Wyeth Nutrition SCIENCE CENTER

2019 Issue 3

WNSC Hong Kong Bulletin

HEADLINE

Unravelling the diet of Hong Kong mothers

Emily Tai PhD, Mphil, MSc, BSc (Hons)

While breastfeeding has been more popular in Hong Kong, do mothers know what healthy eating is? The human milk research by the Hong Kong Polytechnic University helps answering this[1-3].

Ninety-five healthy lactating women aged 19 to 40 were recruited between 2014 to 2015[2,3]. Their diet and milk samples were analyzed to understand their dietary intake as well as the nutritional profile of their milk[2]. **An unbalanced diet with intake of vegetables, fruits and dairy products that was far below the recommendation was noted** (Table 1)[1]. High consumption of protein and fat was characterized and mean protein intake was 40% higher than the recommendation by the Chinese Dietary Reference Intake (DRI)[1].

Mean dietary intake of macronutrients was also out of the Acceptable Macronutrient Distribution Range (AMDR) by the Chinese DRIs (Table 2)[1].

In addition, **the daily dietary intake of calcium, iodine and iron among these lactating mothers (*n* = 95) were significantly lower than the recommendation by Chinese DRIs**[2]. Only 12%, 2% and 6% of the mothers could meet the recommended intake of calcium, iodine and iron respectively[2]. The mothers fulfilled the recommended intakes of a few omega-3 fatty acids (i.e. alpha-linolenic acid, EPA and DHA) and omega-6 fatty acids (i.e. linoleic acid)[1]. High intake of fish (10 servings per week on average) may explain the omega-3 fatty acid intake among mothers[1]. More importantly, the intake of freshwater and saltwater fish, salmon, croaker and mandarin fish in particular, was significantly associated with the level of DHA in human milk[1].

The period following birth is for improving the nutritional status of both mothers and children[4]. Healthy diet, physical activity and sedentary time are all imperative whereas **appropriate maternal supplementation, iron and folic acid, during the first 3 months after delivery is advised by the International Federation of Gynecology and Obstetrics (FIGO)**[4].

Authors:

Emily Tai,
Senior Manager
Medical Affairs

Danica Yau,
Senior Specialist
Medical Affairs

Kelly Ching,
Specialist
Medical Science Liaison

Editor:

Josie Ho,
Project Intern
Medical Affairs

Produced by:

Medical, Regulatory & Quality Affairs Department
Wyeth (Hong Kong) Holding Company Limited
42/F, Manhattan Place, 23 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong
Tel: 852 2599 8248 / Fax: 852 2599 8999
Email: hk.wnsc@wyethnutrition.com

Scan to visit WNSC HK website:

Table 1 - Food group consumption of the studied lactating mothers (*n* = 73)[1]

Food Groups	Servings[a]/ Day	Recommendations from Hong Kong Department of Health[5] (Servings/Day)
Grains	6.8 ± 3.2[b]	4-5
Vegetables	1.5 ± 1.2[b]	4-5
Fruits	0.9 ± 1.5[b]	3
Meats	9.0 ± 3.7[c]	6-7
Dairy product	0.2 ± 0.7[b]	2

Remarks:
a. *One serving: Grains – 75 g; Vegetables – 80 g; Fruits – 80 g; Dairy products – 240 ml; Meats – 30 g (cooked)*
b. *Data as median ± interquartile range*
c. *Data as mean ± standard derivation*

Table 2 - Dietary intake of macronutrients of the studied lactating mothers (*n* = 73)[1]

Energy and Nutrients	Daily intake	Chinese DRIs 2013 for lactating women[6]
Energy (kcal)	2370.2 ± 407.1	2300
Carbohydrates (g)	258.6 ± 49.5	NA
% kcal	44.0 ± 6.6	50 – 65 (AMDR)
Protein (g)	112.1 ± 27.2	80 g (RNI)
% kcal	18.9 ± 3.1	NA
Fat (g)	98.1 ± 24.4	NA
% kcal	36.9 ± 5.0	20 – 30 (AMDR)

Remarks:
1. *AMDR represents acceptable macronutrient distribution range*
2. *RNI represents recommended nutrient intake*
3. *NA represents not available*

References: 1. Wong VW et al. Br J Nutr. 2019;121(12):1431-1440. 2. The Hong Kong Polytechnic University. Available at: https://www.polyu.edu.hk/web/en/media/media_releases/index_id_6237.html. Accessed on 14Aug2019. 3. Wong VW et al. Abstract II-61. Presented at the power of programming, Germany. 2016. 4. Hanson MA et al. Int J Gynaecol Obstet. 2015;131 S4:S213-S253. 5. Hong Kong Department of Health. Healthy eating during pregnancy and breastfeeding. Reprinted in 2019. 6. Chinese Nutrition Society. Chinese DRI handbook. 2013.

Healthy Eating Tips Cards

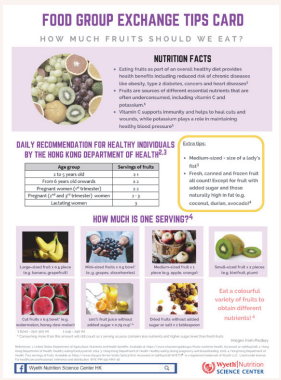
Food group exchange tips card series available on WNSC HK website:

Scan here:

Grains

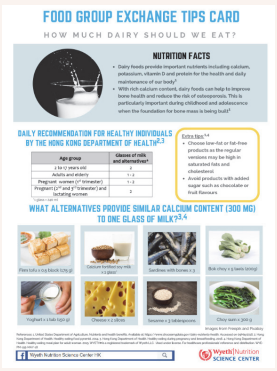
Vegetables

Fruits



Meat

Dairy



LATEST SCIENCE

A new pragmatic guide from FIGO on pre-eclampsia

Emily Tai PhD, Mphil, MSc, BSc (Hons)

In May 2019, the **International Federation of Gynecology and Obstetrics (FIGO)** published **the first evidence-based global recommendations for first trimester screening and prevention of pre-eclampsia** that affects 2% to 5% of pregnant women[1,2]. To address health burden posed by the disease, FIGO recommends the below[2].

Public Health Focus

- Public health measures to raise awareness, access, affordability and acceptance of preconception counselling
- Prioritizing prenatal and postnatal services for women of reproductive age

Universal Screening

- **Screening for ALL women on preterm pre-eclampsia during early pregnancy** by,
  - ◊ First-trimester combined test with maternal risk factors and biomarkers as a one-step procedure
- A free risk calculator is available online, https://fetalmedicine.org/research/assess/preeclampsia/first-trimester
- The best combined test should include maternal risk factors, measurements of mean arterial pressure (MAP), serum placental growth factor (PLGF) and uterine artery pulsatility index (UTPI)
  - ◊ If the risk is 1 in 100 or more, the woman is considered high risk
- When resources are not available, the baseline screening testing should combine maternal risk factors with MAP

Contingent Screening

- **When resources are limited**, the below can be considered,
  - ◊ **Routine screening for preterm pre-eclampsia by maternal factors and MAP in ALL pregnant women**
  - ◊ Reserving measurements of PLGF and UTPI for a subgroup of women (based on the risk derived from screening of maternal factors and MAP)

Prophylactic Measures

- After first-trimester screening,
  - ◊ Aspirin prophylaxis (dose of ~150 mg every night, starting at 11-14^{+6} weeks of gestation until 36 weeks of gestation, when delivery occurs or when pre-eclampsia is diagnosed) should be given to women at high risk of pre-eclampsia
- Low-dose aspirin should NOT be prescribed to ALL pregnant women
- To help lessen impact of both early- and late-onset pre-eclampsia, **offer women low calcium intake (< 800 mg/day) calcium replacement (≤ 1 g elemental calcium/day) or calcium supplementation (1.5 to 2.0 g elemental calcium/day)**

The full recommendations are available online:

https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/ijgo.12802

References: 1. FIGO. Available at: https://www.figo.org/news/figo-releases-new-guidelines-combat-pre-eclampsia-0016190. Accessed on 13Aug2019. 2. Poon LC et al. Int J Gynaecol Obstet. 2019;145 Suppl 1:1-33.

Gastrointestinal barrier and permeability – Targets to optimising immune health

Danica Yau *Accredited Dietitian (HKDA), Accredited Practising Dietitian (DAA), MSc, BSc (Hons)*

The intestine is a main portal for pathogen entry, so possessing specialised defense mechanisms that resist pathogens while maintaining essential nutrient intake within the region is crucial[1,2]. The gastrointestinal (GI) barrier is the largest interface between the body and the external environment, separating the gut lumen and inner host[3,4]. It is more than just a mechanical barrier and instead refers to a **functional entity that encompasses epithelial defenses, metabolic functions, the mucosal immune system and enteric nervous system also**[5].

GI barrier and immune health

The GI barrier contains tight junction proteins that seal the paracellular space between adjacent epithelial cells, where the controlled regulation of this space supports antigenic tolerance[3,6]. However, **disruption of the GI barrier can increase permeability, allowing translocation of bacteria and their products (pathogen associated molecular patterns, PAMPs)**[3,6]. **This increase in paracellular pathway may lead to an aberrant immune response, which is a key factor in the pathogenesis of diseases** such as necrotizing enterocolitis and infectious diarrhea in infants, as well as other inflammatory and autoimmune diseases in adults[3]. **As it may be difficult to permanently modify GI barrier integrity in adulthood, interventions in early life to support optimal development and maturation of the GI barrier may be preferred**[3].

Important factors to prevent GI barrier dysfunction

Diet and the GI microbiota are two major regulatory factors on intestinal permeability, where the effects of diet may be dependent on individual genetic susceptibility[4]. Other important factors supporting gut health also include a healthy lifestyle, normal GI perfusion and stable mental status, where major impairment of any of these may lead to a breakdown of the barrier[5].

1. *Diet*

Below are some proposed dietary factors that may support gut barrier health[4].

- Avoid high amounts of
- Avoid energy-dense
- Prebiotics and fibres
- Probiotics and synbiotics
- Glutamine
- Flavonoids (e.g. quercetin)

2. *GI microbiota*

A normal GI microbiota contributes to maintenance of the GI barrier structural integrity[7]. There is a continuous dialogue between the GI microbiota and intestinal immune system, which leads to a massive production of secretory immunoglobulin A (sIgA), a non-inflammatory antibody for mucosal protection[1]. **sIgA helps to protect barrier integrity by restricting the access of antigens and microbes, as well as neutralising toxins and some pathogens**[1]. **Human milk contains large amounts of oligosaccharides (HMOs) that can help to promote the growth of beneficial bacteria in the gut,** and the carbohydrate section is indeed considered one of the factors in human milk that support healthy development of the GI barrier in infants[3]. Similarly, other dietary interventions that modify microbiota composition may also alter GI barrier functions[3].

How we can assess GI barrier health

Based on the rationale that an impaired GI barrier potentially leads to the translocation of luminal antigens, microbes and their toxic products into the circulation, **there are *in vivo* biomarkers such as the below that can be utilized in the assessment of intestinal permeability**[4,8].

Biomarker	*Sampling method*
Calprotectin	Feces
Alpha-1-antitrypsin	Feces or serum
sIgA	Serum
Citruline	Plasma
Fatty acid binding protein (FABP)	Plasma
α-gluathione (αGST)	Plasma or urine
Claudin-3	Urine

Increased GI permeability will generally cause intestinal inflammation[8]. For instance with increased permeability, activated neutrophils will infiltrate the mucosa and release products into the intestinal lumen through to feces, making fecal markers of neutrophils specific for the detection of inflammatory intestinal diseases[8]. Calprotectin is an example of inflammation-related protein resulting from inflammatory insults of the intestinal epithelia, and can be found in leukocytes such as neutrophils[8,9]. Alpha-1-antitrypsin is another potential fecal marker of intestinal permeability as it is a protease inhibitor and levels can reflect the loss of proteins to the intestinal lumen such as in the case of GI barrier disruption[10].

It is evident that a functional GI barrier has important health implications, **making it a potential target for optimising GI and immune health from infancy to adulthood, while a healthy lifestyle with care to diet and microbiota modulation seems to be a plausible approach in achieving so.**

References: *1. Gutzeit C et al. Immunol Rev. 2014;260(1):76-85. 2. Maynard CL et al. Nature. 2012;489(7415):231-241. 3. Anderson RC et al. Colitis. 2012. DOI: 10.5772/25753. (Accessed on InTechOpen) 4. Bischoff SC et al. BMC Gastroenterol. 2014;14:189. 5. Bischoff SC. BMC Med. 2011;9:24. 6. Wang L et al. J Immunol Methods. 2015;421:44-53. 7. Jandhyala SM et al. World J Gastroenterol. 2015;21(29):8787-8803. 8. Derikx JPM et al. World J Gastroenterol. 2010;16(42):572-5279. 9. Siddiqui I et al. World J Gatrointest Pharmacol Ther. 2017;8(1):39-46. 10. Schwiertz A et al. Parkinsonism Relat D. 2018;50:104-107.*

Understanding executive functions – A toolkit for learning

Kelly Ching *Registered Dietitian (CDR, USA), BSc*

Executive functions (EFs) is a set of mental processes necessary for the cognitive control of behaviors that would otherwise be non-sensible, insufficient or impossible without[1,2]. How EFs may impact children's potential to learn has been of keen interest in the field of developmental psychology. While research continues to expand, this toolkit for the brain is generally considered to be composed of three core areas:

The core executive functions

(1) **Inhibitory control** refers to the ability to control one's attention, behavior, thoughts or emotions to override strong internal predisposition or external lure. It enables us to exercise self-control such as staying on task despite distractions from surroundings, temptations to give up and/ or impulses to move on to more interesting tasks[1].

(2) **Working memory** refers to the ability to make use of information retained as opposed to simply holding memory in mind (i.e. short-term memory)[1]. It not only makes reasoning possible by connecting different events/experiences in life, but also helps build creativity by disaggregating and then recombining elements in new fashions[1].

(3) Requiring the former two as a foundation, **shifting** (sometimes called cognitive flexibility) involves the ability to change perspectives, think outside of the box, and adapt to unfamiliar environments[1].

Development of Executive Functions

Although executive functions are not innate, they are acquirable and has the potential to improve with proper training and support[3]. Biological, social, and psychological factors altogether shape the development of EFs[3,4]. Evidence-based training interventions for school-aged children include computerized trainings, aerobic exercise and sports, mindfulness practice, and classroom curricula[4]. Notably, brain structural connectivity, namely myelination of the white matter, has been correlated with the development of executive functions[5]. **Certain nutrients also support EF improvement via varying mechanisms. For example, zinc modulates neurotransmitter activity[6], choline maintains structural integrity and signaling functions of cell membranes[7], and DHA supports normal brain development in early life[8].**

Common food sources

Choline[9]	Eggs, soybeans, low fat milk, non-fat yogurt, etc.
DHA[10]	Egg yolks, oily fish (e.g. salmon, sardine, sea bass, etc.)
Zinc[11]	Oysters, lean beef, fortified breakfast cereal, pumpkin seeds, yoghurt, etc.

Further research should focus on establishing evidence-based assessment and intervention guidelines to facilitate parents, schools, and healthcare professionals in supporting EF development during the critical years.

References: *1. Diamond A. Annu Rev Psychol. 2013;64-135-68. 2. Espy K et al. J Child Psychol Psychiatry. 2011;52(1):33-46. 3. Center on the Developing Child. InBrief: Executive Function. Available at: https://developingchild.harvard.edu/science/key-concepts/executive-function/. Accessed on 27Aug2019. 4. Diamond A. Curr Dir Psychol Sci. 2013;21(5):335-341. 5. Kaller M et al. Current Opinion in Neurobiology. 2017;47:86-92. 6. Gower-Winter S and Levenson C. Biofactors. 2012;38(3):186-193. 7. Zeisel S. JACN. 2004;23(6):621-626. 8. Lauritzen L et al. Nutrients 2016;8:6. 9. National Institutes of Health. Choline – Health Professional Fact Sheet. Available at: https://ods.od.nih.gov/factsheets/Choline-HealthProfessional/. Accessed on 27Aug2019. 10. National Institutes of Health. Omega-3 Fatty Acids – Health Professional Fact Sheet. Available at: https://ods.od.nih.gov/factsheets/Omega3FattyAcids-HealthProfessional/. Accessed on 27Aug2019. 11. National Institutes of Health. Zinc – Health Professional Fact Sheet. Available at: https://ods.od.nih.gov/factsheets/Zinc-HealthProfessional/. Accessed on 27Aug2019.*

Bringing to you our Nutrition A to Z series
A handy alphabetical listing of terms used in nutrition!

Scan to view more:

One of the commonly found human milk oligosaccharide (HMO) along with 2'-fucosyllactose (2'-FL)[1]. HMOs have antiadhesive antimicrobial properties and may contribute to the lower incidence of intestinal, upper respiratory and urinary tract infections in breastfed infants[2]

Xanthophylls is a category of fat-soluble and oxygen-containing carotenoid pigments, responsible for the color of the yellow, orange, and red hues of various plant species[3]. Lutein, mostly abundant in dark leafy vegetables, is an example of xanthophyll known to accumulate in the macula of the human retina[4]

References: *1. Puccio G et al. J Pediatr Gastroenterol Nutr. 2017;64(4):624-631. 2. Bode L. Glycobiology. 2012;22(9):1147-1162. 3. Zielinska M et al. Nutrients. 2017;9:838; doi:10.3390/nu9080838. 4. Kotake-Nara E et al. Mar Drugs. 2011;9:1024-1037; doi:10.3390/md9061024.*