



Author: **Dr. Rangson Tonjunpong**

Illustrations: **Nattika Boonsatitya**

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Acknowledgment and Note

This booklet is part of the 'Dancing with the Bacteria' series of publications aimed at raising public awareness about antibiotic resistance, prevention of infectious diseases, nutrition, food safety and medicine.

The contents of the booklet are an outcome of discussions on these themes at several workshops held in Chiang Mai, Thailand in February and July 2015. The workshops were organised by ReAct along with the Drug System Monitoring and Development Centre (DMDC), Sustainable Alternative Development Association (SADA) and Chiang Mai Green City Initiative.

The 'Dancing with the Bacteria' concept focuses on three sets of activities, all of which are closely related to the microbial world. These include promotion of organic food and farming practices, understanding the link between food/nutrition and health and the rational use of medicine.

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Introduction

For centuries food, in all its amazing varieties across the globe, has been considered the best medicine. The link between imbalances in nutrition, through over-nutrition, under-nutrition or mal-nutrition, is clearly acknowledged by both medical professionals as well as the general public.

While access to food continues to be a problem in many parts of the world today, this is compounded by the fact that a very large amount of food available is contaminated in one form or the other by chemical residues from pesticides, preservatives and antibiotics. Monoculture of certain crops and the pressure from commercial factors have also led to a shrinking of the diversity of cuisine and reduced consumer choices drastically. The media unfortunately often plays a role in misleading consumers in terms of their consumption behavior.

The crisis of non-availability of good quality and safe food is particularly acute in urban areas where people are at the mercy of whatever the market has to offer. Unlike in rural areas, very few have the opportunity or time to produce their own food.



In response to this crisis, there has been a sharp increase in the production of organic food worldwide — free of chemicals, in particular pesticides. The numbers of people taking to kitchen or terrace gardening in cities and towns is also growing rapidly. At the same time, new research on the Human Micro biome in microbiology is revealing the large role of friendly bacteria in the metabolism of the human body and their impact on overall human health.

This booklet explores the concept of 'Food as Medicine', arguing that good nutrition together with healthy lifestyles can help everyone avoid a range of modern-day diseases that are lowering both life expectancies and quality of life across the world. It helps us understand the link between food and medicine, through knowledge of the medical properties of regular ingredients of food and the right way to cook and consume them.

Food as Medicine

Currently, the highest incidence of mortality in Thailand, excluding road accidents, is due to non-communicable diseases (NCDs), which include diabetes, high blood pressure, cardiovascular diseases, cerebrovascular diseases, cancer, liver cirrhosis, kidney failure and so on. In Thailand, over 14 million people are affected by NCDs, with a death rate of 300,000 annually, of those less than 60 years.

How can we protect ourselves from this health threat of NCDs?

More and more scientific studies show that the root causes of NCDs mainly came from:

- a. Consumption habits;
- b. Quality of nutrition; and
- c. Lifestyle

There is no better and more effective method to safeguard from these threats than changing our eating habits, with the right nutrition together with improvement of lifestyles.

Relationship between Food and Health

Before describing this relationship, we should consider three aspects:

The term "Health" can be defined in various ways, but it is directly derived from the word 'Heal', which reflects the miracle power of our human body for self-healing from injury or sickness. When we define anyone as being in 'Good health', we refer to those who are able to heal their body effectively and quickly on their own.

This self-healing ability is called 'immunity' by medical science

According to a saying from the ancient Ayurvedic medical texts:

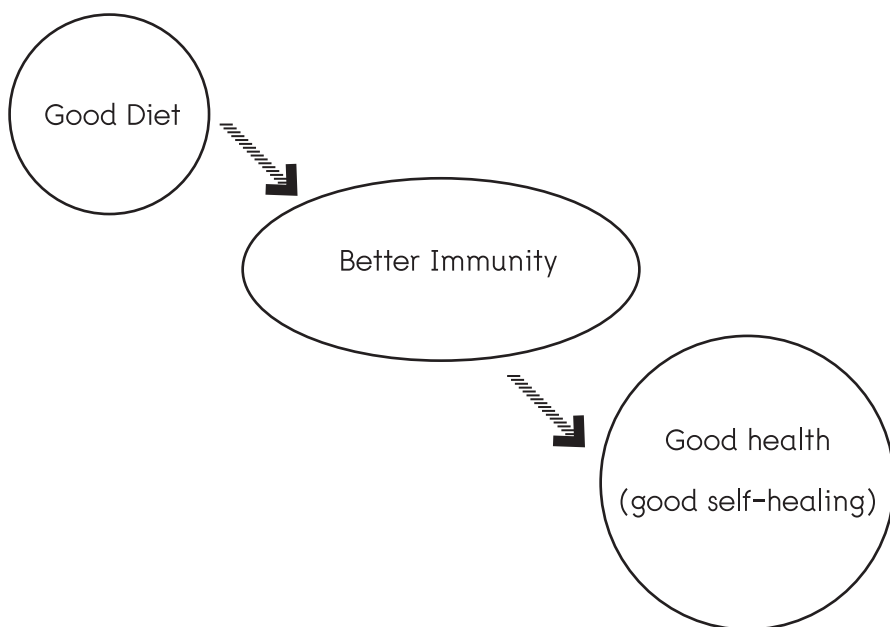
"When diet is wrong, medicine is of no use.

When diet is correct, medicine is of no need "

And as Hippocrates, considered the Father of Western medicine, also said:

"Let food be thy medicine and medicine be thy food."

Modern scientific research during the past several decades has also approved and confirmed these ancient medical beliefs. We can describe the relationship between food and medicine in a simple diagram:



How does good diet prevent NCDs?

We define good diet as one that can protect our body from deterioration due to NCDs.

A good diet can prevent, remove or reduce five processes of deterioration, which include:

- Chronic inflammation
- Dysbiosis
- Degeneration of cells and organs due to free radicals and oxidative stress
- Pollution from chemicals in agricultural, industrial products
- Damage due to wrong diet

1. Chronic Inflammation

Naturally, our body faces various attacks from microbes, injury, toxic substances, foreign bodies etc. But our body has a self-defense mechanism called 'inflammation' to dilute, remove and prevent their invasion into our blood stream and organs. The most common symptoms of inflammation are pain, swelling, redness; fever, which results from our immune system's fight against foreign bodies to confine them to a restricted area.

Generally these symptoms fully recover, within 4-7 days, but if they still persist this indicates that our immune system cannot cope with such attacks and is still engaged in endless fighting, which is defined as 'chronic inflammation'. If this situation per-

sists in the kidney, we call it kidney disease; if it persists in the blood vessels of the heart, we call it cardiovascular disease.

There are several dangerous food ingredients that create "chronic inflammation" in our body:

Refined sugar, high fructose corn syrup, artificial sweeteners, trans-fat, margarine, shortenings, chemical additives, processed meat, alcohol, genetically modified agricultural products, hydrogenated vegetable oils and poly-unsaturated oil, that along with their byproducts such as 'oxidized fatty acids', harm the inner lining of our blood vessels.

Food items that help to reduce such inflammation include:

Carrots, ginger, chamomile, Omega-3 fat /oil, cayenne, cinnamon, clove oil, turmeric, green vegetables, green tea, high fiber grain & nuts, soybean, yoghurt, tomatoes, garlic, onion, and olive oil.



2. Dysbiosis

After massive use of antibiotics in treatment of human illness, industrial farming and food production over the last seven decades, there has been a dramatic increase in incidence of antibiotic resistance and this is becoming a serious issue of concern for modern medicine.

Apart from killing bacteria, antibiotics also destroy the human body's normal gut flora i.e. good bacteria, which then result in rapid growth of bacteria harmful to human beings, along with different kinds of yeast and fungi. This ends up with a crisis in our gut called 'dysbiosis', that means a microbial imbalance on or inside the body.

Antibiotic resistance creates various health complications especially an increase in death rates due to respiratory tract infections, such as pneumonia. Secondly, because of an imbalance of the gut flora there is much more incidence of allergies and autoimmune diseases. Finally, an overgrowth of harmful bacteria, yeast and fungi in our gut leads to ailments such as the leaky gut syndrome, irritable bowel syndrome and eventually gut and psychology syndrome (GAPS).

Recent research indicates the importance of our gut, beyond its role in digestion and absorption of food. Some experts have

even called the gut our "second brain". Therefore any damage to our gut may damage our ability to maintain the overall health of our bodies.

There are three main groups of food products that help prevent dysbiosis.

a. Prebiotics or food that contains typically non-digestible fiber compounds. When these pass undigested through the upper part of the gastrointestinal tract they stimulate the growth or activity of beneficial bacteria that colonize the large bowel.

Some examples of prebiotics are cereals, vegetables and fruits that contain:

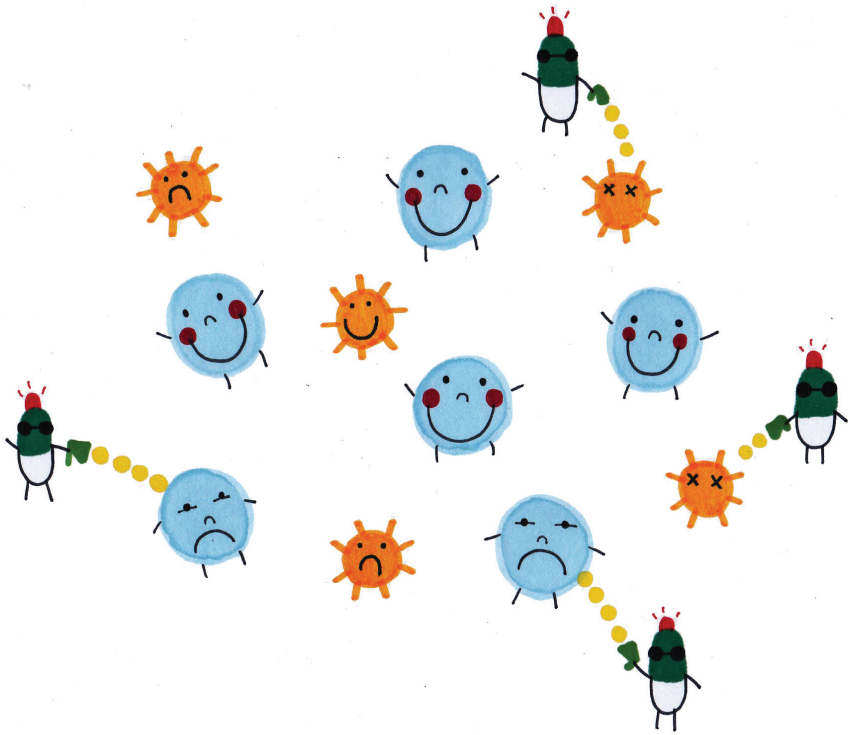
Oligosaccharides, such as tomato Jerusalem artichoke, garlic, bananas, onion, honey, asparagus.

Inulin, a soluble dietary fiber, such as taro, garlic, red onion, onion and cabbage.

Beta glucans, such as oat, barley, yeast, mushrooms and seaweed

All these prebiotics greatly promote growth of good bacteria like lactobacillus and bifidobacteria, prevent constipation, and improve digestion and absorption of food.

b. Probiotics, which are basically normal flora that naturally live in our digestive tracts especially in our intestine. The most



common probiotics are Lactobacillus and Bifidobacteria.

These normal flora are able to resist the acidic or alkaline conditions inside our stomach and small intestine and survive to settle in our large intestines.

The large intestine is the ideal place for this normal flora to grow or settle and ferment to synthesize various beneficial vitamins, fatty acids and minerals. These fermented byproducts have huge benefits for our food digestion, food absorption, waste elimination and removal of toxic substances.

List of some health benefits from probiotics:

Produce lactic acid to prohibit overgrowth of harmful bacteria and prevention of infectious diseases;

Improve waste elimination from our large intestine, reduce constipation, greatly assist defecation;

Synthesize some amino acids, vitamin B1, B2, B6, B12, nicotinic acid, folic acid and natural immune boosters;

Assist in reduction of blood sugar and cholesterol;

Produce the lactase enzyme that helps to digest milk effectively.

Foods that contain probiotics include natto, kimchi, toona, Tempe, pickled cucumber, miso, cheese, kenema, and chungkookjang, shrimp paste.

c. Synbiotics, that are foods that contain both prebiotics and probiotics, which are greatly synergized for the greatest impact. Some examples of synbiotics are yoghurt, kefir, sauerkraut, natto, Tempe, kimchi, fermented tea, fermented soy.

3. Damage of cells and organs by free radicals and oxidation reaction

Free radicals are unstable atoms or molecules, which react harshly to the pull of electrons from neighboring molecules and

create a chain reaction to produce more and more unstable atoms or molecule in our body.

Free radicals generally occur in the body during digestion, especially after consumption of grilled fat or alcohol, hard exercise, air or water pollution, ultraviolet radiation, smoke from cigarettes or exhaust fumes from certain drugs.

The human body has a natural defense mechanism against harmful free radicals through the anti-oxidant enzymes it produces. However, with ageing, the body produces fewer anti-oxidants leading to a situation where there is much more free radicals than the body's antioxidant production can handle. This results in the deterioration of cells and body tissues, leading in turn to what are called "degenerative diseases" such as NCDs.

In our daily life at present, the most common source of free radicals is wrong cooking methods. The use of poly-unsaturated fats such as soybean oil, sunflower oil, rice bran oil, and the cooking of food at high temperatures accelerate the reaction between unsaturated fat and oxygen to form free radicals. These rusty fats (oxidized oil) cause blood clots, constrict blood vessels, damage inner lining of blood vessels, all of which are the major cause of heart disease and stroke, etc.

Prevention and Solution

Foods that reduce or prevent damage from free radicals are called 'antioxidants'. They promote and strengthen the antioxidant enzymes already present in the human body to efficiently destroy free radicals.

Groups of antioxidants in vegetables and fruits include vitamin A, vitamin C, vitamin E, beta-carotene, polyphenols, and flavonoids. These antioxidants are also anti-inflammatory. Both these protecting actions efficiently decrease tissue damage from free radicals; decrease incidence of cataracts due to ageing and lower incidence of cardiovascular disease. Moreover they inhibit cell mutation so they are capable of reducing cancers and tumors also.

To reduce the dangers of free radicals more effectively, we should combine different strategies together:

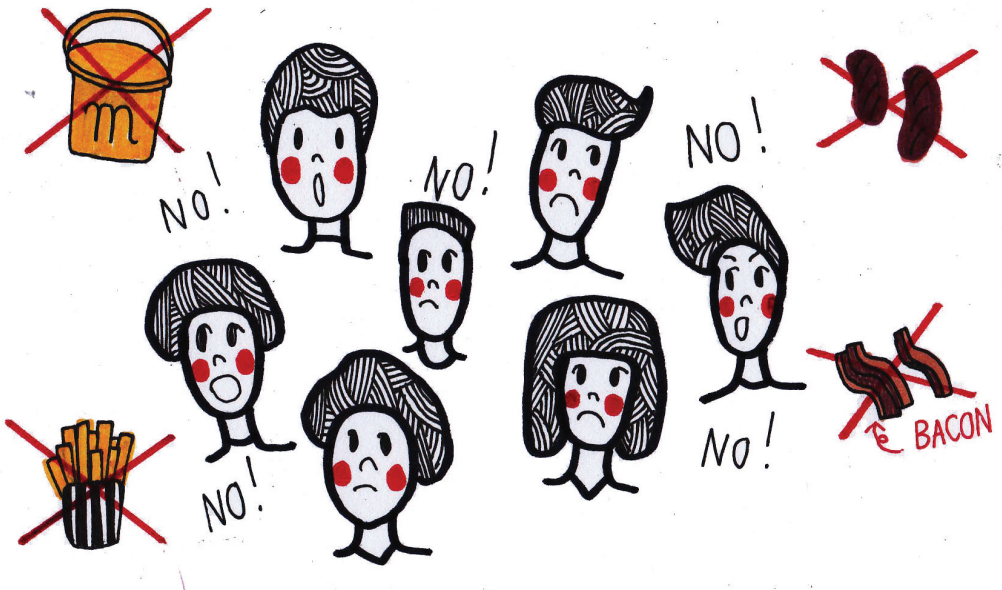
Avoid consumption of oxidized foods, such as grilled or fried foods cooked with unsaturated fat oils at high temperatures.

Avoid pollution, such as radiation in food, exposure to ultraviolet radiation, smoke, air pollution, cigarettes.

Increase consumption of fruits and vegetables, enriched with antioxidants.

a. Fruits that contain antioxidants such as beta-carotene in-

clude mango, ripe cherry tomatoes, ripe papaya, banana, violet sweet cantaloupe and ripe pineapple. Fruits that contain high amount of vitamin C are seedless guava, Indian gooseberry, rambutan, persimmon, strawberries, papaya, grapefruit, cucumbers, apple, Chinese dates.



Fruits that contain high amounts of vitamin E are jackfruit, Manila tamarind, raw mango, cherry tomatoes, Ekiweswi mango, dragon fruit, pink strawberry and Pisang Mas (fig bananas).

The fruit that contains the highest amounts of beta-carotene, vitamin C and vitamin E is cherry tomatoes. Fruits that contain less beta-carotene, vitamin C and vitamin E are Chinese pear, grape and apple.

b. Vegetables that contain high carotene and carotenoids (beta-carotene, lutein and lycopene) include dark green vegetables, pumpkin, gourd, Chinese cabbage, morning glory. Vegetables that contain high amounts of vitamin C are green pepper, broccoli, kale, Neem leaves, green turnip and morning glory.

c. Foods that contain a lot of vitamin A include pork liver, egg yolk, milk, vegetables, especially dark green. The fruits with high vitamin A content are yellow-orange vegetables, carrots, pumpkin, gourd, morning glory, mango, papaya, apricot and ripe tomatoes.

d. The herbs that are rich in antioxidants are divided into three categories:

Hot tea including: *Thunbergia laurifolia*, black tea, green tea, stevia, *Houttuynia Cordata* Thunb (Plu Kaow), Kariyat, Roselle, Bael, okra, safflower, *Tinospora Crispa*;

Ready-to drink beverages: Indian goose-berry juice, cashew nut juice, myrobalan juice (*T. chebula*), *Cleistocalyx operculatus* juice, Roselle fruit juice, grape juice, Noni juice, strawberry juice, *Chrysanthemum* juice, star apple juice, black galingale juice;

Powdered beverages: powdered pandanus and powdered Java tea.

However, cancer patients may have to be careful while consuming fruits, especially fruit juice or fruits with high sugar content (fructose) because of their negative side effects.

4. Pollution from agricultural, industrial contaminants in food and water.

Over the years chemical pesticides have been used in agriculture in large quantities. Divided into groups such as insecticides, herbicides, fungicides and rodent poison these chemicals accumulate in the food chain.

These chemical pesticides often spread into the environment. The water that flows through the farms, which use pesticides inevitably contaminate river and underground water. The contamination of the ecosystem by chemicals is now widespread. Residues in agricultural products cannot be washed off with water or destroyed by the heat of cooking.

Symptoms of long-term contamination

Long-term contamination by agricultural chemicals (may be over several months or years) and its accumulation in the body

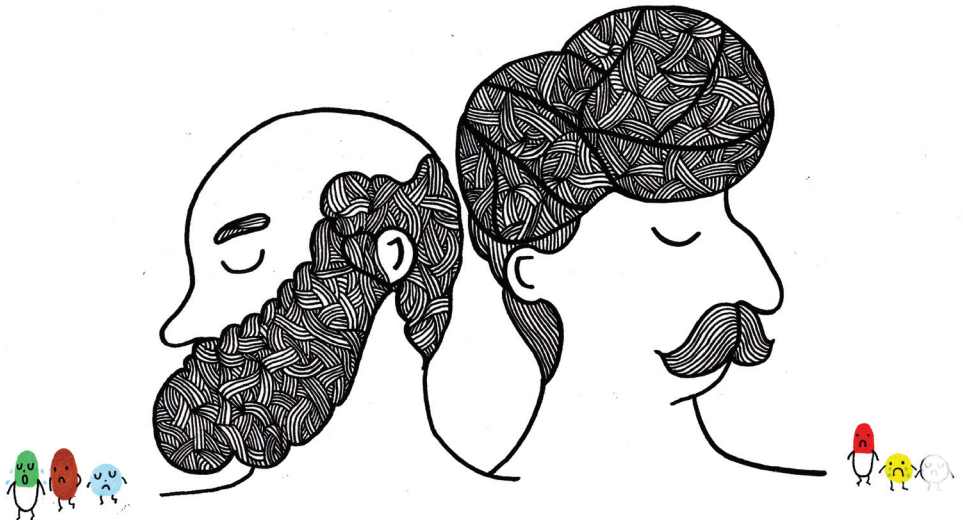
may cause health problems of different kinds, such as through the alteration of human cells. This could result in tumors or cancer, defective physical development of babies in the womb and adverse impact on reproductive cells.

Prevention and Solution

Choose a supplier of organic food for daily consumption to be safe from harmful agro-chemicals, pesticides, anti-fungal agents, fertilizers or herbicides.

Consume food without contamination from antibiotics and hormones

Select food, which is free from synthetic chemicals such as preservatives, artificial colors, irradiation and bleaching agents.



Increase consumption of food that offers higher nutritional and health benefits, such as essential fatty acids, amino acids, antioxidants, essential minerals, pre-biotics and pro-biotics to promote good intestinal flora.

5. Damage due to wrong diet

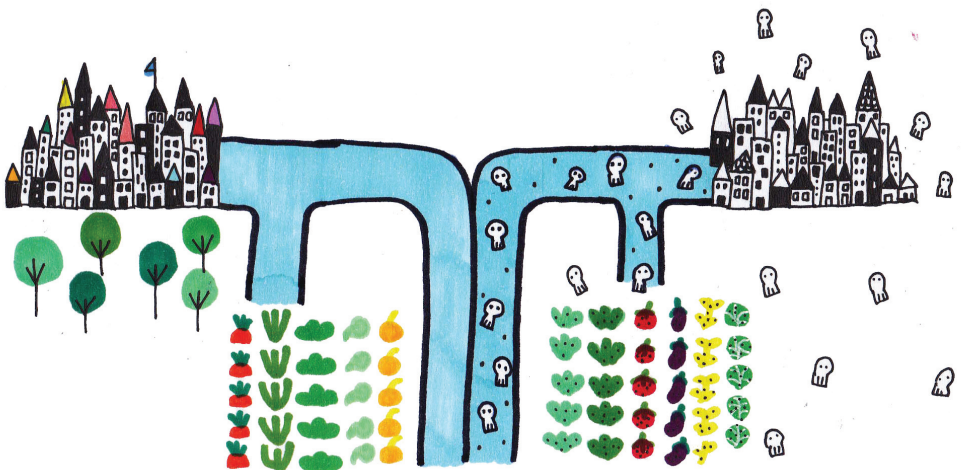
Currently our societies are driven by the power of capital. Enormous marketing budgets and mass advertising influence modern lifestyles. Such consumption behavior is a major cause of many degenerative diseases (NCDs) for example through:

Sugar Addiction: High sugar content in foods and beverages accelerates secretion of the insulin hormone into the blood stream, which is the main cause of damage to the inner lining of blood vessels. Long-term adverse effects gradually develop into insulin resistance, obesity, diabetes, atherosclerosis, stroke, etc.

Excessive fat consumption: Especially harmful is consumption of foods fried with processed poly-unsaturated vegetable oils or stir fried with temperatures above 110 degrees centigrade, which accelerate the oxidation reactions to produce rusty fat (oxidized lipids), which damage the inner wall of blood vessel.

Trans-fats: Non-dairy creamers, shortening, margarine, fried foods from the fast food industry are particularly harmful to the blood vessel walls and cannot be removed or digested by our body.

Buying cooked food from unknown sources: Often food sold in the markets contain taste enhancers such as Mono Sodium Glutamate (MSG), preservatives, artificial colours, poor quality ingredients, trans fats etc. This is especially so with regards to food that is canned, bottled or boxed. Please be aware that any canned food contains ingredients on their label with complex and strange names and uncommon nutrients.



Lack of sufficient intake of fruit, vegetables and drinking water: Fruits and vegetables provide valuable fiber for our gut flora, potent anti-inflammatory agents, and antioxidants and help eliminate toxins from the body. To achieve optimum health one should drink at least 8-10 glasses of plain water per day (Not: 2 sodas + 4 cups water + 2 cups of coffee = 8 glasses per day!)

