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Review

A Comprehensive Review On Nutraceuticals In Tuberculosis Disease

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Abstract

Nutraceuticals are products that may be defined as a substance which has physiological benefit or provides protection against chronic health. Nutraceuticals may be used to improve health, delay the aging process, prevent chronic diseases, increase life expect an support the structure or function of the body. Nowadays, Nutraceuticals have received considerable interest due to potential nutritional, safety and therapeutic effects. Recent studies have shown promising results for these compounds in various complications. In the present review much effort has been devoted to present new concepts abuts Nutraceuticals used on their diseases modifying indications. Emphasis has been made to present herbal Nutraceuticals effective on heart curative disorders related to oxidative stress including allergy, Alzheimer, cardiovascular disease, cancer, diabetes, eye, immune, osteoporosis, arthritis, cholesterol, hypertension, inflammatory and Parkinson's diseases as well as obesity. Nutraceuticals are globally growing in the field of services such as health care promotion, disease reduction, etc. Various drug nutraceuticals interaction have also been elaborated with various examples in this review. In whole, nutraceuticals has lead to the new era of medicine and health, in which the food industry has become a research oriented sector. Through a comprehensive review of scientific literature, we analyses the bio active compounds found in Nutraceuticals and their impact on various physiological processes. Additionally, this study examines emerging trends, challenges and future prospects in the field of nutraceuticals research.

Keywords: Nutraceutical

INTRODUCTION

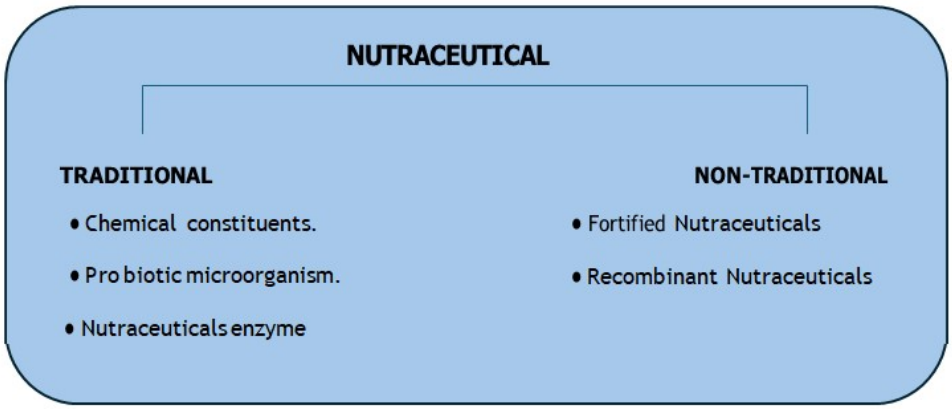
Nutraceuticals is a broad umbrella term that issued to describe any product derived from food sources with extra health benefits in addition to the basic nutritional value found in foods. The term "nutraceutical" combines the two words of "nutrient", which is a nourishing food component, and "pharmaceutical", which is a medical drug. The name was coined by Stephen L. De Felicein (1989), the founder and chairman of the Foundation for Innovation in Medicine, which is an American organization located in Cranford, New Jersey. The philosophy behind Nutraceuticals is to focus on prevention, according to the word "Let food be your Medicine" which was said by a Greek physician Hippocrates (known as the father of medicine).

Nutraceuticals are the pharmaceutically blended products that possess both nutritional as well as the medical value. Such products are designed to improve the physical health, fight against day-to-day challenges such as stress and increase longevity, etc. They exhibit high similarities and overlaps among their properties and

functionalities. In recent years there is a growing interesting Nutraceuticals which provide health benefits and a real tentative to modern medicine. The principle reason for the growth of the Nutraceutical market world wide is the current population and the health trends. The era of emergence nutrients as medicines in the pharmaceutical world is of great importance and draws attention scientists and researchers toward the appreciable benefits. As a result, inter disciplinary approaches are now been applied to design and develop various dosage forms to deliver these herbal products relative to their applications. The extensive researches have revealed the involvement of these agents in the treatment of many disorders such as cancer, arthritis, metabolic abnormalities, diabetes, asthma, tuberculosis, lung cancer and many others.

CLASSIFICATION

Nutraceuticals is a broad term that is specifically divided in to two broad categories,



TUBERCULOSIS

The word “tuberculosis” is a derivative of the Latin word “tubercula”, which means “a small lump”. World Tuberculosis Day has been com memo rated annually on the 24th March each year since 1982 initiated by the WHO Honoring the centennial anniversary Dr Robert Koch’s discovery in finding the
Bacteria (Mycobacterium tuberculosis –causative agent if tuberculosis). It is an ancient disease as evident from the skeletal deformities found in the Egyptian mummies belonging to 2400 BC, but it has been only around 2000 years since the first report of TB was documented in India and China. The traditional Treatment of TB is practice based on indigenous knowledge possessed by the local healers. Earliest known treatment of this disease consisted of natural methods to manage TB and comprised various rituals derived from old traditional practices. Age-old practices related to TB treatment that have been Handed down from generation to generation and are still part of TB therapy in various countries of South Africa and Asia.

In present times, tuberculosis has become one of the most difficult diseases to control considering that it is among the top ten most infectious diseases in the world. Despite advancements in this disease management and control, it is still a leading management and control; it is still a leading cause of death of death in many countries with highest mortality ratios in Asia and Africa. In this article, we provide a brief overview of tuberculosis and potential applications

of nutraceuticals in the management of this disease. Emphasis was also made on the potential use of medicinal plants and phytochemicals against tuberculosis.

Tuberculosis (TB) is a bacterial infection primarily caused by Mycobacterium tuberculosis**.** It commonly affects the lungs but can also impact other parts of the body. TB spreads through the air when an infected person excels respiratory droplets through coughing, sneezing, talking and laughing, the patient with an open form of tuberculosis emits small droplets of phlegm containing tubercle bacilli in to the air which are scattered around at a distance of upto1.5 meter and or kept in air in the form of suspension up to30 minutes. Symptoms may include persistent cough, weight loss, fever and night sweats. TB can be latent, where the bacteria are dormant or active causing illness. Treatment involves a coarse of anti biotic over several months and it's essential to complete the entire regimen to prevent drug resistance. TB is the world's second most common cause of death from infectious disease after HIV/AIDS. It may spread to any part of the body including meanings, kidney, bones and lymph-nodes. India is the highest TB burden country in the world, home to 20 percent of cases occurring globally. Each year 1.8 million develop TB. In India, 0.37 million people die because of TB every year.

Global Emergency Tuberculosis (GET) kills 5000 people in a day. It is characterized by the formation of tubercle (round nodules or granuloma in the lung parenchyma. TB remains the world's dead list infectious disease although global efforts have a vertex and estimates deaths, the WHO warned on Tuesday. WHO, in its latest 2018 global TB report, says countries are still not doing enough to end TB by 2030 and calls for an un presented mobilization of national and international commitments.

Tuberculosis and malnutrition re linked in a complex relationship. TB may cause under nutrition through increased metabolic demands and decreased intake and nutritional deficiencies may worsen the disease or delay recovery by depressing important immune functions. At present, there is no evidence-based nutritional guidance for adults and children being treated for tuberculosis. To access the effects of oral nutritional supplements in people being treated with anti-tuberculosis drug therapy for active tuberculosis.Nutritional supplements could help people recovery from the illness by strengthening their immune system and by improving weight gain and muscle strengthening, allowing them to return active life. Good nutrition requires a daily intake of macro nutrients (carbohydrates, proteins and fats) and micro nutrients (essential vitamins and minerals). Tuberculosis can also lead to complication in the course and the management of other diseases like diabetes. It is therefore important to identify these co morbidities in TB patients. Tuberculosis most commonly affects the lungs (pulmonary tuberculosis), but can also spread to affects the central nervous system, lymphatic system, circulatory system, genitourinary system bones and joints. TB is treated with a combination of antibiotic drugs (anti- tuberculosis therapy) which must be taken for a period of at least 6 months to ensure success. TB patients with DM have a worse clinical presentation and more symptoms, especially weight loss, fever, dyspnoea and night sweats. Patients with TB and previously diagnosed DM are usually female, In contrast, patients with TB and newly diagnosed DM are more likely to be male and younger, as well as to have lower level of HbA1c.

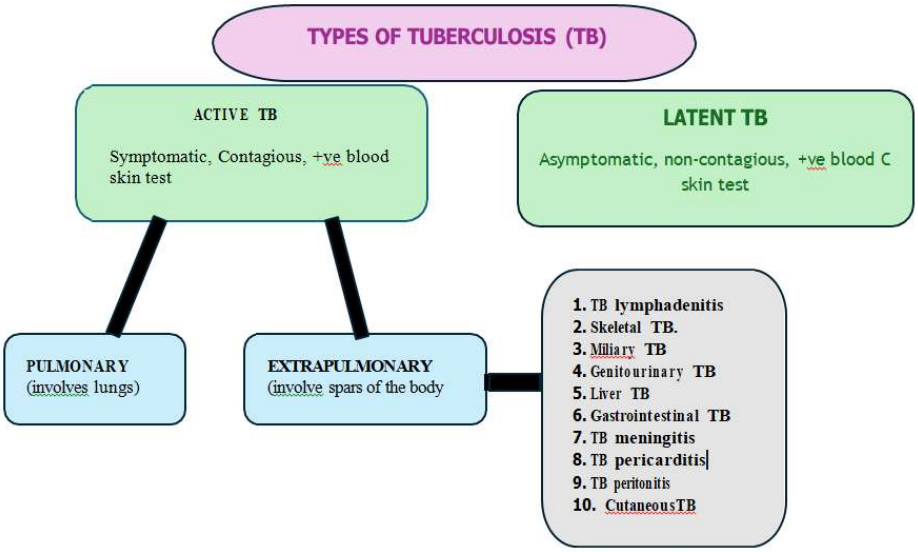
The treatment of TB using Directly Observed Treatment Short-course (DOTS) therapy comprises multiple anti biotic is quite lengthy and causes serious side effects in different organs. The length of the TB treatment leads to withdrawal from the patients which pave the way for the emergence of drug resistance in the bacterial population. These concerns related to therapy need serious and immediate interventions.

Traditional medicine using phytochemicals has shown to provide tremendous potential in TB treatment, mainly in the eradication of Mycobacterium tuberculosis (M.TB), increasing the natural immunity and managing the side effects of anti-TB drugs. This review describes the anti-tuberculosis potential of selected eth no pharmacologically important phytochemicals potential immune-modulator and as an adjunct- therapy in TB.

BCG (Bacillus Chalmette -Guerin) is the only validated vaccine against pulmonary TB Mycobacterium tuberculosis is in hale dun the form of small aerosol droplets containing the bacilli and is transmitted to healthy individual from an infected person through the respiratory route via inhalation into the Lung. The bacteria travel through the lungs and reside in the alveoli of the lungs. In 90 percent if the infected individuals, the infection do not lead active disease and it is called a latent state of infection where bacteria can live many years in a non replicating state. In the remaining 10 percent individuals, who are in immune compromised state, the disease may take the active replicating form. Treatment of TB I'd globally known as **"**Directly Observed Treatment Short-course (DOTS)**"** .It is an multi drug and along-therapy.

SPECIALITY: Infectious disease, pulmonology
SYMPTOMS: Chronic cough, fever ,cough with bloody mucus, weight loss
CAUSE: Mycobacterium tuberculosis
RISK FACTORS: Smoking. HIV/AIDS
DIAGNOSTIC METHOD: CXR, culture, tuberculinskintest, Quantiferon
DIFFERENTIAL DIAGNOSIS: Pneumonia, Histoplasmosis, Sarcoidosis, Coccidioidomysis
PREVENTION: Screening those at high risk, Treatment of those infected Vaccination with Bacillus Chalmette- Guerin (BCG).
TREATMENT: Antibiotics

FREQUENCY: 25% of people (latent TB)
DEATHS: 1.3 million (2022)



TYPES OF TUBERCULOSIS
ACTIVE TUBERCULOSIS

Active TB disease happens when the immune system cannot control an infection. Germs cause disease throughout the lounge or parts of the body. Active TB disease may happen right after primary infection. But it usually happens after months or years of latent TB infection. The WHO estimates that, annually, around 8million people develop Active TB globally, and nearly 2 million people die from the disease. After infection, the risk of developing active tuberculosis is highest in the first year, but the active disease usually occurs many years later in most patients. This activity outlines the evaluation and management of active tuberculosis and highlights the role of the inter professional team in evaluating and treating patients with this condition. Active TB is contagious. That means it can be spread from person to another. It is most often spread through the air. The germs may enter the air when a person with TB disease the lungs or throat cough sore sneezes. People nearby may breathe in these germs and get infected. People get sick from the TB germs that are alive and active. This means that they are growing and destroying tissues in a person's body. Today, we have many medicines to treat and cure TB disease. TB infection can spread from the lungs to other parts of the body. This is called extra pulmonary tuberculosis. Active TB disease in the voice box is outside the lungs it induce various side effects.

PULMONARY TUBERCULOSIS

Patients with tuberculosis have a potentially serious infectious, which largely effects their lungs and is called **"**pulmonary tuberculosis**".** It is contagious and can spread from one person to another through droplets from coughs and sneezes. It can cause permanent lung damage, if early treatment is not provided. Pulmonary TB is normally treated with a combination of 4 antibiotics over a period of 6 months. The treatment has to be followed for the entire prescription period. Patients with active pulmonary TB may be A symptomatic, have mild or progressive dry cough, or present with multiple symptoms, including fever, fatigue, weight loss, night sweats, and a cough that produces bloody sputum. If it is detected early and fully treated, people with the disease quickly become non-infectious and eventually cured. People with pulmonary TB cough a lot, because the destruction of tissue in the lungs and airways leads to inflammation. The body reacts to inflammation by trying to eliminate the particles that cause did-if this happens in the air way, the easiest way to eliminate the cause is to cough it up. Initially, people with pulmonary TB have a dry, persistent cough. This cough is often worse at night. People with pulmonary TB lose weight, because the body uses a big part of its energy to fight the infection in the lungs- and this means that energy cannot be stored in the body to gain weight and stay healthy. As the destruction of lung tissue becomes worse, this put um that people init- assign of the tissue destruction and inflammation in the airway.

EXTRA PULMONARY TUBERCULOSIS

EPTB is tuberculosis outside of the lungs. EPTB includes tuberculosis meningitis, abdominal TB, skeletal, Pot's disease (Spine), Scrofula (Lymphadenitis) and Genitourinary (Renal). Disseminated or Miliary TB often includes pulmonary and extra pulmonary sites. It is estimated that extra pulmonary tuberculosis accounts for 15to20 15% of all cases of TB. HIV patients, especially with low CD4 Counts, have higher rate of EPTB. Children' sore more like to have skeletal TB than adults. In general, EPTB is more difficult to diagnosis than PTB and often requires invasive

procedures to obtain tissue and fluid samples. The symptoms and signs generally relate specifically to the affected organ system. It requires a high clinical suspicion and carries a lengthy period from the initial symptoms to the final diagnosis. Never the less, it's presentation can be extremely acute causing a life threatening condition..The initial step in early identification is having knowledge of its findings in the proper clinical setting and including them within the differential diagnosis. Even though some patients do not have the expected risk factors, TB is identified as the culprit of symptoms associated with other conditions. This illustrates the ample spectrum of EPTB manifestation. Vast medical knowledge helps the clinic into identify this condition in that adequate clinical scenario to pursue its diagnosis.

LATENT TUBERCULOSIS

TB bacteria can live in the body without making you sick. This is called latent TB infection. Many people who have latent TB infection never develop TB disease. In these people, the TB bacteria remain in active for a life time without causing disease. But in other people, especially people who have a weak immune system, the bacteria become ac, multiply and cause TB disease. Peoples with latent TBI are not infectious and cannot spread TB infection to others. LTBI is detected by the Monteux tuberculin Skin Oran Interferon-gamma release Assay. Most people with LTBI have a positive TST or IGRA result. They has a small number of TB bacteria in their body that are alive or but under control. It cannot spread TB bacteria to others. LTBI doesn't require any respiratory isolation. An illustration of droplet nuclei containing tubercle bacilli being inhaled, entering the lungs and travel to the alveoli, tubercle bacilli multiply in the alveoli. It occurs after moat primary infections. In about 95% of cases, after about 3 weeks of un inhibited growth, the immune system suppresses bacillary replication, usually before symptoms or signs develop

SYMPTOMS

Systems of TB disease depend on where in the body the TB bacteria are growing. TB bacteria usually grow in the lungs (PTB). TB disease in the lungs may cause symptoms such as

- abadcoughthatlastsfor3weeksorlonger.
- Pain in the chest.
- Cough signup blood or sputum (phlegm) from deep inside the lungs.
- Diabetes (high blood sugar).
- Weakened immune system (For example HIV or AIDS).
- Being malnourished.
- Tobacco use.
- Loss of appetite.
- Chills.
- Fever and tiredness.
- Night's sweats.
- Fatigue and weakness.
- Pain in breathing and coughing.
- Weight loss.
- Enlargement of lymph nodes.
- A nuclear that refuses to heal (In case of skin TB).
- Abdominal distension, constipation and a non-healing and fistula (in case of intestine lTB).
- Backache, stiffness, or even swelling in the back/groin (incase if spinal TB).
- Not wanting to eat.
- Not feeling welling neural.
- Pain near the site of infection.
- Seizures.
- Have blood in urine or stool.

AGES: Symptoms are similar to adult symptoms.
1 TO 12 YEARS OLDS: Younger child may have a fever that would not go away and weight loss.
INFANTS: The baby doesn't grow or gain weight as expected. Also a baby may have symptoms from swelling in the fluid around the brain or spinal cord, including:

- Beings sluggish or not active.
- Unusually fussy.
- Vomiting.
- Poor feeding.
- Poor reflexes.

DIAGNOSIS

BLOOD TEST

Known as interferon- gamma release assays (IGRAs), these test inform your physician about your body's response when TB protein remixed with a little amount of Blood.

OTHER TEST

In order to figure out the type of tuberculosis (active or latent), the doctor will recommend a chest X-ray, CT scan or sputum test.

Rapid diagnosis test recommended by WHO include the X per MTB/ RIF Ultra and True at assays These tests have high diagnostic accuracy and will lead to major improvements in the early reduction of TB and drug-resistant TB

Diagnosing multi drug- resistant and other resistant forms of TB (see multi drug-resistant TB section below) as well as HIV- associated TB can be complex and expensive.

Tuberculosis is particularly difficult to diagnose in children

- Acid-fast stain and culture.
- Line probe assay.
- Drug susceptibility.

CAUSES AND RISK FACTORS

Tuberculosis is caused by a bacterium called Mycobacterium tuberculosis.People with active TB disease in the lungs or voice box can spread the disease. They release tiny droplets that carry the bacteria through the air. This can happen when they are speaking, singing, laughing, coughing or sneezing. Person can get infection after inhaling the droplets. The disease is more likely to spread when people spend a lot of time together In an indoor space. So the disease spreads easily in places where people live or work together for long periods. Also, the disease spreads more easily in crowded gatherings.

A person with a latent TB infection cannot pass the disease to other people. A person taking drugs to treat active TB disease usually can't pass the disease after 2 to 3 weeks of treatment. Anyone can get tuberculosis, but certain factors increase the risk of getting an infection. Other factors increase the risk of an infection becoming active TB disease. The Centers for Disease Control and Prevention recommends a TB test for people who have an increased risk of TB infection or active TB disease. Talk to your healthcare provides if you have one or more of the following risk factors.

RISK OF TB INFECTION

Certain living or working conditions make it easier for the disease to pass makes it easier for the disease to pass from one person to another. The second editions increase the risk of getting a TB infection:

- Living with someone with active TB disease.
- Living or traveling in a country where TB is common including several countries in Latin America, Africa, Asia and the Pacific islands.
- Working in health care and treating people with a high risk of TB.

RISK OF ACTIVE TB DISEASE

A weakened immune system increases the risk of a TB infection becoming active TB disease. Condor treatments that weaken the immune include:

- HIV/AIDS.
- Diabetes.
- Severe kidney disease.
- Cancers of the head, neck and Blood.
- Malnutrition or low body weight.
- Cancer to prevent rejection of transplanted organs.
- Long- term use of prescription steroids.
- Use of un law full injected drugs.
- Miss use of alcohol.
- Smoking and using other tobacco products.

PATHOPHYSIOLOGY

When a person inhales air that contain droplet nuclei containing. Tuberculosis, most of the larger droplets become lodged in the upper respiratory tract (the nose and throat), where infection sun likely to develop. Smaller droplet nuclei may reach the smaller sacs of the lung (the alveoli), where infection may begin. The following section describes the pathogenesis of TB (the way TB infection and disease the body).

INFECTION BEGIN WHEN DROPLET NUCLEI REACH THE ALVEOL

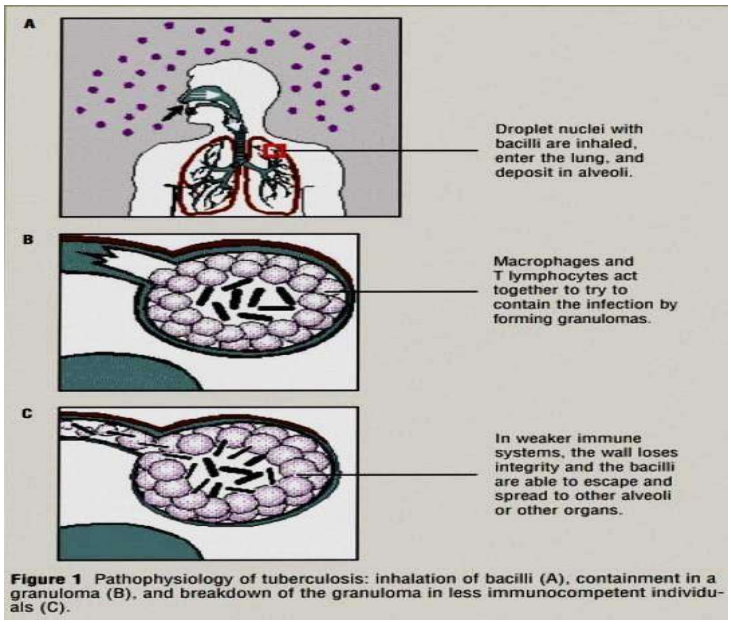


Figure 1 Pathophysiology of tuberculosis: inhalation of bacilli (A), containment in a granuloma (B), and breakdown of the granuloma in less immunocompetent individuals (C).

Tuberculosis is may occur in three stages:

- Primary infection.
- Latent infection.
- Active infection.

M. tuberculosis bacilli initially cause a primary infection, a small percentage of which eventually progress to clinical disease of variable severity. Most about 95% primary infections are a symptomatic. An unknown percentage of primary infections resolve spontaneously, but the majority are followed by a latent. A variable percentage 5 to 10 percent of latent infections subsequently reactivates with symptoms and signs of disease. Infection is usually not transmissible in the primary stage and is never contagious in that latent stage. There are 7 steps these steps are aerosolization, macrophages phagocytosis, phagolysome, blockage and replication, The 1 response, granuloma formation, clinical manifestations and transmission.

PRIMARY TUBERCULOSIS INFECTION

Infection requires inhalation no particles small enough to transverse the upper respiratory defenses and deposit deep in the lungs, usually in the sub pleural air space of the middle or lower lobes. To initiate infection. M. tuberculosis bacilli must being tested by a alveolar macrophages. In the early weeks of infection, Some infected macrophages migrate to region (example: haler, Meditational) where they Across the blood stream.

LATENT TB INFECTION

It occurs after most primary infections. In about 95% of cases, after about 3 weeks of inhibited growth, the immune system bacillary replication, usually before symptoms or signs develop. Tubercle bacilli can survive in this material for years. Sites of latent infection or dynamic process and or not entirely dormant as was once believed. The primary focus progresses immediately, causing acute illness with Pneumonia, pleural effusion and marketed Mediastinal or haler lymph node enlargement (which, in children, may compress bronchi). This sequence may be more common among young children and recently infected or re infected immunity suppressed patients. Extra pulmonary TB at any site can sometimes manifest without evidence of lung involvement. It is the most feared because of its high mortality in the very young and very old.

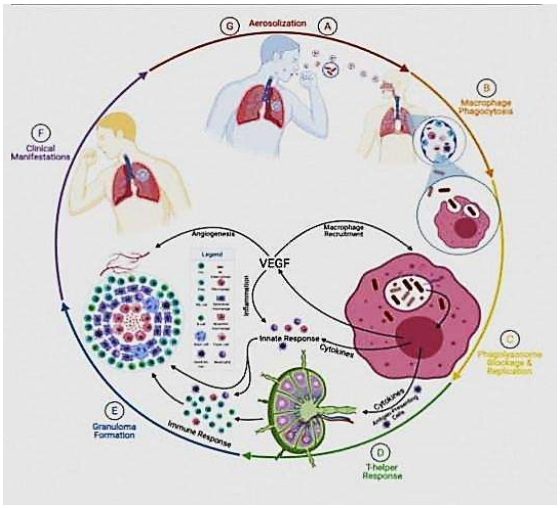
ACTIVE TB DISEASE

Healthy people who are infected with tuberculosis have about a 5-10 % life time risk of developing active disease, although the percentage varies significantly by age and the risk factors. In 50-80 % of those who develop Active disease, TB reactivates within the first 2 years, but it can also reactivate de Cades later. Conditions that impair cellular immunity significantly facilitate reactivation. Patients co infected with HIV and not receiving appropriate with anti retroviral therapy (ART) have about a10 % annual risk of developing

active disease.

Other risk factors:

- Diabetes.
- significant weight loss.
- Head and neck cancer.
- dialysis-dependent chronic kidney disease.



ALLOPATHIC REMEDIES

TB infection and disease is treated with these drugs:

- Isoniazid (Hyzyd).
- Rifampin (Rifadin).
- Ethambutol (Myambutol).
- Pyrazinamide(Zinamide).
- Rifapentine (Priftin).

You must take all the medication your provider prescribes, or not all of the bacteria will be killed. You will have to take to these medications for as long as you are told- sometimes up to 9 months. Some forms of TB have become resistant to medications. It is very important and lightly that your provider will use more than 2 drug to treat TB. It is very important to finish your entire prescription.

TUBERCULOSIS TREATMENT: FOODS THAT CAN HELP YOU RECOVER FASTER

TB patients should focus on consuming foods that are low in sugar and carbohydrates and high in fiber, proteins and health foods. Examples include non-starchy vegetables as leafy greens, broccoli and peppers, lean proteins our as fish, nuts and seeds and whole grains in limited amounts. Your diet can really help in supporting the treatment and restoring your health.

1 Rava Laddu or Ragi Porridge.
2 Khichdi.
3 Soybean.
4 Paneer.
5 Milk.

Wheat, corn, rice, lentils, and potato are example of high carbohydrate foods they will help to add calories and reduce energy malnutrition. Malnourished people are at increased risk of developing tuberculosis and take a prolonged time to recover**.** Daily consumption of milk, milk products, egg, meat and fishes beneficial. Protein requirements can be met by including ground nuts or dry fruits and nut mixes. As TB patients have a low appetite. They can eat dry fruits and nuts powdered finely and mixed into a milkshake and or added to roti.

Fruits such as pap, oranges, guava, kiwi, ginger, garlic, turmeric and berries are good actions for TB patients as they are rich in vitamins, minerals and anti oxidants that can support the immune system. It is important to consume them in moderation and to choose fresh, whole fruits rather than canned or processed varieties.

PAPAYA

SYNONYM.: Carica papaya.
COMMON NAMES: Papaya, Pawpaw, Tree melon.
FAMILY: Caricaceae.
CHEMICAL CONSTITUENTS: PAPAYA contains alkaloids. Glycosides, tannins, siphoning, flavanoids, which will be responsible for its therapeutic activity.
NATIVE: Costa Rica, Mexico, USA.
EXOTIC: Australia,Barbados,Berbuda,Brazil,Chile,Cuva,Fiji,Haiti,Colombia,Kenya,Malaysia, Myanmar,Newzealand,Nigeria,Phillipines,Singapore,Sodan,SouthAfrica,SriLanka, Thailand, Indonesia and India.

BOTANICAL DESCRIPTION
Carica papaya is a never green herb, having tree like appearance, 2 to10 meter all and usually un branched. It contains white latex. Its stem is cylindrical having diameter 10 to 30 cm. Root system is extensive. C.papaya comes into fruiting in 5 months and lives for 4 to 5 years.
LEAVES : Leaves are arranged spirally, clustered, close to apex of trunk, petiole up to 1 meter long, purple green or green colored lamina, diameter is 25 to 75 cm, glabrous, palmate,
Venation prominent, lobes are deep and broadly to other.
FLOWER: Flowers are yellow and tiny, funnel shaped, solitary and may be clustered in the leaf axils.
There are three types of flower; they are male flower, female flower. Hermaphrodite.
FRUIT : Fruit is large with fleshy orange pulp, when ripe skin is thin yellow**.** Female flower fruit are pear shaped, spherical, oblong. Seeds larger in number black small, round covered.
NUTRIENTS: Vitamin C, Vitamin A, Float, Potassium, Fiber, Vitamin E, Vitamin K.
ECOLOGY: C.papaya satisfactorily grows in wide range of areas, equatorial tropics to temperate Latitudes it should be grown in warm sunny sites, strong winds are harmful. When C.papaya is exposed to frost or cold wind result in leaf damage and death of plant.
USES: antioxidant, antiulcer, wound healing property, and the anti- tumor, anti-mutagenic, anti-diarrheal, neuro protective property, used for inflammation and digestion. Papaya is rich in vitamins, minerals and antioxidants that can support the immune system and helps to reduce these verity of TB.

FOODS AVOID TO PREVET TUBERCULOSIS
A person suffering from TB should avoid the following foods such as chips, candy and sugary beverages and such processed foods, fast meals and meats a rerich infat and sodium, Caffeine and alcohol fried food sand snacks.

NUTRACEUTICAL MANAGEMENT
Nutraceuticals products can be considered non-specific biological therapies used to promote general well-being, control symptoms, and prevent malignant processes. In the present review, an overview of various bioactive ingredients that act as nutraceuticals (carbohydrates, lipids, edible flowers, alkaloids, medicinal plants, etc.) and their role in health benefits has been discussed. Nutraceuticals with an effective safety profile and well-established impact on pregnancy might be a suitable therapeutic option for preventing diabetes mellitus and hypertensive disorders or as an adjuvant to therapy with standard medications. In United States, nutraceuticals are unregulated, existing in the same category as dietary supplements and food additives by the Food and Drug Administration **(**FDA**)**, under the authority of the Federal Food, Drug and Cosmetic Act. Under Canadian law, a nutraceutical can either be marketed as a food or as a drug; the terms **"**nutraceutical**"** and **"**functional food **"**have no legal distinction, referring to **"**a product isolated or purified from foods that is generally sold in medicinal forms not usually associated with food **[**and**]** is demonstrated to have a physiological benefit or provide protection against chronic disease reduction**"**.

CONCLUSION

In conclusion, TB is a serious infectious disease that requires medical attention and a comprehensive approach to treatment. By following a nutrient-dense diet, practicing good hygiene habits and following prescribed medications regimens, individual scan support their immune system and improve their chances of successfully managing and recovering from TB. Its important to remember that early detection and treatment are key to preventing the spread of this disease and reducing its impact on individuals and communities. TB elimination has been defined arbitrarily as no more than one new case per million population per year or prevalence of TB infection of below 1 % in the general population. As case rates decrease, there is a significant risk that TB control programmers' will be dismantled, resulting in a resurgence of TB. Thus, the answer to the question, 'Can tuberculosis be controlled?' is 'Yes'- if appropriate policies are followed, effective clinical and public health management is ensured and there are submitted and co- ordinate efforts for its control from within and outside of the health sector. Rapid expansion of effective TB control services is urgently required, both to avert the continued high burden of morbidity and mortality from TB and because of the HIV pandemic.

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