereals and grains of a "refreshing", "warm" and "neutral" nature, in particular, corn, millet, spelled [33, 41, 58].

3.2. Ayurveda. In Ayurveda SD has been known since ancient times as Ashrava (Prameha) and/or Madhumeha (madhu - "honey", mecha - "urine"). One of the sources of Madhumeha is considered to be constitutional problems caused by the aggravation of Vata (air constitution), symbolizing wind and dryness, violations of which are characterized by wear and tear of the body. Vata diabetes is divided into 4 types, Kapha diabetes is divided into 10 types, Pitta diabetes is divided into 6 types. Physical inactivity and indigestion are also considered important causes of DM, leading to the accumulation of “specific impurities” that accumulate in pancreatic cells and disrupt insulin production [8, 30, 37]. Especially harmful is excessive consumption of food that is hot (ushna), oily (snigdha) and heavy (guru) nature [8].

In total, 21 types of diabetes are distinguished in Ayurveda, and Madhumeha disease itself is classified as Maha Roga (Great Disease, Major Disease), which violates the 5 sheaths of the body, and which cannot be treated with simple medicines or dietary regimen, because, not being cured in time, it can lead to a number of serious complications in the body. Treatment should be aimed not only at maintaining blood glucose levels, but also at rejuvenating the body, which will avoid further complications. Along with medications and a diet that includes the mandatory inclusion of whole grains, the patient is advised to lead a healthy active lifestyle, which contributes to the proper functioning of the brain, as well as rejuvenates the cells and tissues of the body and

makes them able to produce insulin properly again [8, 30].

3.3. Tibetan medicine. Tibetan medicine distinguishes three regulatory systems of the human body: Wind (rlung) - the nervous system, Bile (mkhris) - the digestive system and Mucus (bad-kan) - the hormonal and lymphatic system. Accordingly, disorders in these three systems, as well as factors of heat and cold, wind and fire, dampness and dryness, malnutrition and lifestyle, excessive physical exertion and psycho-emotional overload, trauma and laziness can serve as the causes of diabetes [53].

According to the ancient treatise Jude-Shi, "from salty, sweet, cool and heavy food and from dampness [in the body] there is an accumulation of Mucus and fat, which seep into the bladder and cause cloudy urine" [52] (a symptom of diabetes mellitus in Tibetan medicine). At the same time, “distinguish diseases from the wind [Wind diabetes], from Bile [Diabetes of Bile] and from Mucus [Diabetes of Mucus]. In total, twenty-one types of diabetes are distinguished by the turbidity of urine [52]. Most often, the disease occurs in people of the Bile type (overweight, reddish face, irritability, anger), the second most common type of diabetes is the Mucus type (loose, obese, obese), people of the Wind constitution suffer from diabetes much less often [53] .

Treatment always includes diet therapy and provides for a constitutional approach. If the cause of the disease is caused by a disorder of the nervous system (Wind), then in addition to procedures that increase the level of heat in the body, external methods of influence are used, as well as food and medicinal plants to restore the balance of the nervous system. If DM originated as a disease of "Coldness" (Mucus), then warming procedures, an appropriate diet and herbal medicine should normalize the weakened "fire" of the stomach and metabolic processes, improve digestion, remove excess mucus, lymph, fluid and fat from the body, increase energy and vitality. warmth. If diabetes occurs as a “Heat” (Bile) disease, then a set of food products and the whole range of measures are directed to the normalization of the bile constitution, correction of the liver-gall bladder, spleen-pancreas, for cleansing the blood and liver, reducing the internal "heat" [53]. In all cases, diet therapy is not complete without the use of properly prepared meals based on cereals [38, 53].

4. Cereals and cereals from the standpoint of the main traditional medical systems of the world

In various TMS, cereals and cereals are not only a necessary component of the diet of a healthy and sick person, but also have therapeutic and prophylactic properties, including in metabolic diseases, in particular, in type 2 diabetes [6, 14, 15, 25, 38, 41, 53].

4.1. Traditional Chinese Medicine

Cereals and cereals (gu) in TCM are everyday foods that, as a rule, have a harmonizing effect on the body due to their properties and characteristics [6, 10, 25, 28, 41]. Indications for their use in healthy and sick people are, among other things, constitutionally determined (Tables 1, 2), as well as the tendency to develop DM is constitutionally determined [14].

Table 1

Constitutional types in TCM (according to [14])

I	II	III	IV	V	VI	VII	VIII	IX
Пустота энергии (Ци)	Пустота Ян	Пустота Инь	Пустота крови	Застой энергии (Ци)	Застой Крови	Избыток Ян	Скопление Мокроты и Сырости	Скопление Сырости и Жара

table 2

Cereals useful for various constitutional types in TCM (according to [14])

Пищевой продукт					Конституциональный тип								
Название крупы	Свойства	Вкус	Действие	Дополнительная информация	I	II	III	IV	V	VI	VII	VIII	IX
Кукуруза	Нейтральные	Сладкий	Оздоравливает Селезенку и Желудок. Питает энергию и Инь. Выводит Воду и восстанавливает проходимость при дизурии.	Улучшает функцию Селезенки и Желудка. В ТКМ входит в перечень продуктов, «открывающих желудок» – продуктов, которые следует употреблять перед едой, чтобы подготовить желудок для восприятия и переваривания пищи. Повышает аппетит. Подходит как людям с Путотой Ци, так и при нехватке начала Инь. При пустоте Инь лучше выбирать клейкие сорта кукурузы, у которых восполняющее Инь действие выражено сильнее.			+						
Овес (Геркулес)	Нейтральные	Сладкий	Пестует Печень и гармонизирует Желудок. Поддерживает движение энергии.	Рекомендуется ослабленным и медлительным детям в качестве вспомогательного средства, двигающего энергию. В «холодной» и «сырой» Великобритании традиционная утренняя овсянка позволяет активизировать ток жизненной энергии, замедляющийся ночью. Не рекомендуется употреблять без перерывов в связи с наличием антипитального фактора – фитиновой кислоты и ее солей (фитатов), препятствующих усвоению кальция.					+				
Пшеница	Прохладные	Сладкий	Пестует Инь Сердца и ликвидирует беспокойство. Питает энергию Почек. Гармонизирует Селезенку. Увлажняет Легкие. Выводит Жар и прекращает жажду. Стимулирует мочевыделение.	Особенно подходит людям с Путотой Инь. Помогает им избавиться от таких проявлений синдрома, как Жар в пяти центрах, беспокойство. Для восполнения Инь и Крови Сердца, гармонизации и успокоения Духа зерна пшеницы заваривают в виде чая с солодкой и унаби.			+						
Рис клейкий	Теплые	Сладкий	Восполняет энергию Селезенки и Желудка. Укрепляет поверхность тела.	Является лечебным средством при диарее, снижении аппетита. Включают в диету при хронических гастритах, пептической язве.	+								
Рис короткозерный	Нейтральные	Сладкий, Пресный	Восполняет энергию Селезенки и Желудка	Гармонизирует взаимоотношения между 5 внутренними цзан-органами. Прекращает беспокойство и жажду. Восполняет энергию Селезенки и Желудка. Утренняя жидкая каша укрепляет организм, улучшает пищеварение, восполняет силы ослабленных больных, стариков, детей, женщин после родов.	+								
Рис дикий (цицания)	Нейтральные	Сладкий	Питает Инь и восполняет Почки. Пестует Кровь, оздоравливает тело и согревает Желудок. Просветляет глаза и двигает Кровь. Очищает Печень и увлажняет Кишечник.	Это «зерно, восполняющее Кровь», или «зерно долголетия». Лечебное средство при недостатке Крови и слабости Почек, головокружении, поседении, отеках. Можно добавлять к белому рису.				+					
Чумиза	Слегка прохладные	Сладкий	Восполняет энергию и питает Инь. Оздоравливает Селезенку и Желудок. Питает Легкие.	Головчатое просо внешне очень похоже на пшено. Широко культивируется в Китае и Японии. Среди китайцев чрезвычайно популярна жидкая чумизовая каша – «отвар, заменяющий женьшень». Необходима для восстановления сил ослабленным людям, детям и беременным. Благотворно действует на функцию органов пищеварения. Хорошее профилактическое средство от трещин в углах рта («заед»). В косметологии используется внутрь как средство для замедления появления морщин и уменьшения пигментации (отложения пигмента).			+						

In accordance with the theory of TCM, "entry into the channel" is one of the most important properties of the product. This implies that each product acts on certain organs and certain channels, exerting a selective effect on them. In the case of cereals, the Heart channel includes wheat, the Spleen channel includes wheat, rice, barley and buckwheat, the Liver channel includes buckwheat, the Lung channel includes rice, the Kidney channel includes buckwheat and wheat, the Bladder channel contains corn, channel of the Large intestine - buckwheat and corn [15]. In table. 3 presents data on the affinity of some cereals to partner organs in accordance with the concept of the Five Primary Elements according to [36], although the data in various sources differ.

Table 3

Cereals that enhance (nourish) each of the Five Primary Elements (according to [36])

Первоэлементы	Дерево	Огонь	Земля	Металл	Вода
Органы-партнеры	Печень и Желчный пузырь	Сердце и Тонкий кишечник	Селезенка и Желудок	Легкие и Толстый кишечник	Почки и Мочевой пузырь
Крупа	Пшеница	Кукуруза	Просо	Рис	Ячмень, гречиха, горох, фасоль, бобы

Here are the characteristics of cereals and cereals, adopted in traditional Chinese dietology and diet therapy according to modern bibliographic sources [6, 10, 14, 15, 25, 41, 50, 58].

Buckwheat, buckwheat, buckwheat - 荞麦 qiaomai. The nature of the impact and taste: cooling, cool, refreshing, neutral, sweet, slightly sour. Action: strengthens (opens) the stomach, promotes digestion, dissolves (eliminates, destroys, dissolves, removes) stagnation and blockage, including Qi stagnation, “dissolves” accumulation of food, lowers energy and benefits the intestines, stops sweat. Recommended for: stagnation of food in the stomach and intestines, abdominal pain and diarrhea, dysentery. Contraindications: emptiness and weakness of the body and Qi. Due to its cold properties, it is not recommended to use it in the spring (besides, it nourishes Yin, gives rise to Wind).

According to [6], buckwheat correlates with the channels of the Spleen, Stomach, Large Intestine. The main functions include strengthening the Spleen and Stomach, replenishing Qi, strengthening the Spleen to eliminate Dampness and food blockages, eliminating Dampness-Heat, sedimenting abnormally raised Qi, and promoting the elimination of waste from the body. The main indications include lack of Spleen Qi, internal accumulation of Dampness, Dampness-Heat, "food blockages", prolonged stagnation of dirty Dampness-Heat [6].

Corn, maize - 玉米 yumi. Common name: 包米 baomi - corn; 珍珠米 zhenzhumi - corn, maize. The nature of the impact and taste: smooth, fresh sweet (according to some reports: sweet, warm [15], neutral [28], tasteless [10]), sweet and "moderately (repressive)" [58]. Action: "diuretic of non-renal nature" [58], can "reduce blood pressure and blood sugar levels, hemostatic" [58] beneficial effect on the lungs, calms (option: soothes and pacifies) the heart, strengthens (replenishes) the spleen, heals (opens) the stomach, replenishes the Qi of the Stomach and Spleen, removes (expels) Dampness and relieves swelling, promotes urination, enriches the Lungs, stimulates appetite, prevents the occurrence of cancer, lowers cholesterol, increases the efficiency of the brain, strengthens the mind, calms the soul. Recommended in the treatment of dysentery, diarrhea, jaundice, edema. Indications [58]: diabetes, involuntary urination, urinary stones, polyuria, pain during urination, acute and chronic cystitis, edema due to nephritis [58]. Contraindications: no. Caution: if the cereal becomes damp and moldy, then yeast is formed that stimulates the development and growth of a cancerous tumor. Since corn did not grow in ancient China, there is no information about it in the classical ancient treatises of TCM. Whole grains can generate excess wind.

Oats - 燕麦 yanmai. The nature of the impact and taste: warming, warm, according to some data – neutral [15], sweet. Action: replenishes the spleen, stomach, emptiness, stops devastating sweat, lubricates the intestines, stimulates the fetus. Recommended: for the treatment of weakness after illness, poor appetite, constipation and difficult childbirth. Contraindications: no. Warnings [28]: The main property that food should have, from the point of view of TCM, is to give back Qi more after its assimilation than it was spent on digestion. From this point of view, oatmeal is an empty product - it practically does not replenish Qi. Therefore, hercules is practically not used in traditional Chinese dietology as a food product, only in some special cases - as a medicine. It is quite heavy food for the Spleen.

Millet, millet (also kaoliang, veiny sorghum) - 高粱 gaoliang. common people title: 芦粟 - lusu - sorghum (kaoliang, sugar sorghum). Other names: 稷米 – jimi – sorghum

(kaoliang), 黍米 - shumi - sorghum (kaoliang, glutinous millet). The nature of the impact and taste: warming (according to other sources - neutral [15], warm [10]), slightly cold [Cai, 1988], sweet, astringent, tart. Action: replenishes (replenishes) vital Qi, strengthens (replenishes) the spleen, nourishes the stomach, nourishes the lungs, removes fever and heals acne and abscesses. Effective for insomnia, combined with dyspepsia due to the weakness of the functions of the stomach-spleen. It is recommended mainly for postpartum weakness, insomnia and general debility [58], cough due to empty lungs; hiccups, thirst and restlessness with empty spleen. Refers to products that replenish energy. Millet cereals are especially useful in spring. Contraindications: diabetes mellitus.

Wheat - 小麦 xiaomai. The nature of the impact and taste: cooling, refreshing, sweet. According to other sources - sweet and neutral [15], sweet and slightly cold [58]. Action: balances the mind and the Heart, stops sweating due to asthenia [58], strengthens, nourishes the spirit-Shen of the heart, collects (calms) the devastating sweat generated by emptiness. Refers to products that replenish, nourish Yin. Enters the Liver Channel, cools, nourishes and soothes her Liver Fire. It is recommended for everyone who has an excited Liver (it is excited in almost all "white" people), as well as for those who have an excess of Heat or Yin Emptiness. Indications [58]: idiopathic sweat, palpitations, night sweats, hysteria (in combination with the use of licorice and dates). Especially useful in spring. Contraindications: diabetes mellitus.

Bran: sweet, cool. They harmonize the spleen, remove fever, treat excessive sweating in empty syndromes. Used for symptoms such as mouth ulcers, sweating with weakness and low temperature, redness, heat, swelling and tenderness of the joints when exposed to wind, cold and dampness.

Short-grain rice (grain) - 粳米 jingmi. Common name: 大米 dami. Character effects and taste: smooth, warm, sweet. Action: replenishes the middle (replenishes the middle heater), promotes the accumulation (enriches, promotes the accumulation) of Qi, strengthens the spleen, nurtures (nourishes) the stomach. It is recommended for: a general decline in vitality, heat and high temperature, a protracted illness, to restore strength after childbirth, as well as for the elderly. Rice porridges are especially useful in spring. Contraindications: no.

glutinous rice - 糯米 nuomi. Common name: 元米 yuanmi - no, 江米 jiangmi - Jiangnan glutinous rice. Character of influence and taste: warming, warm, sweet. Action: replenishes the middle (replenishes the middle heater), promotes the accumulation (enriches, promotes the accumulation) of Qi, strengthens the spleen, replenishing its energy, nurtures (nourishes) the stomach, stops the devastating (caused by emptiness) sweat. Refers to products that replenish energy. Recommended for diabetes, increased urination, unmotivated sweating, diarrhea. Contraindications: increased wet fire caused by the penetration of heat and dampness; heat; cough with yellow sputum; jaundice, bloating. Glutinous rice is sticky and makes it difficult for the body to absorb and digest food. Old people, children, people with weakened digestion and recovering from illness are not recommended to eat cakes, biscuits and pancakes made from glutinous rice.

Common rice: sweet, neutral, according to other sources - sweet and restraining (warm if grown in northern China) [58]. Replenishes the spleen, harmonizes the stomach, benefits the seed and strengthens the will, cures empty spleen, gloomy and depressed mood, diabetes, diarrhea, dysentery, emaciation, emptiness of the kidneys.

Paddy rice - 谷芽 guya. Common name: 稻芽 daoya - unrefined rice. Character of influence and taste: warming, warm, sweet. Action: strengthens the spleen, opens the stomach, stimulates the appetite, harmonizes the center (soothes and harmonizes the middle burner), eliminates stagnation and congestion, promotes digestion and assimilation of food. Contraindications: no. Special Notes [58]: Must simmer until glutinous. For medical purposes, poria or dereza fruits are added with

in order to enhance the nutritional properties.

Rice chaff, chaff - 米皮糠 mipikang. Common name: 杵頭糠 Chutoukang - rice chaff, chaff (bran, small seedings), 细糠 xikang - rice chaff, chaff (bran, small seeds), 米糠 mikang - rice chaff, chaff. The nature of the impact and taste: harmonizing, smooth, tart (bitter) and sweet. Action: provides intestinal patency, opens the stomach, excites (increases) appetite, promotes the lowering of Qi down (promotes the release of gases from the intestines), eliminates Qi stagnation, resolves (relieves) stagnation and blockage - dissolves the accumulation of food, improves intestinal patency. Contains a lot of provitamin A, vitamins of group B. Contraindications: none.

Barley (also pearl barley, barley groats) - 大麦 damai. Effects and taste: slightly cold, cooling, refreshing, sweet and salty, according to other sources - warm and salty [58]. Action: improves the function of the stomach-spleen, eliminates dyspepsia [58], enriches Qi, promotes the accumulation of Qi, harmonizes the energy of the spleen, expands the center, nourishes the body, digestion of food, stops and reverses (wraps) milk (prevents the flow of milk). Indications [58]: dyspepsia, digestive weakness, especially in children, weakness due to hepatitis, the need to interrupt lactation. It is recommended for the treatment of emptiness and weakness of the spleen and stomach, digestive disorders, vomiting and diarrhea, and constipation after childbirth. Contraindications: the period of pregnancy and lactation.

Naked barley - qinkemai. Character of influence and taste: smooth, salty. Action: replenishes the spleen, nourishes the stomach, enriches Qi, promotes the accumulation of Qi, increases physical (muscular) strength, eliminates diarrhea.

Analyzing the above descriptions from specialized bibliographic sources of TCM, one can easily notice that only two of all the described cereal crops (millet, wheat) have DM among the contraindications. Contrary to conventional wisdom, glutinous rice, common rice, buckwheat and corn, on the contrary, are recommended in TCM for DM.

To facilitate dietary prescriptions, B. Temeli and B. Trebut (2010) summarized in one table (Table 4) the most commonly used cereals by Europeans, indicating their properties in accordance with the Five Elements System, which is one of the main theoretical foundations of TCM [41].

Table 4

Correspondence of cereals and cereals to the Five Elements System (according to [41])

Элемент	Вкус	Направление	Действие	Горячий	Теплый	Нейтральный	Освежа-ющий	Холодный
Дерево	Кислый	Внутрь и вниз	Сохраняет соки	–	Полба	Булгур, кускус, спельта	Пшеница	Отруби пшеничные, проростки пшеницы
Огонь	Горький	Вниз	Побуждает к изменению	–		Амарант, киноа, рожь	Гречка	
Земля	Сладкий	Распределяет во всех направлениях	Питает и увлажняет	–	Рис сладкий (особый вид риса)	Кукуруза в початках, пшено	Ячмень	
Металл	Острый	Вверх и вовне	Сдвигает и устраняет застой	–	Овес	Рис		
Вода	Соленый	Направлен в глубину	Укрепляет кости и устра-няет застой	–	–	–	–	–

R. Dahlke (2010) proposed a similar classification according to thermal properties, however, taking into account the way cereals are usually cooked - whether they are eaten raw or boiled, baked in an oven or fried before cooking (Table 5), and tastes [11].

According to R. Dalke, almost all cereals are products that have a "sweet" taste,

which has a harmonizing and relaxing effect, helps to retain moisture and always has a supportive effect on the body [11]. At the same time, the experience of the main TMS shows that some cereals may have a different taste: naked barley - salty, common barley - sweet and salty, rice chaff - tart (bitter) and sweet, kaoliang - sweet, astringent and tart at the same time [6, 10, 14, 15, 25, 26, 41, 50, 58] (Tables 4, 7).

Table 5

Classification of cereals according to thermal properties, taking into account the traditional method for Europe cooking (according to [11])

Тепловые (термические) свойства	Характер воздействия на организм	Название зерновой культуры или крупы
Горячие	Защищают от холода, особенно зимой. Активизируют защитные силы организма. Активизируют пищеварение. Необходимо употреблять в ограниченном количестве, чтобы избежать сильного внутреннего жара.	
Теплые	Согревают тело и придают силы. Лучше всего подходят для осени и зимы, особенно в сочетании с нейтральными. Летом лучше сводить потребление к минимуму.	Амарант Зеленое зерно Овес Полба Рис восковидный
Нейтральные	Оказывают уравновешивающее воздействие. Хорошо насыщают, помогают держаться середины и снабжают энергией. Должны составлять основу питания практически каждого человека. почти все зерновые культуры в отварном виде относятся к этому типу.	Греча Киноа (квинойя) Кукуруза Льняное семя Пшено Рис Basmati Рис круглозерный Рожь
Освежающие (прохладные)	Улучшают кроветворение и производство иных жидких субстанций организма. Способствуют увлажнению слизистых оболочек и других тканей. Больше подходят для теплого времени года, но полезны круглый год (их потребление следует ограничивать только зимой).	Пшеница Ячменные крупы – ячневая, перловая
Холодные	Могут приводить к энергетическому дисбалансу в организме. Могут замедлять всасывание биологически активных веществ из других продуктов. Могут усилить выделение и накопление слизи. Больше подходят для теплого времени года и должны быть сведены к минимуму зимой.	Овсяные хлопья Пшеничные хлопья Пшеничные отруби

4.2. Ayurveda

In DM, Ayurveda does not allow the use of Navanna (young grains), while the use of barley (Java), wheat (Godhuma), flaxseed (Kodrava-Paspalum scrobiculatum) and other whole grains is encouraged [8].

Taking into account the constitutional features and causes of diabetes, when using cereals in the diet, one should take into account the individual ability of each of them to influence different Doshas in the body [26, 27, 37]. In table. 6 shows data on the compatibility of grain products and some products from them in accordance with the main constitutional types in Ayurveda (according to [26, 27]). Such recommendations are of a general nature and need to be individualized, taking into account the strength of digestion, the season, the degree of prevalence of the dominant dosha, the possibility of allergic reactions, the form and stage of diabetes, and the current state of the body.

Since, according to the classical canons, one of the sources of Madhumeha is considered to be constitutional problems caused by exacerbation of Vata (see Section 3), when choosing diet therapy for the prevention and treatment of DM, Ayurvedic physicians are guided, among other things, by the normalization of the corresponding dosha. Grains and grains in general are good for reducing Vata. They should always be boiled in a sufficiently large amount of water. In dry form (in the form of flakes) or in the form of bread with a lot of yeast, they are considered

harmful. Ideal for: wheat, spelled, durum wheat (paste); well suited: rice, oats, corn, buckwheat, rye, millet, barley. Not recommended: brown rice; cereal flakes and muesli are strictly excluded [37].

Table 6

Compatibility of grain products with the main constitutional types * in Ayurveda (according to [26, 27])

ВАТА		ПИТТА		КАПХА	
НЕТ	ДА	НЕТ	ДА	НЕТ	ДА
	Амарант**		Амарант		Амарант**
Гранола			Гранола		Гранола
Гречиха		Гречиха			Гречиха
			Завтраки хлебно-злаковые, сухие		
	Квиноа (лебеда)	Квиноа (лебеда)			Квиноа (лебеда)**
Кукуруза		Кукуруза			Кукуруза
Кус-кус			Кус-кус		Кус-кус
Овес (сухой)		Овес (сухой)			Овес (сухой)
	Овес приготовленный		Овес приготовленный	Овес приготовленный	
Овсяные отруби			Овсяные отруби		Овсяные отруби
Полба			Полба		Полба **
Полента (каша из кукурузы)***		Полента (каша из кукурузы)***			Полента (каша из кукурузы)
Просо		Просо			Просо
	Пшеница		Пшеница	Пшеница	
	Пшеничная мука дурум		Пшеничная мука дурум		Пшеничная мука дурум**
Пшеничные отруби			Пшеничные отруби		Пшеничные отруби
	Рис всех видов	Рис коричневый	Рис (басмати, белый, дикий)	Рис (коричневый, белый)	Рис (басмати, дикий)**
Рисовые лепешки***				Рисовые лепешки***	
Рожь		Рожь			Рожь
Саго					
Таниока			Таниока		Таниока
Ячмень			Ячмень		Ячмень

Примечания: * Конституциональный тип определяется по специальным опросникам (тестам); ** Допускается употребление в умеренных количествах; *** Употребление допускается изредка.

Most grains are good for Pete's constitution, but grains that have a strong warming effect should be avoided. Ideal for: wheat, spelled, rice; good: oats, corn, millet. Not recommended: rye, barley, brown rice, buckwheat [37].

Varieties of cereals that dissolve mucus, warm and have a diuretic effect are suitable for the Kapha constitution, but it is always necessary to monitor the amount eaten. Well suited: buckwheat, barley, corn, millet, rye. Not recommended: rice, oats; strictly excluded: wheat, spelled, brown rice.

In table. 7 provides information about the properties and effect of grains and cereals (and some dishes from them) on each of the doshas (in accordance with Ayurvedic ideas) according to [26].

In general, the effect of grain on doshas, constitution and metabolism is characterized as: Vata -, Pitta - -, Kapha ++, anabolic action ++. Cereals have a sweet (madhura rasa) taste and are therefore useful for maintaining the balance in the body. In the characteristics of sweet products, the predominant primary elements (mahabhuta) are

Earth (prithivi) and Water (ap). They are characterized by the following properties: increases body tissues (dhatu), life expectancy and vitality, improves complexion, cleanses the senses, softens the burning sensation [37].

Table 7

Properties and nature of the influence of cereals and cereals on doshas (according to [26])

Продукт	Вкус	Действие	Влияние на доши		
			Вата	Пита	Капха
Амарант	Сладкий, вяжущий	Легкое	↓	↓	↓
Блины из муки пшеничной	Сладкий	Тяжелое, маслянистое	↓	↓	↑
Гречиха	Вяжущий	Тяжелое	↑	↑	↓
Киноа, лебеда	Сладкий	Согревающее, приземляющее	↓	↑	↓(↑)
Кукуруза	Сладкий	Сухое, легкое	↑	↑	↓
Макаронные изделия	Вяжущий	Тяжелое, мягкое	↑	↓	↑
Овес сырой	Сладкий	Тяжелое	↑	↑	↓
приготовленный	Сладкий	Тяжелое	↓	↓	↑
Овсяные отруби	Вяжущий, сладкий	Грубое, сухое, легкое	↑	↓	↓
Полба	Острый, вяжущий	Легкое, сухое	↑	↓	↓(↑)
Просо	Сладкий	Сухое, легкое	↑	↑	↓
Пшеница	Сладкий	Тяжелое, маслянистое, слабительное	↓	↓	↑
Пшеничная мука дурум	Сладкий, вяжущий	Легкое	↓	↓	↑
Рис басмати	Сладкий	Легкое, мягкое, благотворное	↓	↓	↓
Рис белый	Сладкий	Мягкое, задерживающее воду	↓	↓	↑
Рис коричневый	Сладкий	Тяжелое	↓	↑	↑
Рожь	Вяжущий	Сухое, легкое	↑	↑	↓
Саго	Вяжущий, сладкий	Легкое, сушащее	↑	↓	↓
Ячмень	Сладкий	Легкое, мочегонное	↑	↓	↓

4.3. Tibetan medicine

Tibetan medicine divides all grain crops into two types: spiked and leguminous. Rice, millet, wheat, gymnospermous barley, wild barley, oats and other cereals that have a “sweet” taste after digestion are eared. According to the effect on the body, most of these cultures are among the means that suppress passion and the Wind system, as well as generating strength and Slime [53]. In accordance with the terminology of Tibetan medicine, each cereal crop has its own character and its own thermal characteristics (Table 8).

Table 8

Warming and cooling cereals (according to [38])

Крупы	Согре-вающие	Нейт-ральные	Охлаж-дающие
Гречневые крупы			+
Манная и другие пшеничные крупы			+
Овес, овсяные крупы		+	
Пшено			+
Рис и рисовые крупы		+	
Рожь и ржаные крупы			+
Ячмень, ячневая и перловая крупы			+

Oats are cool, light, suppress mucus and bile [38, 53]. Useful for people of Bile, Mucus and Mucus-Bile mixed type. It is better for people of the Wind to boil oatmeal in milk, eat it hot, sweet, adding cinnamon as a warming element. For people

Vetra undesirable consumption of raw or undercooked oats [38].

Millet (millet) is heavy, cold, strengthens and connects damaged bones and tissues [38, 53]. Promotes healing of wounds and fusion of bones in case of fractures. Useful for people of Bile, Wind and mixed Bile-Wind type, but harmful for people of Phlegm. Especially undesirable for them is milk millet porridge, which is suitable for Wind [38].

Wheat is cold, heavy, nutritious [38, 53], cures disorders of the Wind (Vata) and Bile (Pita) systems [53]. Strengthens the body [52]. Useful for people of Wind, Bile and mixed type of Bile-Wind, harmful to Mucus. Especially undesirable for Mucus is semolina porridge in milk with sugar, which is useful for Wind [38].

Wild barley - cold, light, rough, appetizing. Gymnospermous barley - cold, heavy, the best of the means that give strength [53].

Rice is oily, soft, cold (cool) and light [38, 53]. Favorably affects all three regulatory systems [38, 53], controls sexual desire, and treats vomiting and diarrhea [52]. Liquid rice soup quenches thirst well, relieves hunger, fatigue, "evens out the strength of the body, generates heat and softens the cavities of blood vessels." Thicker soup also generates heat, "helps with fatigue, dissolves diseases, eliminates the retention of impurities" [53]. Rice soups in water or broth are beneficial for all constitutional types [38], but soup made from underripe rice or barley stimulates appetite and depresses heat [53].

For Slime, the combination of rice and milk (milk porridge) is undesirable, so people of Slime should boil it in steam or in water, you can salt it, but you can’t add sugar. For people of the Wind it is useful to cook rice in milk, add butter, sugar, honey, jam. Porridges and soups from fried rice improve bone healing in fractures, help with diarrhea. Rice dishes help lower blood cholesterol levels and are used to prevent atherosclerosis [38].

Leguminous crops have astringent and sweet taste. They are cold, light and whitish, close the openings of blood vessels, remove mucus, stop diarrhea, absorb oil, help with diseases of the blood, bile and obesity [53].

Peas clears mucus and wind, cough, shortness of breath, removes hemorrhoids, "pebbles" of the seed, generates blood and bile. Small peas enhance the work of all three systems of regulation, increase the seed and strength of the body, its gruel cleanses the body in diseases of the blood, skin and joints. Sesame - heavy, hot, suppresses sexual desire and cures wind diseases.

Buckwheat is cold and light [38, 53]. “Destroys malignant tumors”, enhances the movement of all three regulatory systems [53]. Harmful to people of the Wind. Neutral for people Mucus, Bile and Mucus-Bile mixed type [38].

Flax seeds are bittersweet, oily, soft. Useful for all constitutional types, but especially for Wind [38, 53].

The properties of grains, like legumes, can change over time and depending on heat treatment [38]. All freshly harvested raw (new crop) grains are “heavy”, while ripe, dried and old grains are “light”. Cooked and fried grains become “lighter”, are better digested and assimilated, therefore, before cooking porridge, it is useful to fry almost any cereal a little [38, 53]. Tibetans have historically used roasted grains of cereals, for example, as a dressing for tea to make it more nutritious. In addition, liquid cereal soups were used, which, being easily digested, gave strength and cleansed the body [53].

5. Possibilities of using cereals and cereals to create food matrices for SPP in diet therapy for type 2 diabetes

The conducted information and analytical study made it possible to establish that the modern academic approach to the use of cereals and cereals in type 2 diabetes is reduced to a significant limitation of their amount in the diet of patients with type 2 diabetes and other persons with impaired fat and carbohydrate metabolism. This approach is in some contradiction with traditional ideas (Ayurveda, traditional Chinese medicine, traditional

Korean medicine Kore et al.) about the causes of metabolic disorders and dietary recommendations for patients with type 2 diabetes and other individuals with glucose tolerance. Taking into account the experience of traditional medicine in terms of the causes, methods of prevention and treatment of DM, the features of dietary therapy for this disease, as well as modern ideas about the chemical composition and experimentally confirmed biological effect of cereals and cereals [19, 20], it seems appropriate to further study the possibility of their use as sources of food matrices for the development of SPP for patients with type 2 diabetes.

Since the diet of patients with diabetes mellitus should contain a sufficient amount of water- and fat-soluble vitamins [12], cereals and cereals can be considered as their available domestic source. Of particular importance in the diet of diabetic patients is vitamin B1 (thiamine), which is actively involved in carbohydrate metabolism and the synthesis of the neurotransmitter acetylcholine. The greatest amount of thiamine is found in yeast, wholemeal bread, bran and grains of cereals and other cereals [18, 21]. However, with an increase in the quota of carbohydrates in the diet, the need for thiamine also increases [12]. Therefore, when choosing promising grain crops as sources of biologically active substances for creating food matrices, one should take into account the ratio between the content of carbohydrates and vitamin B1. Apparently the best

With diabetes, it is necessary that a sufficient amount of macro- and microelements be supplied with food, among which zinc, copper and manganese are important, since they indirectly lower blood sugar. Zinc is part of insulin, increases the immunobiological reactivity of the body and has a lipotropic effect. Manganese enhances the hypoglycemic effect of insulin, stimulates oxidative processes in the body, increases its reactivity, and has a lipotropic and hypocholesterolemic effect. Copper also enhances oxidative processes in the body and increases its reactivity, improves the antitoxic function of the liver, participates in the synthesis of hemoglobin, and inhibits insulinase, which destroys insulin [12]. Zinc is rich in cereals, manganese is also found in cereals and other cereals, food sources of copper are buckwheat, oatmeal and pearl barley [12, 18–20].

When developing SPP for different age groups of the population, it should be taken into account that the presence of diabetes in the elderly is dangerous not only for hyper-, but also for hypoglycemic conditions. In particular, in type 2 diabetes, hypoglycemic conditions are quite common: at the age of 65 to 69 years, about 20–30% of people experience them, and 50% of people over the age of 85 years [31]. Given the balanced carbohydrate (from the standpoint of "Western" medicine) composition, "neutral" characteristics, "sweet" taste and balanced energy potential (from the standpoint of traditional medicine), it is advisable to include cereals and cereals in the diet for elderly patients with type 2 diabetes.

Thus, cereals and cereals are promising sources of macro- and micronutrients for the creation of food matrices of dry multicomponent instant mixtures with a modified carbohydrate profile in the development of SDS for patients with type 2 diabetes. The choice of specific cereal crops should be carried out in accordance with the specified parameters of a specific category of SPP.

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conclusions

1. Despite the existence of common views on the causes of type 2 diabetes in
In modern academic medical practice and in the main traditional medical systems of the world, the so-called "Western" medicine does not take into account the causes of this disease, due to violations of the body's energy potential (in particular, depletion, or a decrease in the Quality and / or Quantity of Qi).

2. Cereals and cereals in the world traditional medical practice are widely used for prevention and treatment of diabetes (including constitutionally determined) due to their

harmonizing properties, "character" and "taste".

3. When analyzing indications for the use of cereals and cereals in DM in the main Traditional medical systems of the world revealed some differences and constitutional conditionality of the choice of specific cereals and cereals.

4. Cereals and cereals are promising sources of macro- and micronutrients for creation of food matrices of dry multicomponent instant mixtures with a modified carbohydrate profile in the development of SPP for patients with type 2 diabetes.

5. When choosing specific grain crops as promising sources of macro- and micronutrients to create food matrices, one should take into account the ratio between the content of various classes of carbohydrates, vitamins (in particular, B1), vital macro- and microelements.

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