








Review

The importance of diet therapy in the treatment of urinary tract infections (UTIs): Chinese Medicine Dietotherapy and Mediterranean diet integrative perspective.

Teresa Santos^{1,*} , Joana Calado^{1,#} , Manuela Lasca¹ , Daniela Silva¹ , Eva Vieira¹ ,
Maria Begoña Criado^{2,3}  and Alexandra Moura^{1,2} .

¹ ABS – Health Level Atlântico Business School, Vila Nova de Gaia, Porto, Portugal;

² CBSin—Center of BioSciences in Integrative Health, Vila Nova de Gaia, Portugal;

³ 1H-TOXRUN—One Health Toxicology Research Unit, University Institute of Health Sciences (IUCS), CESPU, CRL, Gandra, Portugal.

Authors contributed equally.

* Correspondence: teresamsantos2@gmail.com

Abstract: Treating and preventing urinary tract infection (UTI) has become a health challenge due to its high prevalence, risk of recurrence and bacterial resistance, showing the need for integrative approaches. The aim of this work is to provide a current review of studies reported on the pathogenesis of UTI and an integrated treatment perspective combining Chinese dietotherapy and Mediterranean diet. Due to the growing increase in antibiotic resistance reported in various studies, the importance of complementary approaches was explored. We reviewed the literature on diet therapy, emphasising foods that promote urinary tract health and that can prevent and treat its infection. We analysed principles of Traditional Chinese Medicine (TCM), which uses food to balance Qi and harmonise Yin and Yang and integrated these principles with the Mediterranean diet (Med-Diet), known for its anti-inflammatory and antioxidant properties. This work provides an integrated view of how the combination of these two dietary approaches can contribute to the prevention and treatment of UTI and promote the general health of the urinary tract.

Keywords: UTI, Chinese syndromes, Chinese Dietotherapy, Mediterranean Diet, Complementary therapies, Anti-inflammatory food, Antioxidant food.

Citation: Santos T., Calado J., Lasca M., Silva D., Vieira E., Criado M.B., Moura A. The importance of diet therapy in the treatment of urinary tract infections (UTIs): Chinese Medicine dietotherapy and Mediterranean diet integrative perspective. *Journal of Complementary Therapies in Health*. 2024;2(1) 10.5281/zenodo.13207454

Academic Editor: Jorge Rodrigues

Received: 14 July 2024

Reviewed: 25 July 2024

Accepted: 2 August 2024

Published: 3 August 2024

Publisher's Note: IPTC stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: ©2024 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

1.1. Urinary tract infection from a Western Medicine perspective

UTI is a common concern worldwide that affects people of all ages and genders, however, women are more susceptible due to the anatomy of the female urinary tract and factors such as pregnancy and menopause¹⁻³.

The urinary tract consists of paired organs, the kidneys and ureters, the bladder and urethra. Uropathogens can enter the urinary tract and cause UTI via the ascending route or the haematogenous route, but the vast majority of UTI are thought to occur via the ascending route. The mechanism of ascension is uncertain, but motility mediated by flagella and pili appears to be important^{1,4,5}. Depending on the location, the infection can be called pyelonephritis, if the pathogens reach the kidney (5% of all UTI), cystitis, if they reach the bladder (95% of all symptomatic urinary tract infections) or urethritis if they reach the urethra^{1,6,7}.

Bacterial infection of the bladder mucosa is the most common situation of UTI, with *Escherichia coli* as the predominant uropathogen. A bladder infection can be characterised by symptoms like burning on urination and urinary frequency including nocturia. In women, vaginal colonization is considered to be a prerequisite to bladder infection ^{1,8}.

UTI can be considered uncomplicated if it occurs in non-pregnant women and elderly who have no known functional or anatomical abnormalities of the urinary tract. Uropathogenic *Escherichia coli* infecting young men tend to be highly virulent ⁹. Risk factors for pyelonephritis are similar to those for cystitis, including sexual intercourse, with genetic factors playing also a role ^{2,6}.

In Western medicine (WM), UTI is mainly treated with antibiotics. In this sense, antibiotic resistance complicates UTI treatment and is associated with higher patient morbidity, higher costs with great economic impact, higher rates of hospitalization, especially among the elderly, and great use of broad-spectrum antibiotics in primary care.

Due to its high prevalence, risk of recurrence, inadequate treatment and bacterial resistance, diagnosing and treating UTI has become a challenge for Western medicine that shows the need for a more complete and integrative approach ^{1,10}.

1.2. Urinary tract infection from a Chinese Medicine perspective

TCM offers a unique perspective on UTI as takes into account physical symptoms, and energetic and emotional imbalances underlying the predisposition to the condition and is based, mainly, on disease prevention. Thus, according to TCM, UTI is often associated with energy imbalances in the body, such as *Qi* (vital energy or vital force) and *Jing* (essence) ^{11,12}.

Jing is involved in regulating body fluids and purifying the blood. A deficiency of the essence can weaken the immune system, resulting in symptoms such as chronic weakness, frequency and difficult urination and damp accumulation which leads to a greater predisposition to UTI. With age, the *Jing* weakens or/and is consumed, increasing the frequency of UTI. For TCM, maintaining a healthy lifestyle, with adequate nutrition and rest, helps to preserve the essence for longer ¹³.

Taking into account the manifestation of physical symptoms, energetic aspects and emotional imbalances, TCM uses the Five Elements theory or the theory of Phases ^{12,14}, to treat diseases. Table 1 shows a summary of the characteristics associated with the five elements related to UTI.

For TCM, agents that play an important role in the imbalances of the body can be internal or external. Internal agents such as cogitation, fear, stress, and anxiety, and external agents such as cold, dampness (or humidity), heat and dryness may be involved ^{11,14}. Emotions such as anxiety, fear and stress affect the *Qi* of the kidneys and, consequently, the *Jing* which can cause physical symptoms such as painful, recurrent and frequent urination. Frequency urination is usually related to deficiency of kidney *Yang* or *Qi* and heat in the bladder, while recurrent urination is often associated with deficiency of kidney *Yin*, stagnation of *Qi* and dampness-heat in the bladder ¹⁷.

From the TCM point of view, UTI belongs to a group of symptoms called *lin zheng* 淋, or strangury syndrome, already described in the *Bencao Gangmu* written by *Shizhen Li* (1518 – 1593) ¹⁴, which is defined as pain that is worse at the end of urination during the inflammatory process resulting from UTI, or obstructive processes. UTI can be caused by damp-heat or damp-cold in the lower heater and inhibition of the transformation of the *Qi* by the kidney and bladder. According to TCM, the underlying pattern of UTI is kidney *Yin* deficiency. Symptoms of this syndrome include chronic fatigue, night sweats, persistent thirst, hot flushes, difficulty urinating, dry skin and dry tongue, and irritability ^{13,18}.

Thus, recurrent or chronic UTI involves patterns of external excess and internal deficiency. The pattern of external excess refers to the continuous or repeated presence of pathogen agents such as heat and dampness that can cause symptoms such as burning

when urinating, fever, thirst, cloudy urine and a feeling of heaviness in the lower abdomen, while internal deficiency refers to the weakness of the body's internal systems, such as the *Qi* of the kidneys and bladder ^{13-15,19}.

Table 1. Characteristics associated with the five elements or with the phase’s theory, related to UTI ^{13,15,16}.

Element	Influence on the urinary tract according to TCM	Element imbalances that manifest themselves in UTIs
Wood	Associated with the liver and gallbladder. The liver plays a role in regulating the flow of energy and removing toxins from the body.	Yellow and cloudy urine, burning when urinating, and pain in the bladder area, which indicate stagnation or excessive heat in the liver.
Fire	Associated with the heart and small intestine. The heat and inflammation associated with infection disrupt the body's energy balance.	Fever, excessive thirst and/or urinary irritation.
Earth	Associated with the spleen-pancreas and stomach. The spleen plays a role in blood production and the regulation of body fluids.	Fluid retention, feeling of heaviness in the body and limbs, and oedema, which can contribute to UTIs.
Metal	Associated with the lungs and large intestine and influences the body's immune response (<i>Wei Qi</i>) during a urinary infection.	Decreased immune function, with increased susceptibility to UTIs.
Water	The kidney is allocated to the Water element. Kidney function regulates the volume of fluids eliminated by the body. Associated with humidity control and the regulation of body fluids.	Fluid retention and/or difficulties in eliminating toxins, which trigger UTIs.

Excessive dampness can create a favourable environment for the growth of pathogens, which can easily lead to urinary infections. Excessive heat in the body can cause inflammation and irritation in the urinary tract, predisposing to infections. Conversely, excessive cold or chilliness can lead to contraction of the blood vessels (vasoconstriction) and decreased blood flow to the urinary tract, making it more susceptible to infections due to damp-cold. According to TCM, cold closes the surface, in this case, the pores of the skin, reducing perspiration and increasing urination ^{12,13,15,16}.

In Table 2 we present the relation of the different patterns of UTI according to TCM principles and the pathophysiology of UTI according to western medicine.

Taking all this into account, TCM treatments are aimed at strengthening the *Qi* of the kidney, eliminating heat and draining dampness ^{13,15,16}. In all the TCM ways of treatment, food plays an important role in the treatment and prevention of disease, as the old saying by Hippocrates around the 5th century BC “Let Food Be Thy Medicine and Medicine Be Thy Food”. According to TCM principles, a good and healthy food plan strengthens the immune system, helps to expel external pathogens (cold, damp, dryness and heat) and strengthens the internal organs according to individual needs ¹⁸⁻²⁰.

Table 2. Summary of patterns, characteristics and causes in the context of UTI according to TCM principles and related to pathophysiology according to WM.

Infections according to WM	UTI syndrome according to TCM	Symptoms of UTI in WM	UTI imbalance in TCM	Recommended Food for UTI syndromes	Refs.
Cystitis of bacterial origin	Damp-Heat in the Bladder	Sparse concentrated urine, can be dark yellow, cloudy, and/or with a strong odour, may be bloody, with burning sensation, dysuria, possibly low-grade fever and thirst.	Spleen/Pancreas and Bladder <i>Qi</i> deficiency. Low resistance (weakened <i>Wei Qi</i>)	Avoid: Food with a hot thermal nature (spicy, alcoholic drinks), food that produces humidity and heat (excess sweets, fatty and thermally hot food such as crisps, soft drinks, and junk food). Recommend: Food that cools the heat and drains dampness; nourishes the spleen and suppletes the kidney's <i>Qi</i> .	12,16,17
Non-bacterial cystitis	Damp-cold in the Bladder	Large amounts of fluids which are pale in colour can be frequent urination with clear urine. Sometimes difficulty in urinating. A feeling of heaviness in the lower abdomen.	Low general resistance (emptiness of Kidney <i>Qi</i> and <i>Yang</i>). Often due to an external agent (cold), and possibly internal emotional agents such as fear. Too much sexual activity weakens Kidney <i>Yang</i> .	Avoid: Cold and fresh food, dairy products, and excess meat. Recommend: Food that drains dampness, supplements the lower heater, Kidney, and nourishes the Spleen. Examples of food: walnuts, black sesame seeds, seafood, eggs, pork, and goji berries.	12,16,17
Pyelonephritis	Damp-Heat in the Kidneys	In addition to the symptoms of cystitis, pyelonephritis can include high fever, back pain and chills.	Deficiency of <i>Qi</i> or <i>Yang</i> of the Kidneys and Bladder.	Avoid: Cold Food, moist or that increases internal heat in the body and can exacerbate the symptoms of pyelonephritis. Recommend: Food that drains dampness such as cucumber, watermelon, dandelion tea, walnuts, black sesame seeds, seafood, eggs, pork, and goji berries.	16,17
Urethritis	Damp-Heat in the urethra	Dysuria, frequent micturition, abnormal secretions from the urethra (This can include clear, cloudy, bloody or purulent secretions, depending on the cause of the infection)	<i>Qi</i> deficiency of the spleen and bladder.	Avoid: Cold and fresh food, spicy food, caffeine and alcohol, processed food, and junk food. Recommend: Cucumber to drain dampness; onions, salmon, oysters, and fennel to nourish Kidney and Spleen.	17,21-23

2. Dietotherapy

It is well established that a healthy diet is a foundation for health, well-being and optimal growth and development¹⁸. Several studies have also shown that a healthy diet can play an important role in the treatment and prevention of UTI²³⁻²⁶. From the different approaches to healthy diets, we will focus on the Mediterranean diet and Dietotherapy according to TCM principles.

2.1. Dietotherapy to prevent and treat urinary tract infections according to TCM

Chinese dietetics, also known as Chinese materia medica¹⁴, aims to bring *Yin - Yang* back to a relatively balanced²⁷.

This branch of TCM treatment acts as a preventive dietetic and is classified according to 5 saps or flavours, 5 colours, and 5 consistencies, taking into account the seasons, categories and temperament in order to achieve a balance that is conducive to good health^{14,18,19}.

Chinese Dietotherapy is based on the concepts of *Yin* and *Yang*, *Qi* and the 5 elements (wood, fire, earth, metal and water) and organs (Zang-Fu), with the aim of harmonising and rebalancing vital energy¹⁹. In Chinese diet therapy, food is considered a way of balancing the body from the inside out and thus, directly influences health and illness. Foods have specific energetic properties that affect the balance of *Qi* and harmonise the *Yin* and *Yang* elements in the body^{1,12,18,19}.

Recent studies highlight the effectiveness of TCM Dietotherapy in treating chronic diseases, showing its continued relevance in modern integrative medicine²⁸. The choice of food is based on the diagnosis of the energetic imbalance of the patient who is advised a dietary plan, both to maintain health and to treat specific diseases^{18,19}.

As mentioned earlier, in TCM diagnosis, it is crucial to assess the patient to determine whether the disease is acute or chronic, *Yin* or *Yang* in nature, identify which movement it belongs to within the 5 elements and the internal and/or external agents involved. This is essential in order to understand the nature of the body's energy imbalance. Assessing the *Yin* or *Yang* nature helps to identify whether the condition is one of deficiency or excess, cold or heat, which is fundamental to choosing the appropriate diet therapy. After identifying all these factors, the concept of treatment is established, which includes among other therapeutic interventions, a dietary plan with the choice of suitable or beneficial foods and others to avoid¹¹.

Chinese diet therapy focuses on the therapeutic properties of foods according to TCM principles, and not so much on their nutritional value and needs, to be based on a consistent diagnosis. In TCM, the classification of the food is based on its properties, such as nature, flavour, tropism (affinity with organs and senses), and direction. Each flavour is associated with an element, a season and organs, and has specific effects on them^{12,27,29}.

The thermal nature of the food refers to its intrinsic quality, which can be hot, warm, neutral, fresh or cold. For example, hot food, such as ginger, warms the body and promotes circulation, while cold food, such as cucumber, cools the body and dissipates heat. According to TCM, food indicates a tropism, indicating UTI affinity with specific organs. For example, food that strengthens the kidney, such as beans, is often used to treat conditions related to this organ²⁷. The thermal nature has a cooling or warming effect on the body by acting on microcirculation and the flavour relates to the Five Phases also indicating their affinity with specific organs^{12,14}.

The functional effect direction of action of the food refers to the effects they have on the body, such as dispersing, toning, cleansing or warming. For example, foods that disperse cold, such as cinnamon, are used to treat conditions caused by cold in the body. As another example, bitter foods, such as coffee, help clear heat and dry out dampness, while sweet foods, such as sweet potatoes, can tone the spleen and stomach^{14,19}.

The directions of food are expansion, ascent, transformation, concentration and descent. Therefore, they can act on the surface, or affect more depth, the *Yin* itself¹⁴.

Table 3. Food classification according to TCM approach ^{12,14,19,29}.

Element or Phases	Wood	Fire	Earth	Metal	Water
Energy	<i>Yang</i>	<i>Yang</i>	Neutral/balanced <i>Yin</i> and <i>Yang</i>	<i>Yin</i>	<i>Yin</i>
Tropism	Liver and Gallbladder	Heart and Small Intestine	Spleen and Stomach	Lungs and Large Intestine	Kidneys and Bladder
Tropism action	sourness enters the sinews	bitterness enters the blood	sweetness enters the flesh	acridity enters the <i>Qi</i>	saltiness enters the bones
Sapor or Flavour	Sour	Bitter	Sweet	Pungent or acrid	Salty
Sapor or Flavour mechanism of action	Has an astringent effect, and gathers and preserves fluids.	Has a hardening effect. Bitter taste can clear heat from the body, especially from the heart, Usually, the urine is dark or yellow.	Sweet has the most potent supplemental effect on the body. Sweet has a warming, strengthening, harmonizing, and humectant or nourishing effect on the body fluids. Builds up energy. Has a relaxing effect once inner tension is reduced.	Moves <i>Qi</i> , revitalizes energy circulation, loosens stagnations, disperses, opens pores and protects the surface of external factors of disease.	Cools, moistens, produce a downward movement, softens and loosens.
Thermal Nature (Energy generated)	Hot – has heating and warming effects on the body. Increases <i>Yang</i> energy, speeding up the <i>Qi</i> , activating and dispersing, and moving upward and outward. Warms the bowels and viscera (<i>zang-fu</i>), eliminates external and internal cold, and mobilizes defence energy (<i>Wei Qi</i>).	Warm – has a mild effect on the body, strengthening <i>Yang</i> and <i>Qi</i> , and the center burner.	Neutral – Stabilize the body and has a harmonizing effect on the body. Builds up <i>Qi</i> and body fluids.	Cool – Supplement body fluids and <i>Xue</i> , slow down <i>Qi</i> and clear heat.	Cold – Creates cold, cool internal heat has a calming effect on the spirit (<i>Shen</i>).
Mechanism of action	It causes contraction in the body tissues to maintain fluids.	It has a dehydrating effect.	Do not change the energetic level of the body.	Induces sweat.	It cools and moistens.
Consistency	Hard	Fibrous	Fleshy	Crunchy	Soft
Colour	Green	Red	Yellow	White	Black
Season	Spring	Summer	The end of summer	Autumn	Winter

In UTI, and depending on the TCM syndrome diagnosed, food can be used to harmonise the imbalances and strengthen the patient's immune system. At the same time, it is important to know what foods should be avoided, as they could exacerbate the imbalances and contribute to the proliferation of pathogens ^{6,17,19,21}. Thus, in excess dampness, it is advisable to avoid food that increases humidity such as peanuts, potatoes and mung beans. Excessive heat in the body can be worsened by consuming hot food or those that increase internal heat, such as watercress. Even foods with an overall effect of slightly warming the body (spicy), if consumed in large quantities must be avoided, as they can potentially increase internal heat, especially in people who already have excessive heat. On the other hand, excessive cold in the body can be worsened by consuming food that is cold in nature or that promotes the production of internal cold. Foods such as cucumber, asparagus and pineapple have cooling properties and can aggravate this imbalance if consumed in excess ^{12,19,30,31}. In summary, Chinese diet therapy promotes urinary tract health highlighting the balance between the different properties of foods ^{29,32}.

2.2. Mediterranean Dietotherapy to prevent and treat urinary tract infections

The general definition of the Mediterranean diet (MedDiet) includes guidelines for high intake of extra virgin olive oil (made with cold pressed), vegetables including leafy green vegetables, fruits, cereals (mostly wholegrain), nuts and legumes, moderate intakes of fish and other meat, dairy products and red wine, and low intakes of eggs and sweets. The description also provides an indication of the frequency these foods should be consumed, for example often, daily, biweekly and the amounts in the diet, described using subjective terms such as abundance, high, moderate, low, some, and vast ^{33,34}. Therefore, the MedDiet evaluates proteins, calories, carbohydrates, vitamins, and other nutritional content. However, MedDiet is more than just a list of food, it represents a lifestyle and a cultural tradition of the regions bathed by the Mediterranean Sea (including Portugal). Based on decades of scientific studies and cultural observations, MedDiet promotes nutrition through an abundant variety of natural foods, combined with the pleasure of enjoying the company of beloved ones ²⁴.

The MedDiet is also widely recognised for its positive impact and benefits on the urinary tract. This diet prioritizes the consumption of fresh, whole foods, rich in nutrients and low processed, that can play an important role in the prevention of several urinary tract conditions (e.g. kidney stones), that could be risk factors in developing UTI ²⁴. In addition, MedDiet has been associated with a lower risk of urinary tract infections due to its anti-inflammatory and antioxidant properties ²⁵.

The MedDiet offers a balanced and natural approach that can benefit the health of the urinary tract, helping to prevent urinary tract infections and other related conditions. Table 4 shows a summary of the properties of the MedDiet.

This diet helps to reduce inflammation ²⁶. Removing processed products and excess salt from the daily plan diet will reduce the excessive oxidation of inflammatory cells that cause excessive production of free radicals, as there is tissue degeneration that is persistently inflamed ²³. Incorporating the principles of MedDiet into the dietary routine can be an effective strategy for promoting the health and well-being of the urinary tract in the long term. The MedDiet, with its emphasis on seasonal, fresh, whole and nutrient-rich food, offers anti-inflammatory, antioxidant and diuretic properties that promote urinary tract health ^{24,35}.

Table 3. Food classification according to TCM approach ^{12,14,19,29}.

Characteristics of the MedDiet	Benefits	Foods	Refs.
Plenty of plant foods	These foods are rich in essential nutrients, providing sustainable energy, vitamins and minerals crucial to health	The basis of the MedDiet is made up of a wide variety of fruits, vegetables, whole grains, nuts, seeds and pulses.	35,36
Moderate consumption of animal products	Although animal products are part of the MedDiet, they are consumed in moderation. The emphasis is on fish as a healthy source of protein and omega-3s	Such as fish, poultry, dairy products, red meat and eggs.	23
Emphasis on olive oil	Anti-inflammatory and antioxidant properties. Regular consumption of olive oil strengthens the immune system and reduces inflammation. Regular consumption of olive oil has also been associated with a lower risk of kidney stones, due to its ability to prevent the formation of crystals in the kidneys.	Rich in monounsaturated fatty acids.	30,37
Moderate consumption of red wine	Source of antioxidants and polyphenols, which have been associated with various health benefits	Red wine, consumed in moderation during meals.	38
Reducing processed foods	Favours the consumption of fresh and natural foods, which preserve maximum vital energy and their original nutrients and flavours	Avoids processed foods, refined sugars and trans fats.	26
Sharing family meals	Socialising at the table and sharing meals with family and friends is valued in the MedDiet.	This practice promotes healthy eating, strengthens social and cultural ties and creates moments of connection and well-being	39
Moderate protein intake	Mainly from plant sources, as plant proteins tend to be more easily processed by the body when compared to animal proteins	Pulses and unrefined grains.	40
Inclusion of herbs and spices	Adds flavour to dishes and provides health benefits: possesses natural diuretic properties, which can help increase urine production and assist in the elimination of toxins by the kidneys	Herbs such as parsley, coriander and basil. Watermelon, cucumbers, asparagus, onions and carrots	19,41,42
Increasing the intake of probiotics	Restore healthy levels of intestinal bacteria, stimulating the immune system and allowing the body to continue to infections effectively. Probiotics are by nature cool and their cooling action helps in burning sensation when it is heat and ardor. Avoid if damp and cold. Also, important during and after antibiotic treatment.	Probiotic-rich fermented food such as kombucha, Greek yoghurt, kefir water, kimchi and sauerkraut into the diet.	18,19,43,44

3. Integrative approach to Dietotherapy principles in TCM and MedDiet food

Mediterranean diet plays a crucial role in promoting health in general and in particular the health of the urinary tract preventing urinary infections. On the other hand, according to TCM principles, it is important to consider that food has properties that can affect the body, such as humidity, heat, cold and dryness. In this context, we propose an integrated approach applying the principles of TCM Dietotherapy, always depending on the differential diagnosis, to foods from MedDiet. Thus, the following recommendations are proposed:

- a) If there is a pattern of excess, it is recommended to consume food that drains humidity from the body, such as barley, oats, pumpkin, celery and watermelon seeds, stigma maydis. On the other hand, food that contributes to dampness, such as dairy products, fatty food, sweets and raw food, should be avoided or consumed in moderation^{19,27}.
- b) If the pattern is of excessive heat, consume food that possesses cooling properties and helps purify the excessive heat, such as cucumber, watermelon, mint leaves, melon and chrysanthemum tea. In addition, cold or chilled food, such as salad, fresh cheese, camomile tea, and beer, can help cool the body down. Food that contributes to heat the body, such as spicy, fried, fatty food and alcohol, should be avoided^{18,19,45}.
 - Food with a salty flavour or of a cooling thermal nature possesses a descending effect, promotes diuresis and helps to eliminate heat, thus cooling the body. Examples of such food include cucumber, oysters with lemon, seaweed, fish, black beans, pork, watermelon, melon and pear^{12,18,19,45}.
- c) If the predominant pattern is excess of cold, consume food that possesses warming properties and helps dispel the cold, such as ginger, cinnamon, cloves, garlic, and onions. Warm and hot food, such as beef, coffee, hot chilli peppers and fried foods, are also beneficial for warming up the body. Cold food or food that contributes to internal cold, such as raw food, chilled food, dairy products and citrus fruits, should be avoided or consumed in moderation^{18,19,45}.
 - Food with a salty flavour possesses the ability to soften hardened masses, purge heat and benefit kidney function. This flavour is considered essential for nourishing the *Jing*, which is stored in the Kidney, thus strengthening the general health of the urinary tract. Food with a salty flavour or of a warm or hot nature possesses an upward movement. Examples include fish and seafood, seaweed, goat meat, mutton and beef, beans especially black beans, mushrooms, seeds or nuts such as almonds, peanuts, pumpkin seeds and watermelon seeds^{19,45,46}.
- d) Avoid food that irritates the bladder lining, such as tomatoes, alcohol, caffeine, and fatty, as well as spicy foods^{18,19,43,44}.

Taking the above into account, we propose a complete and integrative approach to the prevention and treatment of urinary tract infections by combining the two dietary approaches. On the one hand, the use of typical food of Mediterranean diet is known for its anti-inflammatory and antioxidant properties. On the other hand, to apply the principles of TCM, which considers the thermal properties and flavours of food to balance the body energetically. This combination allows us to take advantage of the nutritional and therapeutic benefits of both systems and promote more effective and holistic urinary health.

Table 5 shows the characteristics of foods used in the Mediterranean diet in the view of TCM principles. The possible actions of the foods on imbalances that can affect the urinary tract are also described. In addition, the table provides guidance on situations in which these foods should be avoided or consumed to improve urinary conditions, according to TCM. These foods are classified according to their therapeutic properties, including their thermal nature, flavour, tropism and direction of action, with the aim of balancing the body and promoting the health of the urinary tract.

Table 5. Classification of food for the urinary tract from a TCM perspective.

Food	Nature	Flavour	Emotions	Tropism	TCM mechanism of action	Avoid	Refs.
<u>Foods of plant origin (Yin)</u>							
Apple	Neutral and Fresh	Sweet and Slightly Sour	Restless mind, in cogitation or rumination thoughts, anxiety	Lung, Stomach, Spleen	Helps digestion, stimulates diuresis	Avoid in cases of excessive cold or Damp-Cold.	17-19,47
Asparagus	Cold and Fresh	Bitter and Sweet	Melancholy, sadness, fatigue	Lung, Kidney	The descending direction helps the elimination of heat and dampness. Supplements Lung and Kidney Yin. Tonifies Kidney Yin. Diuretic.	Avoid in cases of excessive cold or Damp-Cold. Avoid daily consumption once it is cold in thermal nature and has a dispersive nature.	17-19,47
Black Bean	Neutral	Sweet	Worry, anxiety	Kidney, Spleen.	Tonifies Qi and strengthens the Spleen and Kidney. Eliminates stagnations, cools heat, promotes diuresis, and reduces swelling.	In the case of Spleen Yang deficiency or Damp stagnation.	19,47
Broccoli	Fresh	Slightly Sweet and Bitter	Irritability, frustration, or ira, anger	Liver, Stomach, Spleen	Cools the Liver and blood. Diuretic. Disperses pain and accumulations, detoxifies and cleanses the body. Descending movement makes it ideal for cystitis treatment.	Avoid in cases of Spleen or Kidney Yang deficiency, or Qi or Xue deficiency.	18,19
Carrot	Neutral	Sweet	Irritability, impatience, anxiety	Lungs, Spleen, Stomach	Supplements the middle burner. It should be eaten cooked to maximize its properties.	Avoid in case of heat or heat-humidity.	18,19,47
Celery	Fresh	Spicy and Sweet	Isolation, lack of motivation, depression.	Lung, Spleen	Cools the heat in the Stomach and Liver, moves Qi.	Avoid in case of damp-cold.	19
Cinnamon	Hot	Sweet and Spicy	Irritability, impatience, anxiety	Lung, Spleen, Stomach	Promotes diuresis. Drains humidity. Expels cold. Supplements the Middle Heater. Must be consumed cooked to take advantage of the properties.	In case of excessive internal heat or fever.	19,47

Coffee	Hot and Warm	Bitter	Stimulates the mind, and can increase anxiety and irritability.	Benefits the Heart and Liver.	Dehydrates, stimulates the nervous system, promotes blood circulation and can warm the body.	In case of <i>Yin</i> deficiency or heat conditions in the body, such as inflammation or irritation.	17-19,47
Coriander	Hot	Spicy	Irritability, worry	Lung, Spleen	Causes perspiration. Helps digestion and stimulates the functions of the Spleen and Lungs.	Avoid daily consumption as it is a very hot food.	18,19,47
Cranberries (In Europe it is originally in mountainous areas).	Neutral, Fresh.	Sweet and Bitter	Irritability, excessive worry, depression.	Lung, Stomach, Bladder	Inhibits bacterial adherence, and increases appetite. D-mannose is a type of sugar produced naturally by cranberries.	Avoid in case of hot or humidity. It does not belong to MedDiet but contains bio-active compounds such as proanthocyanidins and has antioxidant and anti-inflammatory properties, which are effective in managing infections, oxidative stress and inflammation.	19,47,48
Cucumber	Cold, Fresh	Sweet, slightly Bitter	Lethargy, lack of energy	Kidneys, Stomach, Small Intestine, Lungs.	Cools Heat. Diuretic. Indicated in UTI.	Avoid in case of excessive cold or cold-damp.	17-19,47
Garlic	Warm to hot	Spicy	Helps to relieve frustration and anger. Promotes a well-being sensation.	Lungs	Garlic extract has antimicrobial properties. Drains phlegm (pituita). Eliminates cold from the lower Heater. Expels external pathogenic factors.	In case of excessive heat, ardor or inflammation.	17-19,47
Grape	Warm, Neutral	Sweet and Sour	Mental agitation	Lung, Kidney	Supplements <i>Qi</i> and <i>Xue</i> . Detoxifying action, therefore stimulates the Kidneys.	Avoid in case of heat or Damp-Heat.	19,47

Leek	Warm	Spicy and Sweet	Agitation, irritation.	Lung, Stomach	Moves <i>Qi</i> and warms the middle heater. Removes internal heat, drain dampness and phlegm (pituita). Similar action to garlic.	Avoid in case of heat or Damp-Heat.	17,19,47
Lemon	Cold	Sour	Melancholy, sadness	Liver, Lung, Spleen	Cools heat and drains dampness, therefore aiding in all types of infection.	In case of internal cold or <i>Yang</i> deficiency.	17,19,47
Lettuce	Fresh and cold	Sweet and Bitter	Irritability, frustration, ira, anger	Stomach and Liver	Cools heat. Against build-up and pain. Treats urinary disorders, and eliminates mucus and <i>Qi</i> stasis.	In the case of Spleen or Kidney <i>Yang</i> deficiency or <i>Qi</i> deficiency.	18,19
Melon	Fresh	Sweet	Apathy, lack of motivation, depression	Heart, Spleen, Stomach	Dissolves stones formed by heat and dampness.	Avoid in case of excessive cold or <i>Yang</i> deficiency.	18,19,47
Mint	Fresh	Spicy	Stress, nervousness	Lungs, Large intestine	Refreshing action benefits the respiratory tract, disperses oedema and favours the elimination of waste products. In case of heat.	In case of internal cold or <i>Yang</i> deficiency.	17,19,47
Olive	Fresh	Sweet and Bitter	Anxiety	Lungs and Stomach	Moisturises the lungs and moistens them.	In case of excess internal humidity.	19
Parsley	Warm	Slightly Spicy and Bitter	Irritability, nervousness, fatigue	Lung and Spleen	Diuretic, helps digestion.	Avoid in case of <i>Yin</i> deficiency or Cold in the Earth Element or phase.	18,19,47
Pea	Fresh	Sweet	Calms the mind and promotes the feeling of safety and stability	Spleen, Stomach	Diuretic. Improves internal heat.	Avoid in case of Spleen <i>Yang</i> deficiency or internal Dampness.	19,47
Pineapple	Fresh	Sour and Sweet	Anxiety, impatience	Spleen and Liver	Diuretic. Disperses stagnation and expels mucus.	In case of internal cold or <i>Yang</i> deficiency.	17,19,47
Plum	Fresh	Sour and Bitter	Relieves anxiety.	Heart and Bladder	Eliminates waste products through urine. The black colour benefits the water element or phase.	In case of chronic diarrhoea or digestive weakness.	13,17,19,47

Potatoes	Neutral and slightly cold	Sweet	Excessive worry, anxiety	Spleen and Stomach	Strengthens the Spleen, supplements <i>Qi</i> and helps in ardor or inflammation.	Avoid when there is dampness or excess heat present.	19
Pumpkin	Neutral and Warm	Sweet	Sadness, anxiety	Stomach and Spleen	Benefits the Middle Heater, stimulates the centre and helps the Spleen function. Tonifies the Kidney <i>Yang</i> and the <i>Yang</i> of the Spleen.	In case of excess dampness.	18,19,47
Spinach	Fresh	Sweet and slightly Bitter	Apathy, irritability, depression	Liver, Stomach	Cools Liver and blood. Benefits the five organs (zang), eliminates heat, and favours the Liver.	Avoid if there is the presence of damp-cold or cold.	18,19
Stigma maydis (strands or tassels) corn	Neutral and Warm	Mild sweetish		Kidney and bladder	Soothing diuretic, antiseptic. It is used for the treatment of oedema as well as for cystitis, nephritis, kidney stones in adults and bedwetting. Promotes the elimination of toxins. The tea diminishes pain during urination.		49,50
Strawberry	Cold and Fresh	Sour, Bitter and Sweet	Apathy, irritability	Lung, Stomach	Stimulates diuresis. Built body fluids and blood.	Avoid in case of spleen and stomach <i>Qi</i> deficiency and internal cold.	19,47
Sweet corn (corn on the cob)	Warm/Neutral	Sweet	Agitation, anxiety	Benefits Spleen and Bladder	Supplements <i>Qi</i> and <i>Xue</i> , treat urinary disorders and kidney stones.	Avoid if excessively cold or damp-cold.	17,19,47
Watercress	Warm and Fresh	Spicy and slightly Bitter	Worry	Lungs and stomach	Stimulates digestion. Refreshes the body. Moistening action.	Avoid in case of heat or fire in the stomach.	19
Watermelon	Cool and refreshing	Sweet	Apathy, lack of motivation, depression	Heart, Bladder, Stomach	Cools heat. Eliminates intense heat, ardor. Treats infections, especially UTI.	Avoid in case of excessive cold or cold-dampness.	19,47
<u>Foods of animal origin (Yang)</u>							
Goat meat	Warm	Sweet	Fear, insecurity, agitation	Acts on the Spleen and Kidney	Tonifies the Spleen and Kidney <i>Yang</i> .	Excessive heat or Liver <i>Qi</i> stagnation.	17,19,47

Honey	Neutral	Sweet	Mental agitation, mood swings	Acts on the Lung, Spleen and Large Intestine	Supplements <i>Qi</i> and <i>Xue</i> . Tonifies the <i>Qi</i> of the Middle Heater.	Avoid when there is dampness, excess heat, or ardor.	17,19,24,47
Lamb	Warm and Hot	Sweet, slightly Bitter	Agitation, anxiety, fear	Acts on Kidney and Spleen	Tones Kidney and Spleen <i>Yang</i> .	Excessive internal heat or excess <i>Yang</i> .	17,19,47
Mussel	Warm	Salty	Fear, insecurity, anxiety	Acts on the Liver and Kidneys	Tones Liver and Kidney <i>Yang</i> and <i>Qi</i> .	Excess internal heat.	17,19,47
Oyster	Neutral and fresh	Sweet and Salty	Anxiety, irritability, lack of will-power	Acts on the Liver and Kidneys	Tonifies Liver, Kidneys, <i>Xue</i> and <i>Yin</i> .	Spleen <i>Yang</i> deficiency and weak stomach.	17,19,47
Pork meat	Warm	Sweet	Apathy, lack of motivation	Moisturises dryness and benefits the Bladder	For all weaknesses related to the Water phase and movement deficiency.	Spleen deficiency or excess dampness.	17,19,24,47
Salmon	Warm	Slightly salty, Sweet	Irritability and anxiety	Spleen, Stomach, Kidney	Suppleness <i>Qi</i> and Blood.	Avoid in case of excess internal heat or Liver <i>Qi</i> stagnation.	19
Sardine	Neutral	Sweet, slightly Salty	Irritability, anxiety	Acts on the Spleen and Kidney	Tonifies <i>Qi</i> and <i>Xue</i>	Excess heat or Liver <i>Qi</i> stagnation.	17,19,47
Shrimp	Warm	Sweet, slightly Salty	Anxiety, fear, insecurity	Acts on the Kidneys and Spleen	Tonifies Kidney <i>Qi</i> and <i>Yang</i>	Excess heat or seafood allergies.	17,19,47

4. Conclusion

Given the high prevalence and recurrence of UTIs, coupled with the rise in bacterial resistance to antibiotics, it is crucial to explore integrative dietary approaches combining WM and TCM. Individualized diets tailored to these medical systems can significantly contribute to the prevention and treatment of UTIs. The MedDiet, known for its anti-inflammatory and antioxidant properties, has shown promise as an effective complementary therapy. Similarly, Chinese diet therapy emphasizes balancing the body and strengthening the urinary tract by considering both emotional and energetic imbalances.

Integrating the dietary principles of MedDiet and TCM offers a holistic approach to health improvement and UTI prevention. This combined approach can reduce UTI recurrence and promote overall well-being. While this study has highlighted the benefits of various foods in managing UTIs, further research is needed to understand their roles fully, particularly from the perspective of Chinese diet therapy. Well-designed nutritional plans

by TCM specialists, incorporating locally available Mediterranean foods, represent a valuable contribution to this integrative approach.

To enhance our understanding and improve dietary strategies for UTI prevention and treatment, future research must focus on the therapeutic potential of less-studied foods from the TCM perspective. Detailed studies on the thermal nature, flavours, tropism, and therapeutic directions of these foods are necessary. Additionally, TCM specialists should develop well-designed nutritional plans incorporating locally available Mediterranean foods, providing patients with the most suitable dietary options.

The ongoing development of food therapy and medical diet therapy, enriched by modern technology, will continue to enhance their efficacy and accessibility. These therapies share the principle of disease prevention, consistent with modern nutritional principles. By integrating MedDiet and TCM, we can offer a balanced and natural strategy for a comprehensive eating plan, benefiting overall health and specifically the urinary system, while promoting well-being.

Author Contributions: Conceptualization and original draft preparation, A.M.; B.C.; writing, review and editing, T.S., J. C., M. L., D. S., E. V., A.M., B.C.; supervision, A.M., B. C. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

Funding: This research received no external funding.

References

1. Moura A, Nicolau A, Hooton T, Azeredo J. Antibiotherapy and pathogenesis of uncomplicated UTI: difficult relationships. *J Appl Microbiol.* 2009;106(6):1779-91. doi: <https://doi.org/10.1111/j.1365-2672.2008.04115.x>
2. Hooton TM, Scholes D, Hughes JP, Winter C, Roberts PL, Stapleton AE, et al. A prospective study of risk factors for symptomatic urinary tract infection in young women. *N Engl J Med.* 1996;335(7):468-74. doi: <https://doi.org/10.1056/nejm199608153350703>
3. Haddad JM, Fernandes DAO. Infecção do trato urinário / Urinary tract infection. *Femina.* 2019;47(4).
4. Wright KJ, Seed PC, Hultgren SJ. Uropathogenic *Escherichia coli* flagella aid in efficient urinary tract colonization. *Infect Immun.* 2005;73(11):7657-68. doi: <https://doi.org/10.1128/iai.73.11.7657-7668.2005>
5. Lane MC, Mobley HL. Role of P-fimbrial-mediated adherence in pyelonephritis and persistence of uropathogenic *Escherichia coli* (UPEC) in the mammalian kidney. *Kidney Int.* 2007;72(1):19-25. doi: <https://doi.org/10.1038/sj.ki.5002230>
6. Scholes D, Hooton TM, Roberts PL, Stapleton AE, Gupta K, Stamm WE. Risk factors for recurrent urinary tract infection in young women. *J Infect Dis.* 2000;182(4):1177-82. doi: <https://doi.org/10.1086/315827>
7. Geerlings SE. Clinical Presentations and Epidemiology of Urinary Tract Infections. *Microbiology spectrum.* 2016;4(5). doi: <https://doi.org/10.1128/microbiolspec.UTI-0002-2012>
8. Stamey TA, Sexton CC. The role of vaginal colonization with enterobacteriaceae in recurrent urinary infections. *J Urol.* 1975;113(2):214-7. doi: [https://doi.org/10.1016/s0022-5347\(17\)59447-1](https://doi.org/10.1016/s0022-5347(17)59447-1)
9. Johnson JR, Russo TA. Molecular epidemiology of extraintestinal pathogenic (uropathogenic) *Escherichia coli*. *Int J Med Microbiol.* 2005;295(6-7):383-404. doi: <https://doi.org/10.1016/j.ijmm.2005.07.005>
10. Mlugu EM, Mohamedi JA, Sangeda RZ, Mwambete KD. Prevalence of urinary tract infection and antimicrobial resistance patterns of uropathogens with biofilm forming capacity among outpatients in morogoro, Tanzania: a cross-sectional study. *BMC Infect Dis.* 2023;23(1):660. doi: <https://doi.org/10.1186/s12879-023-08641-x>
11. Ke SX. The principles of health, illness and treatment - The key concepts from "The Yellow Emperor's Classic of Internal Medicine". *J Ayurveda Integr Med.* 2023;14(1):100637. doi: <https://doi.org/10.1016/j.jaim.2022.100637>
12. Greten J. *Kursbuch traditionelle Chinesische Medizin: TCM verstehen und richtig anwenden*; 55 Tabellen: Georg Thieme Verlag; 2007. 313121662X.
13. Maciocia S. *The Practice of Chinese Medicine: The Treatment of Diseases with Acupuncture and Chinese Herbs*; Elsevier; 2021. 9780702079207.
14. Matos LC, Machado JP, Monteiro FJ, Greten HJ. Understanding Traditional Chinese Medicine Therapeutics: An Overview of the Basics and Clinical Applications. *Healthcare (Basel).* 2021;9(3). doi: <https://doi.org/10.3390/healthcare9030257>
15. Zhang N, Huang L, Liu S, Wang Y, Luo Y, Jin X, et al. Traditional Chinese Medicine: An Alternative Treatment Option for Refractory Recurrent Urinary Tract Infections. *Clin Infect Dis.* 2013;56(9):1355-. doi: <https://doi.org/10.1093/cid/cit029>

16. Flower A, Wang LQ, Lewith G, Liu JP, Li Q. Chinese herbal medicine for treating recurrent urinary tract infections in women. *Cochrane Database Syst Rev*. 2015;2015(6):Cd010446. doi: <https://doi.org/10.1002/14651858.CD010446.pub2>
17. Maciocia G. *The Foundations of Chinese Medicine: A Comprehensive Text*: Elsevier Health Sciences; 2015. 9780702066313.
18. Arantes AM. *Dietoterapia Chinesa - Nutrição Para Corpo, Mente*: ROCA; 2015. 9788527726795.
19. Kastner J. *Chinese Nutrition Therapy: Dietetics in Traditional Chinese Medicine (TCM)*: Thieme; 2011. 9783131475619.
20. Maciocia G. *Diagnóstico na Medicina Chinesa - Um Guia Geral*: Roca; 2021. 9788527737715.
21. Maciocia G. *Obstetrics and Gynecology in Chinese Medicine*: Elsevier Health Sciences; 2011. 9780702049217.
22. Jiang M, Zhang C, Cao H, Chan K, Lu A. The role of Chinese medicine in the treatment of chronic diseases in China. *Planta Med*. 2011;77(9):873-81. doi: <https://doi.org/10.1055/s-0030-1270983>
23. Grosso G, Marventano S, Yang J, Micek A, Pajak A, Scalfi L, et al. A comprehensive meta-analysis on evidence of Mediterranean diet and cardiovascular disease: Are individual components equal? *Crit Rev Food Sci Nutr*. 2017;57(15):3218-32. doi: <https://doi.org/10.1080/10408398.2015.1107021>
24. Estruch R, Ros E, Salas-Salvadó J, Covas MI, Corella D, Arós F, et al. Primary Prevention of Cardiovascular Disease with a Mediterranean Diet Supplemented with Extra-Virgin Olive Oil or Nuts. *N Engl J Med*. 2018;378(25):e34. doi: <https://doi.org/10.1056/NEJMoa1800389>
25. Falbo E, Porchetti G, Conte C, Tarsitano MG. Adherence to Mediterranean Diet in Individuals on Renal Replacement Therapy. *Int J Environ Res Public Health*. 2023;20(5). doi: <https://doi.org/10.3390/ijerph20054040>
26. Sofi F, Abbate R, Gensini GF, Casini A. Accruing evidence on benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis. *Am J Clin Nutr*. 2010;92(5):1189-96. doi: <https://doi.org/10.3945/ajcn.2010.29673>
27. Wu Q, Liang X. Food therapy and medical diet therapy of Traditional Chinese Medicine. *Clinical Nutrition Experimental*. 2018;18:1-5. doi: <https://doi.org/10.1016/j.yclnex.2018.01.001>
28. Saheed S, Oladipipo AE, Abdulazeez AA, Olarewaju SA, Ismaila NO, Emmanuel IA, et al. Toxicological evaluations of Stigma maydis (corn silk) aqueous extract on hematological and lipid parameters in Wistar rats. *Toxicology Reports*. 2015;2:638-44. doi: <https://doi.org/10.1016/j.toxrep.2015.04.001>
29. Zhang HW, Lin ZX, Xu C, Leung C, Chan LS. Astragalus (a traditional Chinese medicine) for treating chronic kidney disease. *Cochrane Database Syst Rev*. 2014;2014(10):Cd008369. doi: <https://doi.org/10.1002/14651858.CD008369.pub2>
30. Mititelu M, Olteanu G, Neacșu SM, Stoicescu I, Dumitrescu DE, Gheorghe E, et al. Incidence of Urinary Infections and Behavioral Risk Factors. *Nutrients*. 2024;16(3). doi: <https://doi.org/10.3390/nu16030446>
31. Zhao X, Tan X, Shi H, Xia D. Nutrition and traditional Chinese medicine (TCM): a system's theoretical perspective. *Eur J Clin Nutr*. 2021;75(2):267-73. doi: <https://doi.org/10.1038/s41430-020-00737-w>
32. Tong Y, Leng Y, Bai J. Chinese herbal medicine: a safe alternative therapy for urinary tract infection in patients with renal insufficiency. *Afr J Tradit Complement Altern Med*. 2012;9(2):266-70. doi: <https://doi.org/10.4314/ajtcam.v9i2.13>
33. Davis C, Bryan J, Hodgson J, Murphy K. Definition of the Mediterranean Diet; a Literature Review. *Nutrients*. 2015;7(11):9139-53. doi: <https://doi.org/10.3390/nu7115459>
34. Scoullou M, Malotidi V, Farnese M, Bicocchi R, Salman N, Atrash I, et al. Mediterranean Food – Our legacy, Our Future: MIO-ECSDE; 2021.
35. Esposito K, Kastorini CM, Panagiotakos DB, Giugliano D. Mediterranean diet and weight loss: meta-analysis of randomized controlled trials. *Metab Syndr Relat Disord*. 2011;9(1):1-12. doi: <https://doi.org/10.1089/met.2010.0031>
36. Turmel N, Hentzen C, Chesnel C, Charlannes A, Le Breton F, Amarenco G. Alimentation, régimes et diététique dans le syndrome clinique d'hyperactivité vésicale : revue de la littérature. *Prog Urol*. 2017;27(7):395-401. doi: <https://doi.org/10.1016/j.purol.2017.05.001>
37. Santangelo C, Vari R, Scazzocchio B, De Sanctis P, Giovannini C, D'Archivio M, et al. Anti-inflammatory Activity of Extra Virgin Olive Oil Polyphenols: Which Role in the Prevention and Treatment of Immune-Mediated Inflammatory Diseases? *Endocr Metab Immune Disord Drug Targets*. 2018;18(1):36-50. doi: <https://doi.org/10.2174/1871530317666171114114321>
38. Buljeta I, Pichler A, Šimunović J, Kopjar M. Beneficial Effects of Red Wine Polyphenols on Human Health: Comprehensive Review. *Curr Issues Mol Biol*. 2023;45(2):782-98. doi: <https://doi.org/10.3390/cimb45020052>
39. Medina FX. Looking for Commensality: On Culture, Health, Heritage, and the Mediterranean Diet. *Int J Environ Res Public Health*. 2021;18(5). doi: <https://doi.org/10.3390/ijerph18052605>
40. Hoffman JR, Falvo MJ. Protein - Which is Best? *J Sports Sci Med*. 2004;3(3):118-30.
41. Opara EI, Chohan M. Culinary herbs and spices: their bioactive properties, the contribution of polyphenols and the challenges in deducing their true health benefits. *Int J Mol Sci*. 2014;15(10):19183-202. doi: <https://doi.org/10.3390/ijms151019183>
42. Scott AM, Clark J, Mar CD, Glasziou P. Increased fluid intake to prevent urinary tract infections: systematic review and meta-analysis. *Br J Gen Pract*. 2020;70(692):e200-e7. doi: <https://doi.org/10.3399/bjgp20X708125>
43. Zhou P, Chen C, Patil S, Dong S. Unveiling the therapeutic symphony of probiotics, prebiotics, and postbiotics in gut-immune harmony. *Front Nutr*. 2024;11:1355542. doi: <https://doi.org/10.3389/fnut.2024.1355542>

44. Reid G, Charbonneau D, Erb J, Kochanowski B, Beuerman D, Poehner R, et al. Oral use of *Lactobacillus rhamnosus* GR-1 and *L. fermentum* RC-14 significantly alters vaginal flora: randomized, placebo-controlled trial in 64 healthy women. *FEMS Immunol Med Microbiol*. 2003;35(2):131-4. doi: [https://doi.org/10.1016/s0928-8244\(02\)00465-0](https://doi.org/10.1016/s0928-8244(02)00465-0)
45. Liu J, Feng W, Peng C. A Song of Ice and Fire: Cold and Hot Properties of Traditional Chinese Medicines. *Front Pharmacol*. 2020;11:598744. doi: <https://doi.org/10.3389/fphar.2020.598744>
46. Xing-Tai L. Introductory Chapter: Therapies Based on Kidney Essence and Qi in Chinese Medicine. In: Xing-Tai L, editor. *Chinese Medical Therapies for Diabetes, Infertility, Silicosis and the Theoretical Basis*. Rijeka: IntechOpen; 2017. p. Ch. 1. 978-953-51-2914-1.
47. Ross J. Zang Fu - Sistemas de Órgãos e Vísceras da Medicina Tradicional Chinesa: Roca; 2011. 9788572410632.
48. de Almeida Alvarenga L, Borges NA, Moreira LSG, Resende Teixeira KT, Carraro-Eduardo JC, Dai L, et al. Cranberries - potential benefits in patients with chronic kidney disease. *Food Funct*. 2019;10(6):3103-12. doi: <https://doi.org/10.1039/c9fo00375d>
49. Hasanudin K, Hashim P, Mustafa S. Corn silk (*Stigma maydis*) in healthcare: a phytochemical and pharmacological review. *Molecules*. 2012;17(8):9697-715. doi: <https://doi.org/10.3390/molecules17089697>
50. Birla R, Mehta P, Singh A, Sharma N. Study on advanced materials for biomedical applications. *Journal of Advanced Scientific Research*. 2020;11(3):16-24.