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HEADLINE

Latest clinical findings on bovine milk oligosaccharides (BMOs)

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

Oligosaccharides in general are thought to influence human health through their prebiotic effects in the gastrointestinal tract[1], and among all, human milk oligosaccharides (HMOs) have unquestionably remained to be the prominent interest of neonatal nutrition due to their significant role in supporting the infant immune system and gut microbiota[2]. **Alongside HMOs, bovine milk oligosaccharides (BMOs) may stand as the next frontier of research given their potential to confer physiological benefits similar to that of HMOs[2].** While research continues to explore strategies on mass manufacture of BMOs, it is of paramount importance to rationalize the introduction of this novel ingredient in neonatal nutrition by evaluating clinical evidences available.

A recent double-blinded controlled trial was conducted to assess the effects of BMO on gastrointestinal and immune outcomes in health term infants[3]. A total of 230 participants aged 21-26 days were randomized to receive cow's milk formula with or without BMO supplementation until 6 months of age. A companion study included a non-randomized breastfed group as reference. The study measured various indicators of gut health, including fecal microbiota composition and fecal markers of intestinal inflammation/permeability. When compared with the group receiving formula without BMO supplementation, study group showed the following results worthy of note:

- **A significantly higher mean of fecal secretory immunoglobulin A (sIgA)** at age 4 months (*p* < *0.0001*)
- **Lower levels of markers of intestinal inflammation/permeability,** including α-1 antitrypsin, calprotectin, elastase, and myeloperoxidase at age 4 months ($p \leq 0.0065$)
- **Higher relative abundance of *Bifidobacteriaceae*** (which is associated with increased fecal sIgA and reduced fecal calprotectin) ($p = 0.002$)
- **Lower counts of *Clostridium perfringens*** ($p = 0.004$) and *Clostridium difficile* ($p = 0.0001$)

As perhaps one of the first in the library to date, the above findings shed light on the functionalities of BMOs in the development of the young intestinal immune system, particularly through the promotion of a more favorable gut microbiota composition and the regulation of key biomarkers of intestinal permeability (such as calprotectin[4] and sIgA[6]).

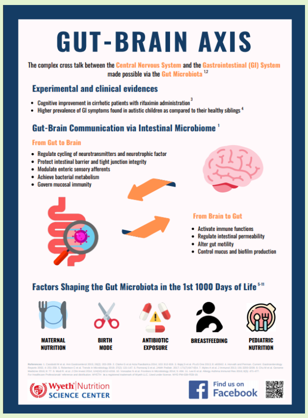
Moving forward, further research on the role of BMOs in the human gastrointestinal tract is deemed necessary in order to address critical questions regarding the application of this functional alternative of HMOs in the field of neonatal nutrition.

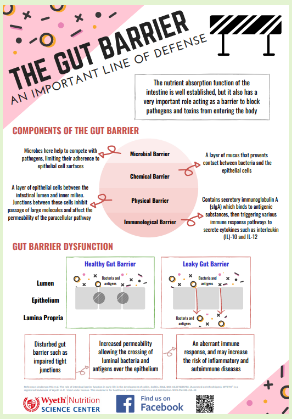
*References: **1.** Kuntz S et al. Front Nutr. 2019;6:3 **2.** Bode L. Glybiology. 2012;22(9):1147-1162. **3.** Estorninos E et al. Abstract presented at the FASEB Science Research Conferences Nutritional Immunology and the Microbiota: Rules of Engagement in Health and Disease. 24-29 June 2018, Virginia, USA. Available at: https://secure.faseb.org/SRC/2018/FileAccess.aspx?secure=djkflserj234084h&topic=11587. Accessed on 27July2018. **4.** Jandhyala SM et al. World J Gastroenterol. 2015;21(29):8787-8803. **5.** Derikx JPM et al. World J Gastroenterol. 2010;16(42);5272-5279. **6.** Mantis JM et al. Mucosal Immunol. 2011l4(6):603-611.*

Sharing with you WNSC HK new infographics!

Please scan:

An overview on the Gut-Brain Axis facilitated by gut microbiota





An overview on the component and dysfunction of gut

10 Quick Facts about Goat Milk

Kelly Ching Registered Dietitian (CDR, USA), BSc

1. Goats were the first animals domesticated and used for milk by man early in 10,000 B.C.[1]
2. The average lactation period of dairy goats is about 284 days.
3. As compared to cow's milk, goat's milk production is relatively scarce, taking up only a worldwide total of 4% when combined with sheep's milk and camel's milk[3].
4. Interestingly, despite the dominance of cow's milk in the world's dairy industry, there are in fact more people who consume goat dairy products than any other animals[4].
5. Goat milk and its products, including butter, are pure white **because goats convert all β-carotenes into vitamin A**[5,6].
6. Goat milk is slightly denser in energy level than human milk (See Table 1).
7. Goat milk has a **lower lactose content that human milk** (see Table 1).
8. Goat milk has a **higher protein content than human milk** (see Table 1). β-casein is the major protein in goat and human milk, where as α_{s1}-casein is the major protein in cow milk[4].
9. Goat milk has **a fat level similar to human milk** (see Table 1). The fat globules in goat milk are significantly smaller than that of cow milk[4], which is why goat milk is naturally homogenized[1,2].
10. Keeping a strong-smelling buck (male goat) with the lactating doe (female goat) may result in more "goaty" flavor that may be offensive to humans[1]. With proper milking and handling, goat milk and cow milk should taste and smell about the same[7].

Table 1. Average concentrations of basic nutrients in goat milk and human milk[2].

	Goat	Human
Energy (kcal/100 ml)	70	68
Lactose (%)	4.1	7.3
Protein (%)	3.2	1.1
Fat (%)	3.8	4.0
Cholesterol (mg/100 ml)	12	20
Calcium (%)	0.19	0.04
Phosphorus (%)	0.27	0.06
Iron (%)	0.07	0.20
Vitamin A (IU/g fat)	39	32
Vitamin D (IU/g fat)	0.7	0.3
Vitamin C (mg/100 ml)	2.0	3.0
Thiamin (μg/100 ml)	68	17
Riboflavin (μg/100 ml)	210	26

*References: **1.** McKenzie-Jakes A. Facts about goats. Florida Agricultural and Mechanical University. **2.** PennState Extension. Dairy goat production. Available at: https://extension.psu.edu/dairy-goat-production. Accessed on 23Oct2019. **3.** OECD-FAO. Agricultural Outlook 2019-2028. Chapter 7: Dairy and dairy products. **4.** Park YW. Goat Milk: Composition, Characteristics. Encyclopedia of Animal Science. 2010. Available at: https://www.researchgate.net/publication/282023189_Goat_Milk_Composition_Characteristics_Encyclopedia_of_Animal_Science. Accessed on 23Oct2019. **5.** Guo M. Encyclopedia of Food Sciences and Nutrition (Second Edition). 2003;2944-2949. **6.** Egan S. Since milk is white, why is butter yellow? The New York Times. Accessed on 04Nov2019. Available at: https://well.blogs.nytimes.com/2016/10/14/since-milk-is-white-why-is-butter-yellow/. **7.** Park YW. Goat milk products: quality, composition, processing, marketing. 2019. Available at: https://goats.extension.org/goat-milk-products-quality-composition-processing-marketing/. Accessed on 23Oct2019.*

Quick facts about soft drinks – Do you know?

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

- People consuming ≥ 2 **glasses of sugar-sweetened or artificially sweetened soft drinks daily had a higher risk of all-cause mortality** versus those drank < 1 glass of these per month (n = 451,743; hazard ratio, 1.17; 95% CI, 1.11-1.22; p < 0.001)[1]
- In a meta-analysis including > 74,000 cases, soft drink consumption was significantly associated with **an increased risk of asthma**[2]:
  - ◊ Children (OR, 1.14; 95% CI, 1.06-1.21)
  - ◊ Adults (OR, 1.37; 95% CI, 1.23-1.52)
- In a survey conducted by Hong Kong Department of Health[3]:
  - ◊ > 80% children aged 2-14 had drank soft drinks in the 7 days preceding the survey
  - ◊ **26% children aged 2-14 drank at least 1 cup daily**

Remarks: 1 glass = ~250 ml; 1 cup = 250 ml or 8 fluid ounces

*References: **1.** Mullee A et al. JAMA Intern Med. 2019. doi: 10.1001/jamainternmed.2019.2478. **2.** Al-Zalabani AH et al. BMJ Open. 2019;9:e029046. **3.** Centre for Health Protection. Non-communicable disease watch. Volume 3. Number 12. 2010.*

Tips on choosing a healthy choice of beverage are only a few clicks away!

Go to WNSC HK website for more tips cards on oils, salt, sugar and caffeine !

Please visit: https://hongkong.wyethnutritionsc.org/en/publications/healthy-eating-tips-card/food-group-exchange-tips-card-fluids-

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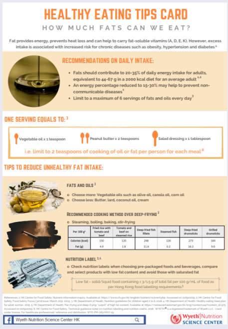
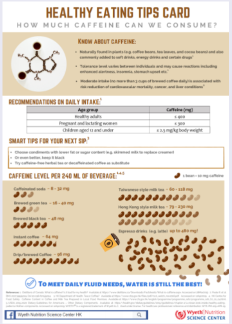




LATEST SCIENCE

Preliminary evidence – Role of micronutrients in children with Attention-Deficit Hyperactivity Disorder (ADHD)?

Josie Ho *Accredited Practising Dietitian (DAA), MND, BAppSc(Ex&SpSc)*

Being one of the common neurodevelopment disorders, the etiology of ADHD remains obscure. Pharmacotherapy and psychological approaches are the most common treatments for childhood ADHD[1]. Given growing body of evidence demonstrating nutrient supplementation approach on modulating mental conditions[2], such as depressive disorder (MDD)[3] and stress[4], there is considerable interest concerning the potential role of broad-spectrum of micronutrient approaches on children with ADHD.

In a 2017 study, medication-free children aged 7-12 year-old with ADHD (n = 93) were randomly assigned to receive micronutrients (multivitamins and minerals) or placebo for 10 weeks. The results showed that micronutrient supplementation may improve some ADHD symptoms[5].

- According to Clinical Global Impressions-Improvement-Overall scale (CGI-I-Overall), children taking micronutrients had **significantly improved overall functioning** (p = 0.029) as compared with those on placebo. 47% of children taking micronutrients were "much" to "very much" improved, with 28% of children receiving placebo on CGI-I-Overall.
- More children taking micronutrients showed a **significant improvement in inattentive symptoms (30% drop)** than those with placebo (32% vs 9%; p = 0.005) **but not hyperactive-impulsive symptoms** (p = 0.951).
- Compared with placebo, children received micronutrients had **more improvement** on some ADHD associated symptoms, such as **emotional dysregulation and aggression**.

A pilot study (n = 18) published in earlier this year found that children with ADHD, who took micronutrients (vitamins, minerals, amino acids, and antioxidants), had lower level of a specific genus, *Bifidobacterium*, that may have potential relevance to ADHD. And micronutrient supplementation could be used as safe intervention in children with ADHD.[6]

- Children taking micronutrients had **significantly fewer *Bifidobacterium*** than other children.
- A general trend suggested that **low abundance of *Bifidobacterium* was associated with a low ADHD Rating Scale IV** (ADHD-RS-IV) for children receiving micronutrients, but no significant correlation observed.

However, as of yet, these preliminary evidence regarding the role of micronutrients on ADHD symptoms and the underlying mechanism is limited, still. These results validate the need for future research. Meanwhile, it is necessary of being cautious when interpreting these speculations.

References: 1. Rucklidge JJ et al. Expert Rev. 2009;9(4):461-476 2. Rucklidge JJ et al. BJPsych. 2014;204:306-315 3. Mech AW and Farah A. J Clin Psychiatrry. 2016;77(5):668-671 4. Schlebusch L et al. SAMJ. 2000;90(12):1216-122 5. Rucklidge JJ et al. JCPP. 2018;59(3):232-246 6. Stevens AJ et al. Scientific reports. 2019;9:10128.

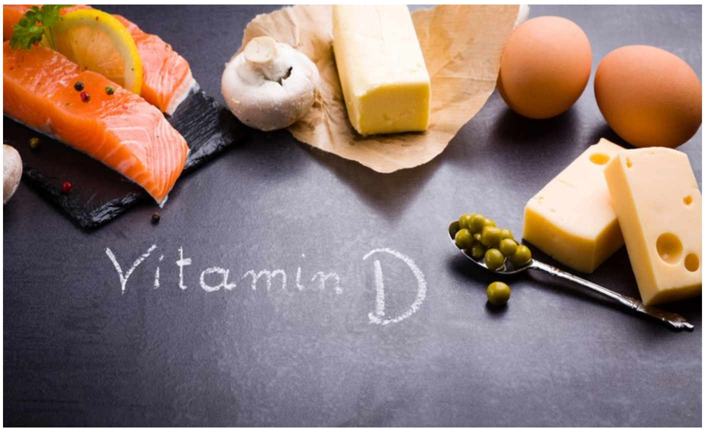
Vitamin D status in Chinese populations – What's new?

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

Vitamin D insufficiency has been a worldwide health issue afflicting different life stages in the globe[1]. In a recent cross-sectional study in Jinzhong city conducted in winter time, high prevalence of vitamin D insufficiency was observed and **women were more prone to vitamin D insufficiency compared to men**[2]. Sufficient vitamin D status (serum level > 50 nmol/L) were noted in 31.25% men (55 out of 176) and 24.60% women (31 out of 126) while 22.16% men (39 out of 176) and 33.33% women (42 out of 126) had vitamin D deficiency (serum level < 30 nmol/L)[2]. In particular, women younger than 40 years old showed the lowest vitamin D level (30.13 nmol/L) among different age groups in both genders[2].

A South China birth cohort with 854 pregnant women further investigated vitamin D level of cord blood and maternal factors that may influence the level[3].

A high prevalence of low cord vitamin D level (22% < 30 nmol/L and 70.4% < 50 nmol/L) from 2016 to 2017 was desmonstrated[3]. Prevalence of vitamin D deficiency was higher in infants born in winter (31% < 30 nmol/L; 76% < 50 nmol/L) versus those born in summer (12% < 30 nmol/L; 64% < 50 nmol/L)[3]. **Maternal vitamin D supplementation during prenatal period was effective in boosting cord serum vitamin D status.** Infants born to mothers taking supplement with vitamin D showed about 10 nmol/L higher vitamin D level than those who had no supplement[3].



Vitamin D status during pregnancy has been associated with different health outcomes including gestational diabetes mellitus (GDM), preterm birth and pre-eclampsia. Newly published data from a Chinese prospective birth cohort implicated the role of vitamin D on GDM. Risk of GDM was significantly lower in women with serum vitamin D level from 50 to 75 nmol/L (RR, 0.74; 95% CI, 0.58, 0.95) and > 75 nmol/L (RR, 0.40; 95% CI, 0.22, 0.70) compared with those with level < 25 nmol/L[4]. **Pregnant women taking 400 to 600 IU vitamin D daily with mean serum vitamin D level of 50 nmol/L had a lower risk of GDM** (RR, 0.83; 95% CI, 0.70, 0.97) [4]. A review analysis, including data from 30 trials with 7,289 women in total, additionally concluded that supplementing vitamin D at level more that the current recommendation (≥ 601 IU daily) during pregnancy may lower the risk of GDM (RR, 0.54; 95% CI, 0.34-0.86) , but no impact on pre-eclampsia, preterm birth and low birth weight was recorded[5].

Very few foods naturally contain vitamin D (Table 2) and most vitamin D in human body is made during skin exposure to sunlight[6,7]. The Hong Kong Department of Health advises that **5 to 15 minutes of sun exposure of hands, face and arms 2 to 3 times a week during summer months is sufficient for most people to keep a high vitamin D level**[7]. A longer exposure may be needed in winter whereas sun screen and skin pigment can reduce vitamin D synthesis via sun light[7]. In addition, recommendations from health experts may help to optimize vitamin D status for better health outcomes (Table 3).

Table 2 – Food sources of vitamin D[6]

- Oily fish (salmon, sardines, herring and mackerel)
- Red meat
- Liver
- Egg yolks
- Fortified foods (some breakfast cereals)

Table 3 – Recommendations on vitamin D intake/supplementation

Life stages	Recommendations
Infants, children and adolescents	American Academy of Pediatrics (AAP) recommends **a vitamin D intake of at least 400 IU/day**[8]: • Both breastfed and partially breastfed infants should be supplemented with 400 IU of vitamin D daily beginning in the first few days of life • ALL non-breastfed infants and older children (consuming < 1,000 ml daily of vitamin D-fortified formula) should be supplemented with 400 IU/day of vitamin D • Adolescents without intake of 400 IU of vitamin D daily should receive a vitamin D supplement of 400 IU/day
Pregnant and lactating women	UK Health Department recommends that **ALL pregnant and lactating women should take a daily supplement containing 10 mcg of vitamin D**[9]
Adults (>18 years to <65 years)	Chinese Dietary Reference Intake of vitamin D is **10 mcg/day**[10]
Elders (>65 years to 80 years)	Chinese Dietary Reference Intake of vitamin D is **15 mcg/day**[10]

References:
1. Holick MF. Rev Endocr Metab Disord. 2017;18(2):153-165. 2. Yan X et al. Med Sci Monit. 2019;25:7094-7099. 3. Zhang JY et al. Asia Pac J Clin Nutr. 2019;28(3):544-549. 4. Yin WJ et al. Am J Clin Nutr. 2019. pii: nqz260. doi: 10.1093/ajcn/nqz260. 5. Palacios C et al. Cochrane Database Syst Rev. 2019;10:CD013446. 6. National Health Services. Available at: https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-d/. Accessed on 23Oct2019. 7. Hong Kong Department of Health. Patient information: Vitamin D. 2016. 8. Wagner CL0 et al. Pediatrics. 2008;122 (5):1142-1152. 9. UK Government. Vitamin D – Advice on supplements for at risk groups. 2012. 10. Chinese Nutrition Society. Chinese DRIs Handbook. 2013.