食品科学与工程英语

（第二版）

主　编　张英春　姜瞻梅
主　审　张兰威

HEUP 哈爾濱工程大學出版社

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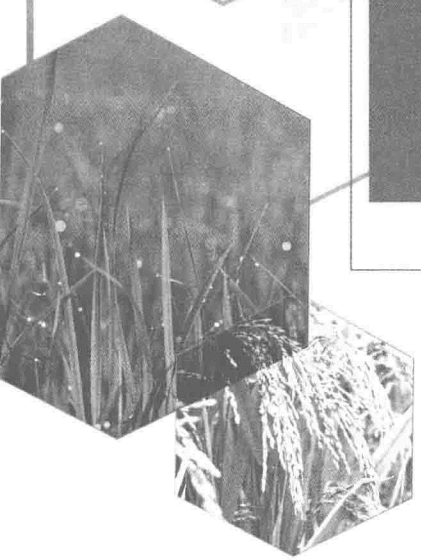

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内容简介

本书系统选编了食品营养、碳水化合物、蛋白质、脂类、维生素、矿物质、食品微生物、热加工技术、蒸发和干燥技术等内容，所有内容均选自权威性刊物和经典著作，能较全面地反映食品营养、食品加工和食品工艺三大方面的内容。全书共21个单元，每个单元分成3部分（除17单元外），每部分的内容具有相关性，不同学校可以根据自身学科特点选讲重点内容。

本书内容具有较强的实用性和指导性，可为食品企业管理者和食品专业的学生提供理论指导。

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前　言

食品工业已经成为世界公认的朝阳产业，随着改革开放的深入，食品业在我国已成为第一大产业。随着食品科学的迅猛发展，许多国外先进的食品工艺、技术和设备源源不断地被引进，各种食品信息愈来愈呈现全球化的趋势。当前食品技术国际发展方向将使我们面临一场新世纪的挑战，作为世界贸易组织的成员国，我国与世界各国交往迅速增多，国家间食品科技合作日益频繁，英语作为一门主流的国际交流语言，其作用日显重要；如何学好英语，一直是人们关心的热点，学生能否在今后的实际工作中熟练运用食品技术专业英语这门国际性的交流工具武装自己，具备强有力的竞争力，对于食品技术专业英语的教育提出了更高的要求。但食品科技英语教材很少，因此在哈尔滨工程大学出版社组织下，我们编写了这本《食品科学与工程专业英语》。

本书系统选编了食品营养、碳水化合物、蛋白质、脂类、维生素、矿物质、食品微生物、热加工技术、蒸发和干燥技术、高压脉冲电场加工技术、高压食品加工技术、食品包装技术、食品分离技术、乳制品加工、肉品加工、蛋品加工、果蔬加工、粮油加工、饮料加工和焙烤食品加工。所有内容选自权威性刊物和经典著作，语言生动、内容新颖、形式多样、涵盖面广，能较全面地反映食品营养、食品加工和食品工艺三大方面的内容。从组织上，全书共21个单元，每个单元分成3部分（除17单元外），每部分的内容具有相关性，不同学校可以根据自身学科特点选讲重点内容。该书是公共英语的延伸，在选材上注重食品科技专业的内容，每一部分都配有专业词汇的解释，有助于学生自学。

本书内容具有较强的实用性和指导性，可为食品企业管理者和食品专业的学生提供理论指导。通过本书的学习，可使学生提高灵活运用与食品相关的词汇、用语的能力，提高英文听、说、读、写等方面的能力，为以后进一步学习或就业打下良好的英语基础。本书由哈尔滨工业大学张兰威教授主审。

由于资料收集和撰写水平有限，不妥之处，敬请读者指正。

编　者

2015年7月

目　录

Unit 1 Nutrition

Part A Nutrients

1. Definition

What are nutrients? A nutrient may be defined as a substance that is necessary for the functioning of the living organism. Sometimes it is referred to as a material that nourishes the body.

2. Functions

The scientist subsequently found that a nutrient can function in the body in three ways:

(1) It may provide the body with fuel, which, when oxidized, releases energy for its activities.

(2) It may provide materials for the building and upkeep of body tissues, both the skeletal structure and the soft tissues of the body.

(3) It may provide the materials that are necessary to regulate body processes or that the body can use to synthesize its own regulatory substances.

A single nutrient may take part in any one of these functions, or two, or even all three. Or a single food may provide nutrients that will participate in one or more of these functions, depending on its composition.

There are five major groups or classifications of nutrients: carbohydrate, protein, fat, vitamin, and mineral.

The first nutritive function—providing fuel for energy—is performed by carbohydrates and fats, and also by proteins. This energy function is usually expressed in calories, a term signifying the potential chemical energy that may be released as heat when food is oxidized. This is what is meant by the calorie value of a specific food. The term is also used to express the amount of energy man needs to "do work" or to perform certain tasks. Carbohydrate and protein each supply approximately four calories per gram, whereas fat provides nine calories per gram.

Performing the second function of nutrients are protein and minerals. They supply the materials for the building and upkeep of body tissue, including the skeletal structure and the soft tissues. However, small amounts of fat are also needed for each body cell. It is possible, too, through the metabolic processes, that segments of molecules of fat and carbohydrate may become incorporated into the cell structure.

Finally, the nutrient that is most active in regulating body processes is the vitamin group. However, minerals as well as protein derivatives, such as enzymes and hormones, are also necessary. Carbohydrate and fat, too, may become involved in the same way that they may participate in structural formation.

Obviously, it is impossible rigidly to ascribe certain functions to each type of nutrient. But major classifications can suggest the primary activity of each group.

New Words and Expressions

nourish /ˈnʌrɪʃ/ *vt.* 滋养；怀有；使健壮
upkeep /ˈʌpkiːp/ *n.* 维持；维修费；保养
skeletal /ˈskelətl/ *adj.* 骨骼的，像骨骼的；骸骨的；骨瘦如柴的
synthesize /ˈsɪnθəsaɪz/ *v.* 合成；综合
signify /ˈsɪgnɪfaɪ/ *v.* 象征；预示
metabolic /ˌmetəˈbɒlɪk/ *adj.* 变化的；新陈代谢的
segment /ˈsegmənt/ *n.* 片段；段数；积弓形片模型
derivatives /dɪˈrɪvətɪvz/ *n.* 派生物
ascribe /əˈskraɪb/ *vt.* 归因于；归咎于

Part B Nutrition and Food

The food we eat is thesole source of nutrients. Most foods are usually classified as belonging to one of the groups of nutrients. Thus butter is considered as a "fat food" and meat a "protein food". Seldom, however, does a food contain only one nutrient. For example, the primary sources of carbohydrate are sugar, bread, cereals, bread products, and root vegetables. But cereals contain some protein and important vitamins, and the vegetables contain certain minerals as well as carbohydrates. Again, butter may be a prime source of fat, but it also contains vitamin A.

An example of a food with many nutrients is milk. Milk has protein, fat, and carbohydrate. It is an excellent source of calcium and also a good source of vitamin A and riboflavin, plus some thiamin and niacin.

Learning about the nutrients in foods can become an interesting game. The basic five food groups and similar groupings have foods containing common nutrients that are helpful in planning the nutrient content of the diet. However, there are variations within the same group. All vegetables, for instance, are not identical. Potatoes have only a trace of vitamin A but a cup of broccoli will yield 3 880 international units. If a diet plan needs additional iron and thiamin, which foods would you recommend?

The exact number of nutrients is debatable. The estimate is more than 50 nutrients. There may be nutrients that have not been discovered during research projects.

Oxygen, water, and fiber are sometimes called nutrients. Oxygen and water are essential for life and fiber promotes health.

The consumption of nutrients varies according to availability, cost, preferences, and other factors in the selection of foods, the carriers of nutrients. A review of the availability of nutrients in the nation's food supply has implications for the adequacy of the American diet, on the whole. The caloric and nutrient content of the 1979 food supply was the same or surpassed that of the previous year and 10 years ago with the exception of B_{12} and vitamin A.

Increased use of pork, shortening, salad and cooking oils, poultry, and peanuts contributed to a somewhat higher level of fat. The phosphorus and magnesium levels were raised slightly. Calcium remained the same.

An increase in B_6 was attributed largely to a greater consumption of poultry, potatoes, and vegetables. Larger amounts of fortified beverages and increased use of frozen orange juice concentrate and chilled products were responsible for the higher levels of ascorbic acid.

Table 1 – 1 contains availability of nutrients for 1969 and 1979. Remember that these figures are for the national diet—that is, the nutrients that are available per capita per day—not individual diets.

Table 1－1　Nutrients available for consumption, per capita per day[a]

Nutrient(Unit)	1969	1979[b]	1979 as a percentage of 1969
Food energy/cal①	3 310	3 500	106
Protein/g	100	104	104
Fat/g	156	168	108
Carbohydrate/g	381	400	105
Calcium/g	0.95	0.95	100
Phosphorus/g	1.54	1.57	102
Iron/mg	17.6	18.5	105
Magnesium/mg	343	352	102
Vitamin A value/IU	8 100	8 000	99
Thiamin/mg	1.92	2.17	113
Riboflavin/mg	2.31	2.44	105
Niacin/mg	23.6	26.7	113
Vitamin B_6/mg	1.95	2.05	105
Vitamin B_{12}/mcg	9.7	9.3	97
Ascorbic Acid/mg	108	120	111

NOTES: [a]Quantities of nutrients computed by Science and Education Administration, Consumer and Food Economics Institute, on the basis of estimates of per capita food consumption(retail weight), including estimates of produce of home gardens, prepared by the Economics, Statistics, and Cooperatives Service. No deduction made in nutrient estimates for loss or waste of food in the home, use for pet food, or for destruction or loss of nutrients during the preparation of food. Civilian consumption. Data include iron, thiamin, riboflavin, and niacin added to flour and cereal products; other nutrients added primarily as follows: Vitamin A value to margarine, milk of all types, flavored milk extenders; vitamin B_6 to cereals, meal replacements, infant formulas; vitamin B_{12} to cereals; ascorbic acid to fruit juices and drinks, flavored beverages and dessert powders, flavored milk extenders, and cereals. Nutrient data reflect for the first time poultry values from "Composition of foods-poultry products... raw, processed, prepared", AH-8-5(1979).

[b]Preliminary.

SOURCE: MARSTON R M, PETERKIN B B. Nutrient content of the national food supply[J]. National Food Review, 1980:21.

There are other influences on nutrient availability. As each one is discussed, consider if that particular influence changed your own diet and what action, if any, needs to be considered now.

Seasons appear to have an influence on the adequacy of nutrients in the diet, according to the 1965 Household Food Consumption Survey of the U. S. Department of Agriculture. Amounts of Vitamin A and ascorbic acid were lower in spring diets, and calcium shortages were more frequent in summer. Vegetables contribute more vitamin A than any food group in each of the seasons, but green and deep-yellow vegetables made the greatest contribution in the fall.

① 1 cal = 4.184 J(准确值)

Nutrient density is another way to examine the nutrients in any given food. The term is related to the concentration of important nutrients, such as vitamins, minerals, proteins, and others, in relationship to caloric value. Vegetables and fruits, for example, are noted for their wealth of valuable vitamins and minerals and yet do not contribute excessive calories. Milk and meat are other food that have important nutrients in comparison to calories. Low nutrient density refers to foods that are high in caloric value but carry insignificant amounts of other nutrients. To maintain health, careful selection and consumption of foods that have considerable nutrient density is essential. Carelessness about this responsibility may result in malnutrition.

Sorenson and Hansen have devised an Index of Food Quality (IFQ) now called Index of Nutritional Quality (INQ) which is a quantitative method of defining or describing nutrient denizen. The Index is determined by calculating the percentage of the total nutrient allowance—for example, that contributed by the calcium content of a cup of low-fat milk—in relation to the total caloric requirement. The requirements are based on an individual's specific requirements as indicated by age level of the Recommended Daily Dietary Allowances or by the use of U.S. RDA's during the use of nutritional labeling in the buying and planning of the daily diet.

Another influence on nutrient availability is inflation and high food costs. The emphasis on conservation of energy has changed certain food preparation practices which could affect nutrient availability. These situations require careful plan to insure adequate nutrition. A similar caution is related to the importance of orchestrating the nutrient density of foods eaten at home with foods eaten away from home each day.

Additional nutrients may be available through the fortification and enrichment of certain foods, such as enriched breads. Comparing the difference in nutrients between enriched white bread and 100 percent whole wheat bread may be helpful in deciding which is the better nutritional buy. Comparisons are important when choices are made between new foods (called analogs) that imitate common foods—for instance, turkey ham or soy bean bacon—as to nutrient content. In which ways are they similar and in which ways do they differ?

New Words and Expressions

sole /səʊl/ *adj.* 唯一的;单独的;仅有的
cereals /ˈsɪəril/ *n.* [作物]谷类;谷类食品
riboflavin /ˌraɪbəʊˈfleɪvɪn/ *n.* [生化]核黄素;维生素 B_2
thiamin /ˈθaɪəmɪn/ *n.* 硫胺;维生素 B_1
niacin /ˈnaɪəsɪn/ *n.* [生化]烟酸;尼克酸
identical /aɪˈdentɪkəl/ *adj.* 同一的;完全相同的
broccoli /ˈbrɒkəlɪ/ *n.* 花椰菜;西兰花
shortening /ˈʃɔːtnɪŋ/ *n.* 缩短;起酥油;缩略词
poultry /ˈpəʊltri/ *n.* 家禽;家禽肉
phosphorus /ˈfɒsfərəs/ *n.* 磷
magnesium /mægˈniːziəm/ *n.* 镁
beverage /ˈbevərɪdʒ/ *n.* 饮料;酒水;饮料类

chilled /tʃɪld/ *adj.* 冷冻了的；已冷的；冻硬了的；淬火迟的
ascorbic /əsˈkɔːbɪk/ *adj.* 维生素 C 的；抗坏血病的
capita /ˈkeɪpətə/ *n.* 头数（尤指牲口）
adequacy /ˈædɪkwəsɪ/ *n.* 足够；适当；妥善性
caloric /kəˈlɒrɪk/ *adj.* 热量的；卡的
malnutrition /ˌmælnjuːˈtrɪʃ(ə)n/ *n.* 营养失调，营养不良
quantitative /ˈkwɒntɪtətɪv/ *adj.* 定量的；量的，数量的
denizen /ˈdenɪzn/ *n.* 居民；外来语；外籍居民
inflation /ɪnˈfleɪʃ(ə)n/ *n.* 膨胀；通货膨胀；夸张；自命不凡
conservation /ˌkɒnsəˈveɪʃ(ə)n/ *n.* 保存，保持；保护
orchestrating 精心策划；给……配管弦乐曲；使协调地结合在一起
analog /ˈænəlɒg/ *n.* 类似物；同型物
ham /hæm/ *n.* 火腿；业余无线电爱好者；蹩脚演员
bacon /ˈbeɪkn/ *n.* 咸肉；腌肉；熏猪肉

Part C Nutrition, Infection, and Immune Response

Infectious diseases and malnutrition are two of the most common health problems in children of developing countries. The situation is more severe if these two conditions occur concurrently. The interaction of infection and malnutrition may be considered to be cyclic in so far as one condition is capable of accentuating the other.

Not only may malnutrition increase host susceptibility to infection, but infection on the other hand may also precipitate malnutrition, particularly in borderline cases. Altered eating habits, loss of appetite: malabsorption and negative nitrogen balance are often secondary to chronic infections so common in developing countries. For example, diarrhea and measles can frequently aggravate subclinically malnourished infant also frank kwashiorkor.

The interaction between malnutrition and infection may be either synergistic or antagonistic. The outcome of this interaction is either immune response or host response. Most interactions in human and in experimental animals are synergistic. The antagonism occurs not only the nutritional deficiency state in severe but also the microbial. Agent has obligatory dependence on the metabolism of the host cell. This phenomenon is restricted primarily to infections caused by virus, rickettsia, and protozoa: Although the antagonistic effect is well documented in animal studies, it has not been as clearly demonstrated in man. Malaria is perhaps the only example of antagonism. Thus for documented in the human host. This is probably because in human population nutritional deficiencies are seldom so specific as to be more damaging to the agent than to the host and these deficiencies are usually not as severe as those produced in the laboratory animals.

The outcome of immune response or host response between malnutrition and infection depends on several factors including the type of infection and the age of the patient. The most serious groups are infants and preschool children. Infections that commonly cause death in these malnourished infants and children are herpessimplex, small-pox, measles, miliary tuberculosis and *Salmonellosis*. Infectious caused by *Staphylococci*, *Pneumocystic carinii*, *Plasmodium falciparum*, and *Hookworm* are not uncommon.

The addition, malnourished children often respond to infection differently from well-nourished children and some of these difference are:

(1) When infection spreads in malnourished children, it often does so with the development of gangrene rather than suppuration.

(2) There is a higher tendency for malnourished individuals to develop a gram-negative septicemia.

(3) An organism which may cause a mild or subclinical infection in a well nourished individual may cause a severe infection or even a fatal one in a malnourished individual.

(4) There is usually little or no fever associated with infection in malnourished individuals.

The exact mechanisms by which diet may be alter the immune response between host and

parasite are poorly understood and rather complex, as both the quality and the quantity of dietary intake not only affect the host defence, but also have a direct influence on the metabolism of the invading organism. Some of the possible on mechanism are:

(1) Alteration of the host defence which controls the initial invasion of infections agents, in such a way as to facilitate acess to the underlying tissues.

(2) Interference with the reparative process of the host with a resultant increase in theseverity of the disease and retardation of recovery.

(3) Alteration of the metabolism of the invading agent once it has become established in the tissue.

(4) Establishment of condition which favour the development of the secondary infection. Clearly defined by systematically examining the resistant factors of the host that are altered by changes in nutritional status. There include apithelial barriers, leukocytic function, inflammatory response, acquired immune response, etc. This symposium will focus primarily on the effects of malnutrition on acquired immunity in human, but non-specific factors which potentiate the effectiveness of the acquired immunity, will also be discussed.

The two distinct type of the immune components which are responsible for defence against infections agents and for the development of other immunological phenomena are humoral and cellular responses. The humoral immune response is mediated by specific antibodies which may belong to anyone of the 5 immunoglobulin classes (IgG, IgA, IgM, IgD, and IgE). Antibody is important in defence against infections caused by extracellular agents, e. g. bacterial organisms. Cell-mediated immune response (CHIR) is, on the other hand, mediated by specifically sensitized lymphocytes and plays an important role in defence against infections caused by intracellular agents e. g. *Mycobacteria*, viruses, *Rickettsia*, and some protozoa. The mechanism by which malnutrition may unfavourably alter these two immune components needs to be investigated further, although a clear and unified concept has began to emerge through findings from recent investigation in this area.

1. Humoral Immune Response

Several groups of investigators have evaluated the function of the humoral immune system in malnourished patients but the results are still controversial. The integrity of the humoral immune response has often been assessed by either measuring the levels of the various classes of immunoglobulin in the serum or by observing the increase of antibody titre following an appropriate antigenic stimulation. This generally agreed that the level of immunoglobulin in the serum of malnourished individuals are not depressed. In fact, if any, they are slightly elevated when compared with the age and u7 sex-matched controls who are well nourished. However, this does not necessarily imply that the humoral immune system is capable of responding normally to antigenic stimulation. The normal levels of immunoglobulins may reflect a competent humoral immune system responding to previous infections because of circulating immunoglobulin levels at any time present the cummulative results of not only the present immunological experience, but

also of the past experience as well. A more suitable method for the evaluation of the functional integrity of the humoral immune system at the time when the children are hospitalized for the treatment of malnourished condition, is by observing the magnitude of change in the antibody titre following an appropriate antigenic stimulation. It was found that, while the antibody response to some antigens, e. g. diptheria and tetanus toxoid, are depressed the response of some other antigens, e. g. typhoid and yellow fever vaccines are normal. Antibody production returns to normal following dietary treatment and the titres are roughly correlated with the quantity and quality of food consumption during rehabilitation. On the other hand, data from the study of gamma – globulin turnover in children with protein-caloric malnutrition (PCM) is consistent with the notion that the humoral immune system of PCM children is unimpaired.

Because malnourished children are particularly prove to infections that occur at the body surface, e. g. diarrhea and respiratory tract infections, it is possible that their local immune system which is independent of the serum antibodies is defective. Information on this point is limited but the available data suggest that the local immune system in malnourished children does not function normally. The system, however, recovers slowly following appropriate dietary treatment.

In order to function to the maximum in host defence, certain types of antibodies must interact with the normal component of plasma known as complement and it is the activation of the complement system that is responsible for the killing of certain infections agents. Children with PCN have a defective complement system. The low circulating complement level in this children returned to normal upon receiving a high-protein diet. However, in some of these children there is an increase in the turnover of complement, and it is possible that this may be associated with the presence of substances in the circulation of these children which can activate and destroy complement. Endotoxin seem to be a good candidate because many of the malnourished children have endotoxaemia at the time of admission to the hospital. This is not unreasonable to postulate that the high tendency for malnourished children to develop a gram-negative septicaemia may be associated with a defective complement system in these children, since these bacteria more suscetible to the action of complement than other.

2. Cell-Mediated Immune Response

The cell-mediated immune (CHI) system of malnourished children is definitely impaired. It is highly possible that this function defect is responsible for the increase susceptibility of these children to certain intracelular infections, e. g. measles varicella, tuberculosis. Measles is an example of an ordinarily mild infection which, when it occurs in malnourished children, often results in fatal giant-cell pneumonitis, a condition similar to that frequently found in patients with acute leukaemia receiving steroid therapy or other immunosuppresive drug treatment. Results from histological studies on the lymphoid tissues that are known to be associated with cell-mediated immune function are consistent with the functional impairment of the system. These children have atrophic thymus, depletion of lymphocytes in the thymus-dependent area of lymph nodes, tonsils, appendices, aid Payer's patches. The thymolymphatic atrophy in these children may result from

impaired synthesis of proteins required for lymphopoesis or from the lytic effect of high plasma corticosteroid. The latter situation is a common finding in children with protein-caloric malnutrition.

There are several possible mechanism which can interfere with the expression of CMI function. Host investigators have used delayed cutaneous hypersensitivity reaction to access the integrity of CMI function in malnourished children and, in this reaction, intact inflammatory response in required. It has been observed that PCM children appear to have a more sluggish inflammatory well-nourished children. In addition to defective inflammatory response, both the afferent and the efferent limbs of the CML response are also impaired in most of those children. All of those defects return to normal following appropriate dietary treatment.

New Words and Expressions

infectious /ɪnˈfekʃəs/ *adj.* 传染的；有传染性的；易传染的；有感染力的

accentuate /əkˈsentʃueɪt/ *vt.* 使突出；强调；重读，以重音读出

host /həʊst/ *n.* 东道主，主人；主办人[地方，机构等]；(电视等的)节目主持人；*n.* 大量，许多；军队；[计]主机

borderline /ˈbɔːdəlaɪn/ *n.* 分界线，国界线；*adj.* 边界上的；边界附近的；暧昧的，不明确的；含混不清的

diarrhea /ˌdaɪəˈrɪə/ *n.* 腹泻；*adj.* 腹泻的

measles /ˈmiːzlz/ *n.* [医]麻疹；[兽](牛、猪的)囊虫病；[摄]斑点；[美俚]梅毒，麻疹的红斑点

kwashiorkor /ˌkwɒʃiˈɔːkɔː(r)/ *n.* 夸休可尔症，恶性营养不良

synergistic /ˌsɪnəˈdʒɪstɪk/ 增效的；协作的；互相作用(促进)的

antagonistic /ænˌtægəˈnɪstɪk/ *adj.* 敌对的；对抗性的

antagonism /ænˈtægənɪzəm/ *n.* 对抗，敌对

virus /ˈvaɪrəs/ *n.* 病毒；病毒性疾病；毒素，毒害；[计]计算机病毒

Rickettsia 发疹、伤寒等的病原体

protozoan /ˌprəʊtəˈzəʊən/ *n.* 原生动物

malaria /məˈleəriə/ *n.* [医]疟疾

tuberculosis /tjuːˌbɜːkjuˈləʊsɪs/ *n.* 肺结核

Salmonellosis 鲑科鱼；(尤指)鲑鱼

Staphylococci 葡萄球菌(形成脓的细菌)

Pneumocystic carinii 卡氏肺囊虫

plasmodium /plæzˈməʊdɪəm/ *n.* 原形体，变形体，疟原虫

falciparum 恶性疟原虫

gangrene /ˈgæŋgriːn/ *n.* 坏疽

supperation /ˌsʌpjʊəˈreɪʃ(ə)n/ *n.* 脓；化脓

septicemia /ˌseptɪˈsiːmɪə/ *n.* 败血病

parasite /ˈpærəsaɪt/ *n.* 寄生物；靠他人为生的人

metabolism /məˈtæbəlɪzəm/ *n.* 新陈代谢