

1-50 為單選題，每題 2 分，答錯倒扣 0.6 分 ※ 注意：請於試卷上「選擇題作答區」內依序作答。

Heat shock treatment

In both the food industry and in households, heat treatment is commonly employed to reduce spoilage and inactivate pathogenic microorganisms in food and food products. However, research in recent years has demonstrated the phenomenon of heat shock response on various microorganisms such as *Salmonella* Typhimurium, *Listeria monocytogenes*, *Escherichia coli* O157:H7 and *Vibrio parahaemolyticus*. With heat shock response, these microorganisms have displayed an enhanced ability to withstand more adverse heat treatment and other forms of lethal stress after pre-exposure to a sub-lethal heat treatment, usually a temperature a few degrees Centigrade above their growth temperature. The heat shock response of microorganisms thus has important implications for food safety. Since the currently employed control measures were typically developed based on studies with non-shocked cells, these measures may be inadequate in dealing with heat shocked-microorganisms that have developed an enhanced resistance to stresses otherwise lethal to them.

Cronobacter sakazakii, formerly *Enterobacter sakazakii*, is a member of the Enterobacteriaceae family. This microorganism is considered an emerging opportunistic pathogen and the etiological agent of life-threatening bacterial infections in infants. Although *Cronobacter* spp. has been detected in multiple food sources such as minced beef, cheese products, milk powder, sausage meat, vegetables, cereals, legumes, and spices; dried infant formula milk has been confirmed as the source of severe systemic neonatal infections caused by this pathogen. We previously have conducted experiments to study the effect of temperature and length of heat shock treatment on the cell leakage and thermal tolerance of *C. sakazakii*. It was found that heat shock treatments (42-48 °C for 5-15 min) caused cell damage, enhanced cell leakage, and increased thermal tolerance of *C. sakazakii*. Moreover, at or below its maximum growth temperature of 47 °C, the thermal tolerance enhancing effect increased as the length or temperature of the heat shock treatment was increased. Additionally, it was also noted that heat shock enhanced the survivals of *C. sakazakii* to environmental stresses including: 15% ethanol, low temperature (3 and -20 °C), high acidity (pH 3.3), high osmotic pressure (tryptic soy broth + 75% sorbitol, a_w 0.81).

1. According to above article, (A) thermal, (B) dehydration, (C) freezing or (D) drying process is frequently employed to preserve the quality of food.
2. The wrong statement concerning *Listeria monocytogenes* which has been subjected to heat shock treatment is (A) became more liable to heat. (B) showed more resistant to low temperature. (C) exhibited a less susceptibility to drying. (D) increased resistance to drying.
3. *Cronobacter sakazakii* will grow when exposure to (A) 47 °C, (B) 15% ethanol, (C) pH 3.3, (D) a_w 0.81.
4. As mentioned in this article, microorganisms in foods are frequently inactivated by (A) cooking, (B) salting, (C) drying, (D) freezing at home.
5. *Cronobacter sakazakii* subjected to heating at (A) 47 °C for 15 min, (B) 48 °C for 15 min, (C) 47 °C for 5 min, (D) 42 °C for 15 min, showed the highest thermal tolerance.
6. The incorrect statement shown below is (A) Heating might cause more detrimental effect on heat shocked cells than the control cells. (B) Heat shock response was noted on bacteria in addition to *Cronobacter sakazakii*. (C) Heat shock treatment was performed at temperature a few degrees above the growth temperature of the microorganism. (D) Temperature and heating time affected the heat shock response of *Cronobacter sakazakii*.

7. Which one of the following statements is not correct? (A) *Cronobacter sakazakii* were found in a variety of food materials. (B) Microorganisms in the family Enterobacteriaceae are pathogenic. (C) Heat shock response of microorganism might make the currently used control measure not satisfactory. (D) *Cronobacter sakazakii* might cause the death of human beings.
8. The authors of this article have investigated the heat shock response of (A) *Listeria monocytogenes* (B) *Salmonella* Typhimurium, (C) *Cronobacter sakazakii* (D) *Vibrio parahaemolyticus*.
9. (A) Beef, (B) sausage, (C) cheese, (D) dried infant formula is essentially the kind of food material associated with the infection of *Cronobacter sakazakii*.
10. The wrong statement concerning "Heat shock treatment" is (A) Killing *Cronobacter sakazakii*. (B) Enhancing the heat resistance of *Cronobacter sakazakii*. (C) Causing detrimental effects on *Cronobacter sakazakii*. (D) Increasing cell leakage of *Cronobacter sakazakii*.

Processing of Vegetable Juice and Blends

Vegetable juice and blends are among the major processed vegetable products. They are liquid foods prepared from vegetables as the major raw material.

Juices can be classified into three types, namely clear juice, cloudy juice and pulpy juice, based on the appearance which is reflected by the content and size of insoluble solids. Clear juice contains no insoluble solids. Cloudy juice is translucent, containing homogeneously suspended tiny insoluble particles. Pulpy juice contains coarse particles that may float on the surface, suspend in the liquid, or precipitate to the bottom. Cloudy juice is the most popular form of vegetable juice and blends on the market.

Common vegetable juices are obtained by the use of mechanical devices that disintegrate the vegetable and separate the juice as a fluid from the excessive solids. The raw juice is subjected to considerable alteration during further processing.

Thermal processing, includes blanching, is an important method of preserving foods, and for maintaining sensory quality attributes such as texture, flavor, and color. When a vegetable is disintegrated without a previous heat treatment, the enzymes from the cells may be freed to act upon the released protoplasmic substances and catalyze undesirable reactions. Most of the vegetables need to be blanched at a temperature high enough to inactivate the enzymes during the early stage of processing. However, blanching process itself may cause some deteriorative effect to the nutritional integrity and the sensory quality attributes of the product. The challenge is to identify an optimum blanching process which inactivates the enzymes properly while preserves the sensory quality attributes and nutritional integrity of the juice most ideally.

Vegetable juice and blends can be a low acid food at a pH above 4.6, an acid food at a pH between 4.0 and 4.6, or a high acid food at a pH lower than 4.0. In the preservation of low acid vegetable juice and blends for long-term storage at ambient temperature, a sterilization process at high temperature is often required. The sterilization process would be much more severe than blanching and often cause serious quality deteriorations such as discoloration, especially on chlorophylls in green-leafy vegetable juices, off-flavor, off-taste, coagulation, flocculation, and precipitation. The marketing of many low acid vegetable juice products is thus hindered.

Acidification may convert low acid juice to an acidic juice and allow the use of milder sterilization conditions, and in many cases improve the quality of product. Unfortunately, the reduction of pH may cause some detrimental side effects, most noteworthy the accelerated destruction of chlorophylls in green-leafy vegetable juice. The appearance of the browned color downgrades the juice quality, and restricts the application of acidification. The canning of green-leafy vegetable juices with good color retention remains a difficult task in the industry. Flash sterilization at an ultra-high temperature followed with aseptic packaging may be helpful. However, discoloration may still occur rapidly in the packed product at ambient temperature storage.

11. "Blend" is a sort of (A) alcoholic beverage, (B) fortified drink, (C) mixed juice, (D) artificially flavored juice.
12. A juice that is not transparent cannot be a (A) clear juice, (B) cloudy juice, (C) pulpy juice, (D) natural juice.
13. What equipment is not commonly used to disintegrate vegetable? (A) A slicer, (B) A peeler, (C) A pulper, (D) A dicer.
14. "Alteration" cannot be a synonym of (A) "Change", (B) "Modification", (C) "Transformation", (D) "Degradation".
15. (A) Taste, (B) Aroma, (C) Mouth feel, (D) Antioxidation activity is not a sensory quality attributes.
16. Deteriorative effect is (A) benign, (B) beneficial, (C) detrimental, (D) constructive, to the quality.
17. (A) Sensory quality, (B) Running cost, (C) Enzyme inactivation, (D) Nutrient retention is usually not a primary concern for the industry in optimizing the blanching process of vegetables.
18. The processing of low acid vegetable juice products involves most commonly (A) a high temperature sterilization process, (B) an acidification operation, (C) a severe blanching process, (D) a harder disintegration operation.
19. The application of acidification to low acid vegetable juice causes most commonly the side effect of accelerated (A) off-flavor, (B) off-taste, (C) discoloration, (D) coagulation.
20. Flash sterilization means (A) sterilization by laser light, (B) short-time sterilization, (C) intermittent sterilization, (D) sterilization under a vacuum.

U.K. consumers remain cautious about emerging food technologies

A report by the U.K. Food Standards Agency (FSA) shows that people remain cautious about the emergence of new food technologies. The report, which looks at research since 1999, brings together knowledge from the U.K. and beyond, on public opinion about up-and-coming food technologies, such as nanotechnologies and cloning. The findings will help to shape the FSA's future work on emerging technologies.

According to the research, genetically modification (GM) and animal cloning remain the areas of most concern for people. Interestingly, the review also showed that food technologies tended not to be a burning issue for the vast majority of people and often did not generate strong opinions. Awareness of emerging food technologies is generally low, and the concept of 'functional foods' and food applications in synthetic biology seem virtually unknown. The exceptions to this are GM and cloning which most people have heard of, at least in the U.K. Nevertheless, people may not realize that they are consuming GM foods, even in the U.S. where GM foods are widely available, and awareness certainly does not mean that people feel confident in their knowledge about these technologies. On the whole, attitudes towards novel food technologies in the U.S. and in Asian and developing countries seem to be more positive than they are in Europe.

"Our top priority is to ensure the food on the shelves is as safe as it possibly can be, but we also need to be aware of how people feel about new technologies," said Clair Baynton, Head of Novel Foods, Additives and Supplements at the FSA. "Because so little tends to be known about emerging food technologies, attitudes towards them are frequently driven by emotions rather than facts. Understandably, people are wary when they're not sure about the benefits and risks."

The research looked at public opinion concerning: Nanotechnologies, Functional foods, Synthetic biology, GM food and crops, Cloning, Irradiation, Novel food processes. (Source: IFT Newsletter- April 1, 2009)

21. According to this article, what is the food area of most concern for consumers? (A) Nanotechnologies (B) functional foods (C) GM food and crops (D) Irradiation.
22. According to this article, which statement is NOT correct about genetically modified food? (A) GM food is not available in UK. (B) People of US are consuming GM food. (C) Many people may not know they are eating GM food. (D) Most people have heard of GM food.
23. Where novel food technology is less accepted? (A) US (B) Asian (C) developing countries (D) Europe.
24. According this article, which statement is true? (A) Most people know the concept of functional food. (B) People do not feel confident in their knowledge of new food technology. (C) Food applications in synthetic biology are forbidden. (D) People take cautious about animal cloning.
25. Why did FSA make this report about emergence of new food technologies? (A) To aware people (B) to wary people (C) to help FSA orientate future work (D) to make food safer.

A Memorable Snacking Experience

Before designing a snack food, it is important to identify the sensory expectations. "Snacks are an emotional and engaging experience for consumers, and a big part of that experience involves multiple senses," says Suzanne Mutz-Darwell, marketing manager, National Starch Food Innovation, Bridgewater, NJ. "It is the crispiness of the texture, the lightness of the puff or the crunchiness of the first bite. It is also the sound ringing in the consumer's ears as they devour their favorite treat.

"Perhaps the most important work of our sensory team is its analysis of basic consumer snack-food descriptors, such as 'crispy' and 'crunchy,' and their translations into a language that our food formulators can act upon—factors such as hardness, fracturability and duration of sound, along with many others," continues Mutz-Darwell.

The goal is to avoid sensory trade-offs in healthier snacks. "Quite often, when formulating for a healthier product with reduced fat, texture and taste may be compromised," says Mutz-Darwell. "Butter, fats and oils make a large contribution to texture and flavor in crackers and chips. Cut back on those, and the product suffers. The desired texturizer for a particular product will depend on the target texture, the other formula ingredients and the process. The application team has produced a broad range of textures that are ideal for sheeted, baked crackers and fabricated chips. These textures can be applied to all types of better-for-you snack foods, ranging from delicate and crispy to bold and crunchy," as well as a middle ground texture the company calls "crinchy." (By: Donna Berry, Food Product Design, <http://www.foodproductdesign.com/> 2009/07/01 online.)

26. According the article, what is NOT the major component contribute to the texture and flavor in crackers and chips? (A) Starch (B) butter (C) fats (D) oils.
27. According the article, what are senses attracting people to eat snacks? (A) Crispiness of the texture (B) lightness of the puff (C) sound of the bite (D) all of the above.
28. What is the term "crinchy" describing for? (A) calorie (B) texture (C) health condition (D) sound
29. According the article, what is the problem of healthier snacks? (A) Too less fat (B) too crunchy (C) loss texture quality (D) difficult to cut.
30. What is Suzanne Mutz-Darwell? (A) A reporter (B) a food formulator (C) a sensory panelist (D) a marketing manager.

Amino-acid imbalance explains extension of lifespan by dietary restriction in *Drosophila*

Dietary restriction extends healthy lifespan in diverse organisms and reduces fecundity. It is widely assumed to induce adaptive reallocation of nutrients from reproduction to somatic maintenance, aiding survival of food shortages in nature. If this were the case, long life under dietary restriction and high fecundity under full feeding would be mutually exclusive, through competition for the same limiting nutrients. Here we report a test of this idea in which we identified the nutrients producing the responses of lifespan and fecundity to dietary restriction in *Drosophila*. Adding essential amino acids to the dietary restriction condition increased fecundity and decreased lifespan, similar to the effects of full feeding, with other nutrients having little or no effect. However, methionine alone was necessary and sufficient to increase fecundity as much as did full feeding, but without reducing lifespan. Reallocation of nutrients therefore does not explain the responses to dietary restriction. Lifespan was decreased by the addition of amino acids, with an interaction between methionine and other essential amino acids having a key role. Hence, an imbalance in dietary amino acids away from the ratio optimal for reproduction shortens lifespan during full feeding and limits fecundity during dietary restriction. Reduced activity of the insulin/insulin-like growth factor signaling pathway extends lifespan in diverse organisms, and we find that it also protects against the shortening of lifespan with full feeding. In other organisms, including mammals, it may be possible to obtain the benefits to lifespan of dietary restriction without incurring a reduction in fecundity, through a suitable balance of nutrients in the diet. (Adapted from Nature (2009) 462:1061-1065)

31. What are the hypotheses that dietary restriction could extend healthy lifespan: (A) to reduce the basal metabolic rate (B) to induce adaptive reallocation of nutrients from reproduction to somatic maintenance (C) to increase the body movement (D) to aid survival of food shortages.
32. What nutrient is identified to produce the responses of lifespan and fecundity to dietary restriction in *Drosophila*: (A) Alanine (B) Arginine (C) Histidine (D) Methionine.
33. Dietary restriction extends healthy lifespan in diverse organisms and reduces fecundity. If the above statement is true, long life under dietary restriction and high fecundity under full feeding would be (A) occurring at the same time (B) mutually exclusive (C) coincidentally existed (D) happening by chance.
34. In this article, what is the experimental model organism (A) fruit fly (B) yeast (C) mouse (D) *C. elegans*.
35. Methionine is (A) essential fatty acid (B) essential vitamin (C) essential amino acid (D) essential trace element.

Maternal Methyl Supplements in Mice Affect Epigenetic Variation and DNA Methylation of Offspring

This study was designed to determine if maternal dietary methyl supplements increase DNA methylation and methylation-dependent epigenetic phenotypes in mammalian offspring. Female mice of two strains were fed two levels of dietary methyl supplement or control diet prior to and during pregnancy. Offspring of these mice vary in phenotype, which is epigenetically determined and affects health and 2-y survival. Phenotype and DNA methylation of a long terminal repeat (LTR) controlling expression of the *agouti* gene were assayed in the resulting offspring. Methyl supplements increase the level of DNA methylation in the *agouti* LTR and change the phenotype of offspring in the healthy, longer-lived direction. This shows that methyl supplements have strong effects on DNA methylation and phenotype and are likely to affect long-term health. Optimum dietary supplements for the health and longevity of offspring should be intensively investigated. This should lead to public policy guidance that teaches optimal, rather than minimal, dose levels of maternal supplements. (Adapted from J. Nutr. (2002) 132: 2393S-2400S.)

36. According to the abstract, what is the main focus of this article? (A) epigenetic variation in pregnant mice (B) DNA methylation and life span (C) dietary effects on DNA methylation and prenatal programming (D) Optimum dietary supplements and the public policy guidance.
37. The expression of *agouti* gene is controlled by (A) DNA methylation of LTR (B) DNA sequence of LTR (C) CG content of LTR (D) the length of LTR.
38. What kind of diet would be "methyl-rich diet"? (A) diet contains plenty of green vegetables (B) diet contains low protein (C) diet contains limited energy (D) diet contains high protein.
39. Which description about DNA methylation variation is NOT true? (A) genetic differences between two mice strains are the main reason to cause DNA methylation variation (B) methyl supplements in diets may affect the level of DNA methylation in the *agouti* LTR (C) maternal methyl supplements may change the health condition or life span in offspring (D) DNA methylation may be inheritable.
40. This study concludes that (A) methyl supplements have strong effects on DNA sequences (B) the study for optimum dietary supplements is nothing to do with public policy (C) the study for optimum dietary supplements is not important (D) methyl supplements are likely to affect long-term health.

Article for Question 41-50

Health promoting microorganisms, e.g., probiotics, have been recently increasingly included in various food products and proposed for use as a food supplement or as a therapy for several infectious diseases. Probiotic therapy is very attractive because it is an effective and noninvasive low cost approach, which attempts to recreate natural flora rather than its disruption. Micro-organisms used as a probiotic for human are mainly gram-positive bacteria belonging to the *Lactobacillus* and *Bacillus* spp. For decades *Bacillus* bacteria and their metabolites have been used for several biotechnological applications, including enzymes, amino acids, and antibiotic production, preparation of fermented foods, and pest control. *Bacillus* based preparations have been only more recently introduced to the international market and are currently used as probiotics for bacteriotherapy and bacterioprophyllaxis of gastrointestinal (GI) disorders in human.

Bacillus probiotics differ in many characteristics from those based on *Lactobacillus* spp. While lactobacilli represent a normal resident GI microflora of humans, the saprophytic bacteria of *Bacillus* genera belong only to the transitory GI bacteria. Thus, the use of *Bacillus* products raised a number of questions, including their safety. (Adapted from Dig Dis Sci (2008) 53: 954-963)

41. The probiotics mentioned in this article are (A) yeasts (B) bacteria (C) molds (D) not mentioned.
42. Which one is the application of probiotics (A) a microorganism model for studying the genome structure of single-celled organisms (B) a cure for some infectious diseases (C) a standard for characterizing gram-positive bacteria (D) none of the above.
43. Why does the author think that probiotic therapy is attractive (A) because it is cheap (B) it won't cause any damage to the human body (C) it will rebuilt the natural flora (D) all of the above.
44. What does "metabolites" mean? (A) The molecules that can enhance the metabolism (B) a substance produced by metabolism (C) a material that makes probiotics more metastatic (D) a similar microorganism as *Bacillus*.
45. Which of the following description is correct (A) we can use Gram stain to characterize *Lactobacillus* (B) probiotics can be the ingredient of food (C) We can use probiotics to produce some nutrients in need (D) all of the above.

46. Which of the following description is not correct (A) *Bacillus* exists in gastrointestinal tract of human (B) *Lactobacillus* spp. exists in gastrointestinal tract of human (C) *Bacillus* is used to treat gastrointestinal disease recently (D) all the above.
47. Why does the author think that the use of the *Bacillus* products might raise safety issue (A) *Bacillus* was reported to cause gastrointestinal disease (B) *Bacillus* is a gram-positive bacteria, which is known to be pathogenic (C) *Bacillus* is saprophytic (D) *Bacillus* exists temporarily in GI.
48. Which of the following do you think is not a kind of fermented food (A) cream (B) kimchi (C) yogurt (D) vinegar.
49. Pest control means (A) to monitor the health of pets (B) crisis management (C) the regulation of energy (D) management of a species which is perceived to be detrimental to a person's health or the ecology
50. Which one do you think is an optimal title for this article? (A) Special topics on the safety of *Bacillus* (B) The development of recent biotechnology (C) Dispute of the use of *Bacillus* - can human beings benefit from it? (D) The future of probiotics.

