

WELCOME

TOPIC-Relationship between nutrition and infection



RELATIONSHIP BETWEEN NUTRITION AND INFECTION



ABSTRACT

Nutrition and infectious diseases are related to each other in some aspects. First, nutrition affects the development of human body immune system. Moreover, nutrition can influence emerge of infectious diseases (e.g., gastrointestinal infections), food poisoning, intestinal diseases, and systemic infectious diseases. In this review, the mentioned aspects of the relationship between nutrition and infections are discussed. Furthermore, the relationship between malnutrition and infectious diseases, nutrition in patients with severe combined immunodeficiency and relationship between overeating and infection are reviewed. Overall, some factors can weaken the body's ability to fight infection and cause malnutrition. The factors include anorexia, traditional behaviors, reduction of intestinal absorption, metabolic damage, disorder metabolism of lipids and carbohydrates, reduction of vitamins, iron, zinc, and copper. In the case of the relationship between malnutrition and infection, a large number of studies have illustrated a bidirectional interaction of malnutrition and infection. In this aspect, to treat serious acute malnutrition and limit the rate of death, some preventive studies applied antibiotics, probiotic bacteria, and prebiotic foods. In the future, studies may be conducted on intestinal or systematic immunomodulation.

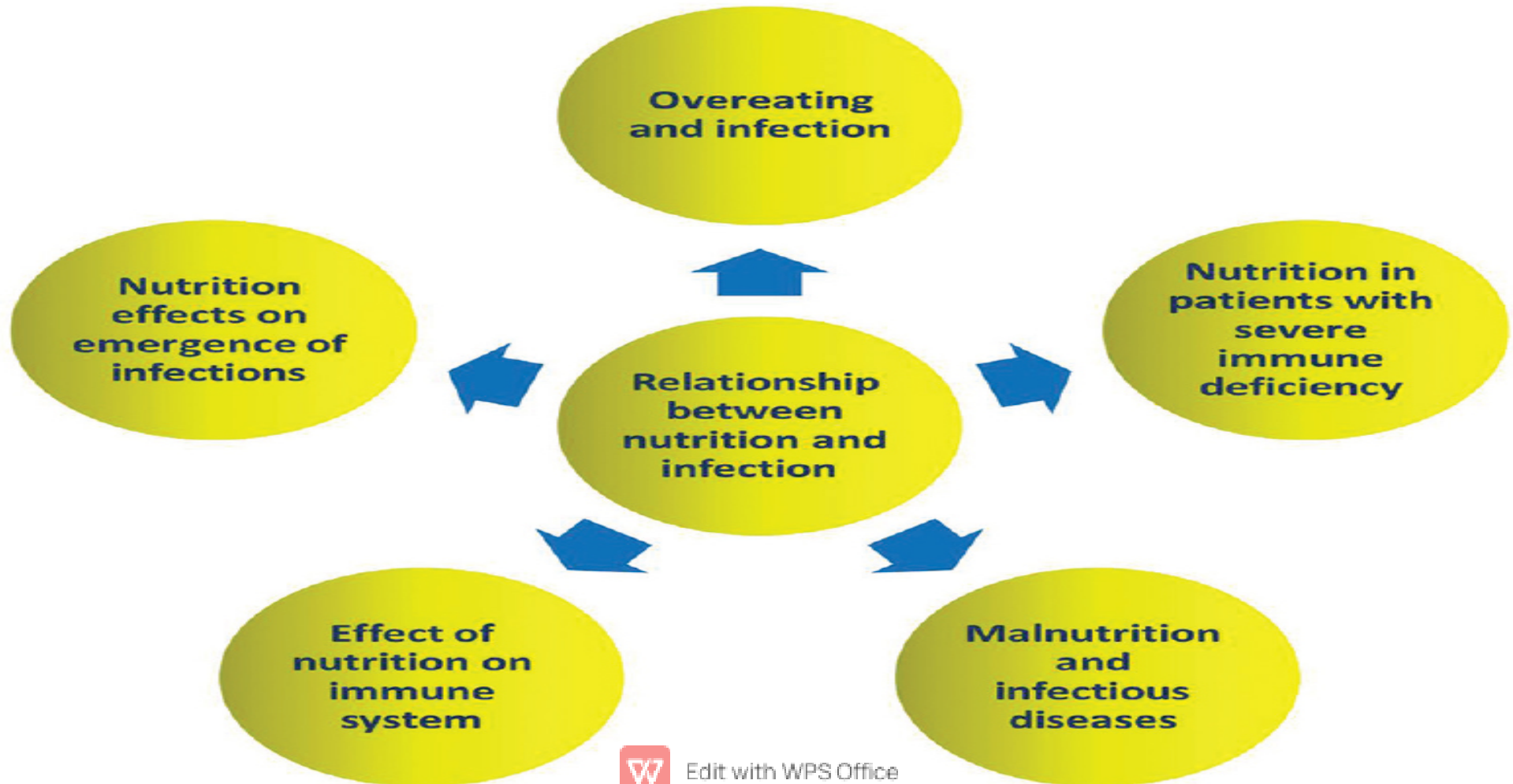


INTRODUCTION

The relationship between nutrition and infectious diseases can be divided into five groups as follows [1]: (1) the effect of nutrition on the development of human immune system; (2) the effect of nutrition on emerge of infectious diseases (e.g., gastrointestinal infections), food poisoning (e.g., botulism), intestinal diseases (e.g., microbial diarrhea), and systemic infectious diseases (e.g., Brucellosis More Details and typhoid); (3) relationship between malnutrition and infectious diseases; (4) nutrition in patients with severe combined immunodeficiency; and (5) relationship between overeating and infection [Figure 1]. These five groups of balance between nutrition and infection are discussed below.



The relationship between nutrition and infectious diseases



THE EFFECT OF NUTRITION ON THE DEVELOPMENT OF HUMAN BODY IMMUNE SYSTEM

The effect of diet on the development of human immune system begins from the embryonic stage. If during pregnancy, especially in the first trimester of pregnancy, the mother receives enough protein, vitamins, and minerals, the embryonic tissues will develop very well. If a fetus develops sufficiently, it will have normal weight and size. The normal weight of the fetus is an important criterion for his/her health.[2] Fetal malnutrition has unfavorable effects on the development of immune system. If the immune system does not efficiently develop in this period, it cannot defense against pathogens in the future.



After birth, breast milk provides sufficient vitamins and minerals to a baby that can guarantee the baby's growth and health.[2] Breastfeeding is the second-most important step to develop a vigorous immune system.[2] A malnourished baby who does not receive enough protein and vitamins is prone to infectious diseases and does not respond well to vaccines.[3] Therefore, nutrition is critical to provide high immunity in humans against environmental pathogens.

The role of nutrition to provide vigorous immunity against infectious diseases has been vastly investigated. For example, it has been shown that if a group of children receives enough food and another group of children receives tuberculosis vaccine, those who have a good diet are less affected with tuberculosis than those who vaccinate. The risk of developing tuberculosis is significantly reduced in people who have healthy nutrition and are vaccinated



NUTRITION EFFECTS ON EMERGENCE OF INFECTION

If food, as a source of energy for human body, has microbial contamination, it can cause various diseases including digestive diseases and food poisoning. People are exposed to various food poisonings in different seasons. In hot weather, intestinal diseases are highly observed, which the most dangerous one is cholera.[7] Food poisoning is also caused by the consumption of contaminated foods. In many cases, eating the spoiled canned foods can be very dangerous. Typhoid fever, caused by *Salmonella* More Details species, is also one of the most dangerous diseases transmitted through contaminated water and food.[8] It causes many problems for patients since the pathogen is antibiotic resistance.



Besides, microbial contaminations transmitted through water and food can cause severe diarrhea and infectious diseases in children.[9] Brucellosis is an infectious disease caused by the ingestion of contaminated food and water. Brucellosis is a common disease between humans and animals. Bacterium *Brucella* More Details can cause illness in sheep, goats, cows, pigs, and dogs. Humans become infected with *Brucella* by consuming unpasteurized milk or undercooked meat from infected animals.[10] Close contact with secretions of infected animals can also transmit the infection to human.[10] Amoebiasis is a major disease caused by consumption of contaminated water and food. Likewise, toxoplasmosis is caused through ingestion of raw or undercooked meat. As the parasitic cyst enters the human stomach, it is released by the action of gastric acid and absorbs into the liver through the intestinal mucosa and then enters the lymph nodes.[11] Pinworm infection is another parasitic disease transmitted through food. The infection is prevalent in all countries with more prevalence in children compared to adults. Parasitic worm infections such as teniasis and hookworm infection are also caused by inappropriate nutrition.



MALNUTRITION AND INFECTIOUS DISEASES

Effects of malnutrition on emergence the infectious diseases

The effect of protein-energy malnutrition on the increase of infectious diseases has been studied extensively. In regions that there is malnutrition of proteins, microbial contamination is a health problem and affects the entire community of children. In such poor societies, the Vitamin A deficiency, which is one of the important immune system boosters, should be added to diet. The lack of the mentioned nutrients, protein, and Vitamin A has caused prevalent infections in the world's poorest areas.



Effects of infections on malnutrition

In 1968, the World Health Organization reported that the infection could worsen malnutrition in humans. This kind of enhancement relationship is called synergy. It is believed that the infection can negatively influence the subjects' nutritional status that results in reduction the body's ability to fight infection. Consequently, infection can cause malnutrition and malnutrition may increase the infection.

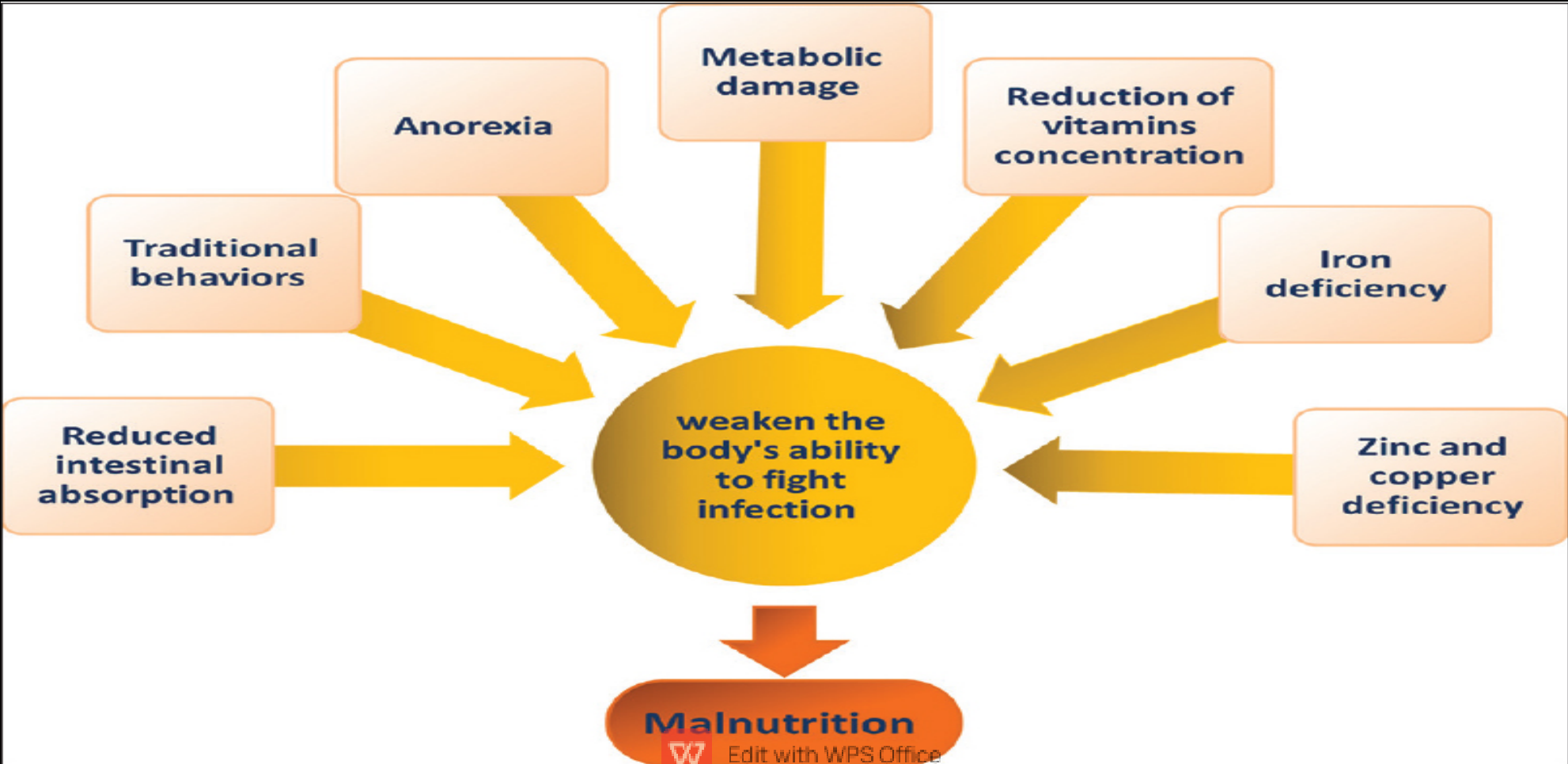
Some factors can weaken the body's ability to fight infection and cause malnutrition [Figure 2]. First, anorexia can cause malnutrition and weaken the body's immune system against infection. The traditional behaviors can also exacerbate malnutrition and infection. For example, in some societies, people who have fever or diarrhea are banned from eating. Reduced intestinal absorption due to intestinal infections can reduce protein, carbohydrate, and fat absorption by 43%, 42%, and 72%, respectively. Of course, these values depend on the type of infection. Diseases such as hepatitis, acute tonsillitis, and rheumatoid arthritis can also reduce serum Vitamin A concentration. The concentration of Vitamin C is reduced in patients' blood with infections. As a result, the concentration of Vitamin C increases in the urine. This situation is even seen in people who have received measles and smallpox vaccine. Obviously, people who have received the vaccine have an imitation infection. [18] Amount of Vitamin B2 (riboflavin) in the body decreases following infection. Reduction of Vitamin B2 due to infection is statistically significant

Iron is another nutrient that is reduced in the body due to infection. Iron efficiency can help to reduce the activity of pathogens and aid to treat infections. Zinc and copper are other elements whose concentration decreases when infections occur. Studies have shown that the balance of copper and zinc in infections is negative. In the blood, the concentration of copper increases, however, levels of copper may significantly decrease in the infected body.

In order to treat malnutrition caused by infection, it is necessary to compensate for energy and weight loss. Overall, nutrition is critical in the treatment of malnutrition caused by infection.



The factors that weaken the body's ability to fight infection and cause malnutrition



NUTRITION IN PATIENTS WITH SEVERE IMMUNE DEFICIENCY

In severe immune deficiency, the susceptibility to infection can occur. A healthy person may eat some poisoned canned food and do not get infection. However, patients with severe immune deficiency may develop disease if they eat the same. Physicians emphasize that patients with severe immune deficiency, especially those with white blood cells below 1000 or less, should not use raw foods and fruits. Such foods may transmit pathogens. It is also recommended that the patients avoid eating dried fruit when the white blood cells are under 1000.

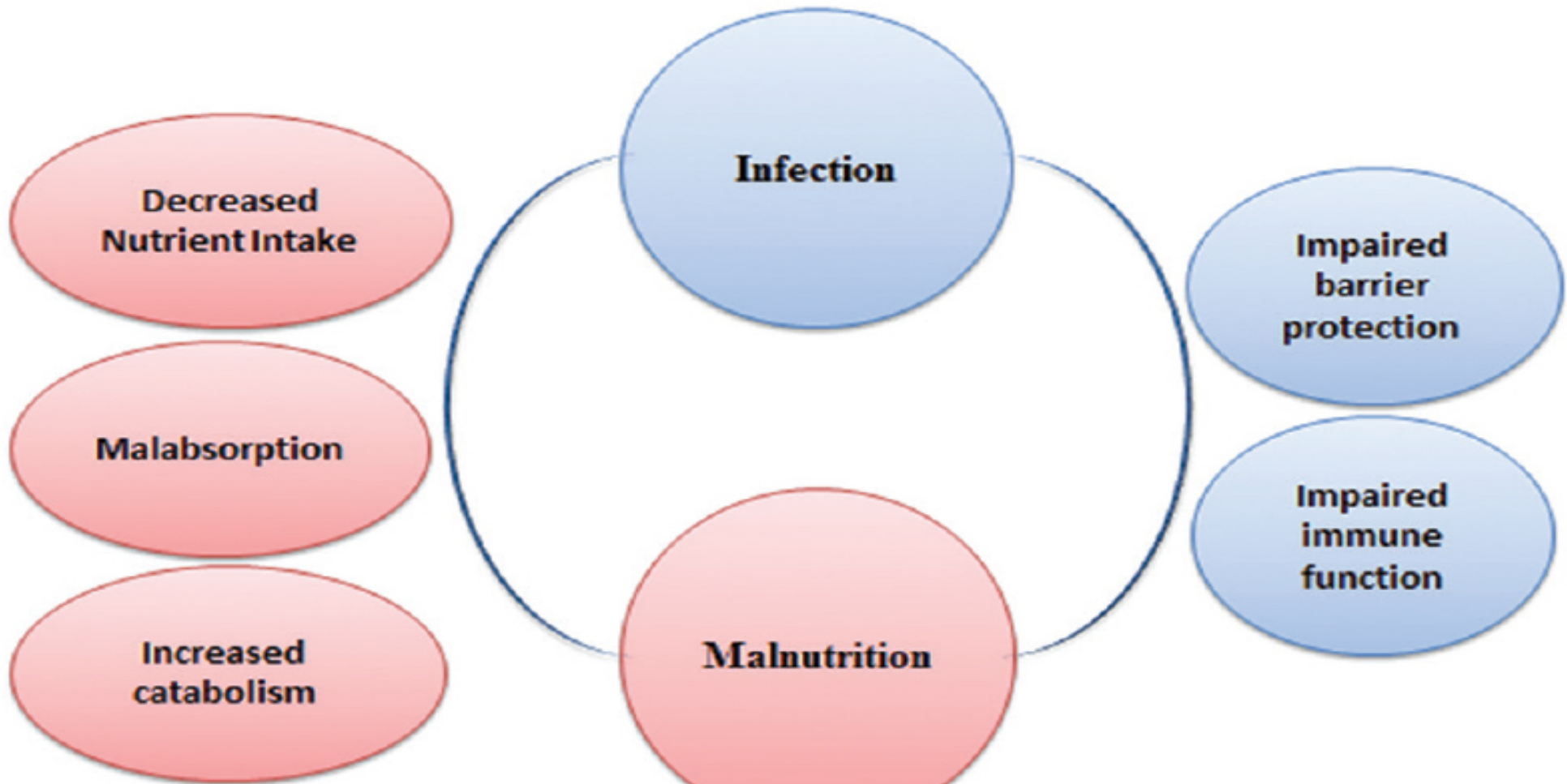


OVEREATING AND INFECTION

The relationship between overeating and infection is not vastly investigated. However, in some studies, it is shown that overweight persons are at more risk for respiratory tract infections.[21] In addition, obese people have potential for get diabetes and all diabetic people are sensitive to infections.



Interaction of nutrition and infection.



Thank You!



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