

Healthy Eating to Support Immunity

This booklet is for educational purposes only. It cannot be used in place of consultation with a medical professional.



Child Nutrition Advisory Group
兒童營養顧問小組

Content

All about the immune system

What is the immune system?	3
Development of the immune system	4
Essentials for developing a healthy immune system	5

Benefits of breastfeeding 6

Benefits for the child	7
Benefits for the mother	8

How does suboptimal nutrient intake affect health? 9

Nutrition and the immune system 10

What should I pay attention to if my child has food allergies?

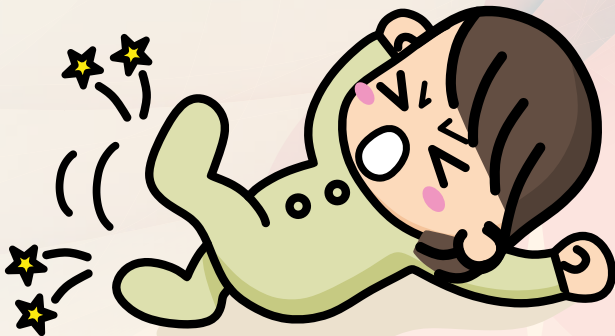
Potential foods that may cause allergies in childhood	12
Maintaining a balanced diet for your child's healthy growth	13
Common myths on nutrition and allergy	14

All about the immune system

What is the immune system?

In everyday life, your child interacts with other people and the environment. This may bring various pathogens in contact, including bacteria, viruses, molds and parasites. The immune system acts as a defense to protect our body from invasion of pathogens that can cause illnesses. There are three types of immunity: innate, adaptive and passive immunity^{1,2}:

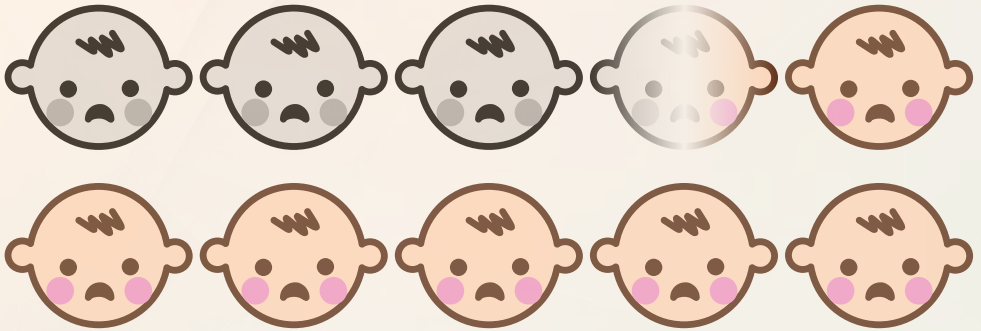
Innate Immunity	Adaptive Immunity	Passive Immunity
It is a kind of inborn immunity which provides general protection against pathogens. This includes body barriers such as the skin and mucosal surfaces ^{2,3}	Immunity developed through exposure to specific pathogens or vaccine immunization ^{2,3}	Temporary immunity obtained from a third-party source. For example, antibodies are transferred from mother to child through breastfeeding ^{2,4}



Development of the immune system

The innate immunity is not fully mature in a newborn baby. Therefore, the immune system needs to keep growing up with your child to provide comprehensive protection against various illnesses^{4,5}.

It is worth noting that infection is one of the major causes of newborn death, accounting for 36% globally⁶.



Besides, an impaired immune system can lead to allergic conditions in children, such as atopic dermatitis and asthma⁵. For the past 50 years, there has been an increasing number of people affected by allergies globally. About 40% to 50% of schoolchildren are suffering from at least one type of allergic conditions⁷. In Hong Kong, 14% of schoolchildren at age of 6 to 12.5 years have atopic dermatitis⁸. A normal functioning immune system is therefore important to child's health, which is a topic to consider for every parent.

Essentials for developing a healthy immune system

A healthy lifestyle is essential for constructing an intact immune system. Environmental factors and dietary nutrient intake are the keys to develop a healthy immune system in children^{1,4,9,10}.

Stress management

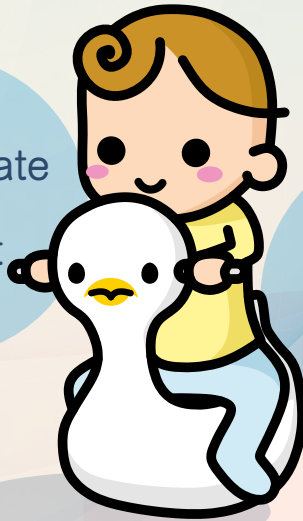
Adequate Exercise

Good Hygiene

Balanced Diet

Appropriate Body Weight

Get appropriate vaccination



Benefits of breastfeeding

The World Health Organization (WHO) recommends exclusive breastfeeding up to 6 months of age, and continued breastfeeding along with complementary foods up to 2 years or beyond¹¹. It is known that prolonged breastfeeding is linked to reduced food sensitivity in children¹.

Breast milk contains IgA antibodies as well as commensal bacteria⁵. IgA works at mucosal surfaces to prevent entry of pathogens; while the commensal bacteria provide protection, and may help to resist against asthma or other allergic conditions when the child grows up⁵. Your child can obtain important immune factors through breastfeeding to help boost immunity.



Benefits for the child¹²

- Breast milk provides all essential nutrients that a baby requires for the first 6 months of life
- Breast milk contains specific enzymes that help with digestion and absorption of nutrients for healthy growth
- Breast milk contains omega-3 fatty acids which play a role in brain and retinal development in young children
- Helps strengthen immunity in children to reduce infections (e.g. meningitis, pneumonia, diarrhea, etc.)
- Reduces the risk of chronic diseases (e.g. diabetes in childhood)
- Helps reduce allergic conditions (e.g. atopic dermatitis, asthma, food intolerance*, etc.)
 - Helps reduce the chance of becoming overweight



* Food intolerance occurs when a person has difficulty digesting specific food or has adverse reactions after consumption, leading to discomfort such as intestinal gas, abdominal pain or diarrhea¹³.

Benefits for the mother¹²

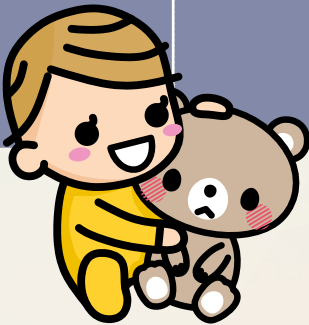
- Helps the mother to return to pre-pregnant weight more quickly
- Helps the uterus to return to its normal size
- Helps reduce the amount of blood loss post-delivery to prevent anemia
- Reduces the risks of ovarian cancer and pre-menopausal breast cancer
- Helps maintain bone health at older age



How does suboptimal nutrient intake affect health?

Inadequate nutrient intake can impact your child's growth. It not only affects physical growth such as height and weight, but also poses a risk to impair immune functions^{1,4}:

More susceptible to infections	Impairs cell functions	Impairs functions of the mucosal barrier to block pathogens	Severe malnutrition affects the development of thymus, leading to impaired immunity	Frequent triggers of immune response against infection increases the burden of the developing immune system
--------------------------------	------------------------	---	---	---



As a parent, it is suggested to have regular consultation with your doctor or registered dietitian on your child's diet plan, so that your child can have the right nutrition to help improve immunity¹.

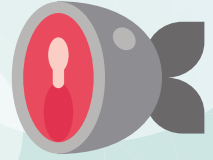
Nutrition and the immune system



Nutrient intake is linked to the signal transmission and immune cell development in the immune system. It may affect the immune responses and tolerance level to pathogens⁴:

Nutrient	Function in the immune system	Food type examples
Amino acids	<ul style="list-style-type: none">Regulate the activities of different immune cells, growth of lymphocytes and production of antibodies⁴Help maintain a healthy immune system and its normal functioning⁴	<ul style="list-style-type: none">Meat^{4,14}Fish^{4,14}Eggs, dairy products¹⁴Beans¹⁴
Long-chain polyunsaturated fatty acids	<ul style="list-style-type: none">Act as a key component to help promote immune cell responses⁴Help in transmission of immune signals⁴Help control inflammatory responses of autoimmune diseases¹	<ul style="list-style-type: none">Seafood¹⁵Meat¹⁵Dairy products¹⁵
Carbohydrates	<ul style="list-style-type: none">Provide metabolic source to maintain normal functioning of the immune system⁴Galactose plays an important role in host defenses⁴	<ul style="list-style-type: none">Whole grains (e.g. rice, noodles)¹⁶Fruits, vegetables¹⁶Dairy products¹⁶





Nutrient	Function in the immune system	Food type examples
Micronutrients	<ul style="list-style-type: none">• Iron, zinc, selenium, vitamin A, C, D, E and folic acid are essential nutrients to keep the immune system functioning⁴• Copper helps modulate the immune system and maintain non-specific immune responses⁴• Chromium helps modulate the immune system and helps prevent allergic reactions⁴	<ul style="list-style-type: none">• Iron: beef, whole grains¹⁴• Zinc: lean red meat, beans¹⁴• Vitamin C: fruits, vegetables¹⁴• Copper: seafood, nuts¹⁴• Chromium: meat, whole wheat products¹⁷
Prebiotics	<ul style="list-style-type: none">• Adding prebiotics and oligosaccharides in the diet for babies helps stimulate the growth and metabolism of protective commensal microbes in the gut, thus reducing the risks of allergies⁴	<ul style="list-style-type: none">• Asparagus, bananas, berries¹⁸• Honey¹⁸• Flax seeds¹⁸
Probiotics	<ul style="list-style-type: none">• Strengthen barrier function of the gut⁴	<ul style="list-style-type: none">• Yoghurt, cheese¹⁸



What should I pay attention to if my child has food allergies?

Potential foods that may cause allergies in childhood

Allergens that trigger allergic reactions exist in food and our everyday environment. Here are eight types of food that cause 90% of allergic reactions summarized by the American College of Allergy, Asthma & Immunology¹⁹:



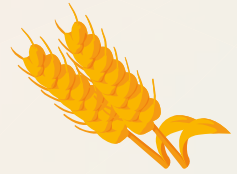
Eggs



Peanuts



Soy



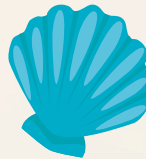
Wheat



Dairy products



Tree nuts



Shellfish



Fish

Peanuts are one of the most common food allergens which require immediate treatment for those with severe reactions¹⁹. Other foods that may trigger allergic reactions (such as in atopic dermatitis) include kiwi fruits, tomatoes and citrus fruits²⁰. Children who are allergic to these foods may have following signs and symptoms¹⁹:

- Hives
- Abdominal pain, diarrhea
- Shortness of breath or difficulty in breathing
- Itchy skin
- Itchy lips and throat
- Difficulty in swallowing
- Nausea, vomiting
- Running, stuffy nose or sneezing
- Headache
- Gastrointestinal discomfort and blood in stool

If any of the above conditions are noticed, seek medical assistance immediately. Since tolerance to particular types of food varies among individuals, parents should consult your doctor or registered dietitian.

Studies showed that a certain proportion of infants with atopic dermatitis also have particular food allergies²⁰. The American Academy of Dermatology recommends that food allergy testing to identify specific allergens should be considered, if a child under 5 years of age has uncontrolled moderate or severe atopic dermatitis; or if allergic reactions to certain food are noticed²¹. Guidelines from the National Institutes of Health also recommend that patients should only avoid food allergens that have been confirmed in diagnosis. They should avoid unnecessary diet restriction²².

Moreover, pregnant mothers should not restrict their diet and avoid particular types of food without advice of a healthcare professional. A review showed that diet restriction during pregnancy did not help in reducing the chance of developing atopic dermatitis in the first 18 months of life²⁰.

Maintaining a balanced diet for your child's healthy growth²³

- Include a variety of food types and choices, and have grains as the major portion in every meal
- Eat more vegetables and fruits
- Eat a moderate amount of dairy products, meat, fish, eggs and their alternatives (including dried beans)
- Eat less food containing high contents of fat/oil, salt and sugar, as well as preserved and processed foods
- Drink enough fluid (including water, tea and clear soup)
- Have regular meal at regular time every day



Common myths on nutrition and allergy

Myth 1

Avoid potentially allergenic foods, or delay exposure to these foods such as peanuts, eggs, kiwi fruits, wheat, etc., may reduce the chance of developing food allergies in my child at early age²⁰.

The truth is: Based on the recommendations from World Health Organization, solid foods can be introduced to infants beginning at 6 months for an adequate and complete nutrition²⁴. Restricting your child's food choices at your own decision, or delaying exposure to potential food allergens may increase your child's intolerance to particular types of food. It may even increase the risk of developing allergies^{20,25,26}. If parents suspect that a particular type of food is causing allergic reactions in their child, do not avoid such food at your own decision. You should consult a doctor or a registered dietitian first, and consider taking an allergen test.

Myth 2

Start giving solid foods early can help my child grow stronger. So my child can get used to eating solid foods and foods that may cause allergies more quickly.

The truth is: Based on the recommendations from World Health Organization, solid foods can be introduced to infants beginning at 6 months²⁴. Start giving solid foods early to your child does not help in promoting growth²⁷.

Myth 3

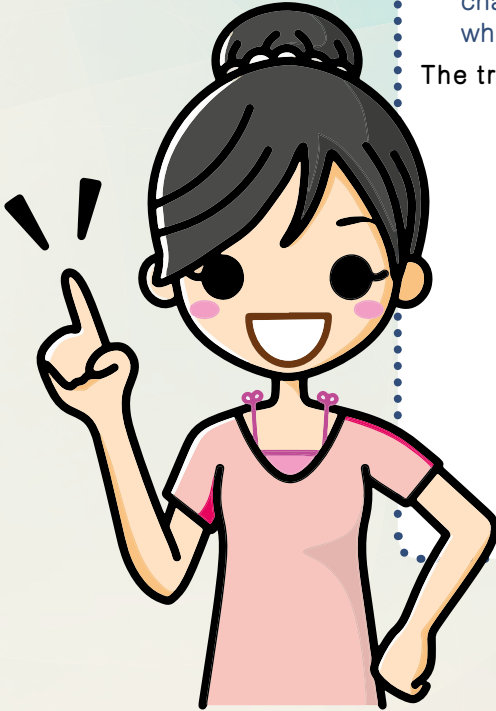
Food allergy is incurable. I should take out the food that causes allergies from my child's diet completely.

The truth is: Common allergies to food in such as milk, eggs, soy and wheat may disappear gradually as the child grows up; while allergy to peanuts, tree nuts, fish and shellfish usually continue until a later age²⁸. Food allergy can occur at any age. So, even though your child does not have food allergies during childhood, parents should be alert that it may happen anytime²⁸.

Myth
4

Pregnant mothers should try to avoid food that may cause allergies, such as milk and nuts, so as to reduce the chance of food allergies to develop when the baby grows up.

The truth is: Mothers need extra nutrients during pregnancy and breastfeeding. Therefore, it is important to maintain a balanced diet with adequate nutrient intake²⁹. According to the Guidelines from the National Institutes of Health, it is not recommended to restrict diet during pregnancy and breastfeeding to prevent allergies from developing in your child²².



Myth
5

Perform a food allergy test can find out possible food substances that may trigger an allergy, so as to prevent my child from suffering food allergies.

The truth is: Food allergy test can help parents get to know their children's conditions in order to include suitable types of food. While parents should consult a doctor first on how to interpret the test results and when they consider adjusting their child's diet.

This booklet is for educational purposes only. It cannot be used in place of consultation with a medical professional.

References:

1. Marcos A, Nova E and Montero A. Changes in the immune system are conditioned by nutrition. *European Journal of Clinical Nutrition*. 2003; S66-S69.
2. KidsHealth. Immune System. Available at: <https://kidshealth.org/en/parents/immune.html> (Accessed on 7 Mar 2019).
3. Simon AK, Hollander GA, McMichael A. Evolution of the immune system in humans from infancy to old age. *Proc. R. Soc. B*. 2015; 282: 20143085.
4. Pai UA, Chandrasekhar P, Carvalho RS, et al. The role of nutrition in immunity in infants and toddlers: An expert panel opinion. *Clinical Epidemiology and Global Health*. 2018; 6: 155-159.
5. Tregoning J. Neonatal Immunology. Available at: <https://www.immunology.org/public-information/bitesized-immunology/immune-development/neonatal-immunology> (Accessed on 11 Mar 2019).
6. WHO. Newborn death and illness. Available at: https://www.who.int/pmnch/media/press_materials/fs/fs_newborndeath_illness/en/ (Accessed on 11 Mar 2019).
7. Chan WM, Chan KC, Tam YC, et al. Guidelines for allergy prevention in Hong Kong. *Hong Kong Med J*. 2016; 22: 279-285.
8. Fung WK and Lo KK. Prevalence of skin disease among school children and adolescents in a student Health Service Center in Hong Kong. *Pediatr Dermatol*. 2000;17:440-446.
9. Harvard Health Publishing, Harvard Medical School. How to boost your immune system. Available at: <https://www.health.harvard.edu/staying-healthy/how-to-boost-your-immune-system> (Accessed on 11 Mar 2019).
10. Cooper EL and Ma MJ. Understanding nutrition and immunity in disease management. *Journal of Traditional and Complementary Medicine*. 2017; 7: 386-391.
11. WHO. Breastfeeding. Available at: <https://www.who.int/topics/breastfeeding/en/> (Accessed on 14 May 2019).
12. Department of Health. Breastfeeding: The First Step to Life Long Health. Available at: https://www.change4health.gov.hk/en/healthy_diet/facts/breastfeeding/index.html (Accessed on 8 Mar 2019).
13. American Academy of Allergy Asthma & Immunology. Food intolerance definition. Available at: <https://www.aaaai.org/conditions-and-treatments/conditions-dictionary/food-intolerance> (Accessed on 28 Jun 2019).
14. Centre for Food Safety, the Government of the HKSAR. Available at: <https://www.cfs.gov.hk/english/nutrient/nutrient.php#protein> (Accessed on 14 May 2019).
15. Abedi E and Sahari A. Long-chain polyunsaturated fatty acid sources and evaluation of their nutritional and functional properties. *Food Science & Nutrition*. 2014;2:443-463.
16. NIH. Important Nutrients to Know: Proteins, Carbohydrates, and Fats. Available at: <https://www.nia.nih.gov/health/important-nutrients-know-proteins-carbohydrates-and-fats> (Accessed on 20 May 2019).
17. NIH. Chromium. Available at: <https://ods.od.nih.gov/factsheets/Chromium-HealthProfessional/> (Accessed on 20 May 2019).
18. KU Integrative Medicine, the University of Kansas Medical Center. Probiotics and Prebiotics. 19. ACAAI. Food Allergy. Available at: <https://acaai.org/allergies/types/food-allergy> (Accessed on 11 Mar 2019).
20. Silverberg NB, Lee-Wong M and Yosipovitch G. Diet and Atopic Dermatitis. *Cutis*. 2016; 97: 227-232.
21. American Academy of Dermatology. Atopic dermatitis: Coexisting allergic disease and allergy testing recommendations. Available at: <https://www.aad.org/practicecenter/quality/clinical-guidelines/atopic-dermatitis/disease-flares-and-adjunctive-therapy/coexisting-allergic-disease-and-allergy-testing-recommendations> (Accessed on 15 May 2019).
22. NIAID. Addendum Guidelines for the Prevention of Peanut Allergy in the United States. 2017.
23. Centre for Health Protection. Principles of Healthy Eating. Available at: <https://www.chp.gov.hk/en/static/90016.html> (Accessed on 8 Mar 2019).
24. WHO. Guiding Principles for Feeding Non-Breastfed Children 6-45 Months of Age. Available at: https://www.who.int/nutrition/publications/guidingprin_nonbreastfed_child.pdf (Accessed on 24 Sep 2019).
25. Agostoni C, Decsi T, Fewtrell M, et al. Complementary feeding: a commentary by the ESPGHAN Committee on Nutrition. *J Pediatr Gastroenterol Nutr*. 2008;46:99-110.
26. Sansotta N, Piacentini GL, Mazzei F, et al. Timing of introduction of solid food and risk of allergic disease development: understanding the evidence. *Allergol Immunopathol (Madr)*. 2013;41:337-345.
27. WHO. Guiding Principles for Complementary Feeding of the Breastfed Child. Available at: https://www.who.int/nutrition/publications/guiding_principles_compefeeding_breastfed.pdf (Accessed on 24 Sep 2019).
28. Food Allergy Research & Education. Food Allergy Myths and Misconceptions. Available at: <https://www.foodallergy.org/life-with-food-allergies/food-allergy-101/food-allergy-myths-and-misconceptions> (Accessed on 11 Mar 2019).
29. Family Health Service, Department of Health. Healthy Eating During Pregnancy and Breastfeeding. Available at: https://www.fhs.gov.hk/english/health_info/woman/20036.html (Accessed on 14 May 2019).

For more information, please visit www.childnutritionhk.org
Sponsored as a service to public education by Wyeth Nutrition. Editorial development by Vital Base International Limited. The opinions expressed in this publication are not necessarily those of the editor, publisher or sponsor. Any liability or obligation for loss or damage howsoever arising is hereby disclaimed.

WYETH® is a registered trademark of Wyeth LLC. Used under license.

Vital Base International Limited

Unit A, 17/F., Mai Wah Industrial Building, 1-7 Wah Sing Street, Kwai Chung, N.T.
Tel: 2741 6265 Fax: 2370 9332
E-mail: info@vital-base.com Website: www.vital-base.com