Review Article

Dairy foods and health in Asians: Taiwanese considerations

Meei-Shyuan Lee DrPH\textsuperscript{1,2}, Mark L Wahlqvist MD, FRACP, FAFPHM\textsuperscript{1,2,3}, Cheau-Jane Peng MS, MPH\textsuperscript{4,5}

\textsuperscript{1}School of Public Health, National Defense Medical Center, Taipei, Taiwan, ROC
\textsuperscript{2}Monash Asia Institute, Monash University, Melbourne, Victoria, Australia
\textsuperscript{3}Institute of Population Health Sciences, National Health Research Institutes, Miaoli County, Taiwan, ROC
\textsuperscript{4}Department of Environmental and Occupational Health, College of Medicine, National Cheng-Kung University, Tainan City, Taiwan, ROC
\textsuperscript{5}Office for Planning and Management, Chi-Mei Hospital, Tainan City, Taiwan, ROC

The health relevance of dairy products has mostly been judged by their abundant nutrients (protein, calcium and riboflavin) and recommendations for these derived in lactase-persistent Caucasian populations. Extrapolation to Asians who are generally lactase non-persisters may not be biologically, culturally or environmentally sound. A number of studies, especially among north-east Asians as in Taiwan, provide guidance for their optimal dairy intake. In Taiwan, the NAHSIT (Nutrition and Health Surveys in Taiwan) linked to the National Health Insurance and Death Registry databases provide most of the evidence. Cultural and socio-economic barriers create population resistance to increase dairy consumption beyond one serving per day as reflected in food balance sheet and repeat survey trend analyses. For the morbidity and mortality patterns principally seen in Asia, some, but not too much, dairy is to be preferred. This applies to all-cause and cardiovascular, especially stroke, mortality, to the risk of overfatness (by BMI and abdominal circumference) and diabetes and very likely to fracture and its sequelae. In Taiwan, there is no apparent association with total cancer mortality, but among Europeans, there may be protection. Historically, while fermented mammalian milks have been consumed in south Asia and various Asian sub-groups and regions, most of the uptake of dairy in Asia after World War 2 has been from imported powdered milk or fresh liquid milk, encouraged further by the use of yogurts and popularization of milk teas and coffee.

Asian dietary guidelines and clinical nutrition protocols need to encourage a modest, asymptomatic dairy intake.

Key Words: dairy, health, stroke, lactase persistence, Taiwan

NUTRITIONAL VALUE OF DAIRY FOODS IN ASIAN DIETS

Oriental Asians and many indigenous peoples of Asia do not have persistent lactase activity beyond early childhood. For this reason, it has been thought, mammalian milk has not formed a significant part of their food culture. Historically, while fermented mammalian milks have been consumed in Asian sub-groups (e.g. western China and Mongolia) and regions (e.g. south Asia), most of the uptake of dairy in north-east (NE) and south-east (SE) Asia after World War II has been from imported powdered milk or fresh liquid milk (about 80%), encouraged further by the popularization of milk teas and coffee.

Perceived nutrient vulnerabilities in Asian diets especially for protein and amino acids, the vitamin riboflavin (B-2) and the divalent cations calcium and magnesium are often used as an argument for the inclusion of dairy foods. However, the recommendations by which these arguments are put are almost exclusively based on studies in Caucasians. We have recently assessed survival in relation to food-based vitamin intakes in Taiwan with its dominantly Chinese population of lactase non-persisters and find that it has an optimal range of intake not contingent on dairy foods.\textsuperscript{1} Nevertheless riboflavin deficiency is seen in adolescent Chinese with its classical features of angular stomatitis and seborrheic dermatitis in relation to dietary quality, especially the refinement of rice.\textsuperscript{2,3} Likewise, in empirical step-wise risk assessment, with calcium intakes for women above 2/3rd's DRIs (about 500 mg per day) combined with other dairy and dietary characteristics in Taiwan as reference, not more than 1 serve (1 cup of 240 ml with about 240 mg calcium) is required for an optimal diet (Table 1).\textsuperscript{4} It is clear that the acceptability and utility of dairy foods depends on their food and nutritional synergy, not simply a question of nutrient content. Part of this acceptability will be predicated on the dose of lactose and how it is distributed across the day.\textsuperscript{5,7}

The nutrient almost unique to milk is galactose, one of...(continued)
Likewise, higher dairy intakes are associated with less source of vitamin K. These CVD mortality findings, dairy food intake is major risk reduction in adult Taiwanese consistent finding irrespective of location. Though the point estimates in an adult cohort study before part study before 2006 at the time of the melamine adulteration fiasco and has since not fully recovered. It is of interest that, for liquid milk, the upper single dose of lactose tolerance seems to be about 25 g, which is the most that a single serve of dairy might provide. It is also the amount of dairy which provides the greatest health protection.

Taiwan: availability, self-sufficiency & servings
In Taiwan the most prevalent dairy consumptions are to be found among children and the elderly (Figure 4). Barriers to consumption are therefore more likely in adolescence and adulthood. Even though lactose digestion may decline with age, it may be asymptomatic. This may account for the relative acceptability of dairy products among the aged at a time when the benefit may also be considerable in terms of CVD.

LIMITS TO DAIRY INTAKE IN ASIA
The NAHSIT study of 2005-2008 enquired about the non-use of dairy foods (unpublished data). More than a quarter (26.5%) of participants claimed this was for physiological reasons. Two thirds (66.7%) of participants claimed that dairy was not part of their diet, including those with “no such habit” (32.2%), “dislike” (17.1%), “no regular time” (10.3%) and “don’t eat it” (7.1%). These were 4.81% for whom dairy was not available usually because the price was too high (3.04%), especially for the Eastern region and Indigenous people.

As indicated, it was found that most people did not regard dairy as a normal part of the diet, followed by physiological reasons as the basis for dairy avoidance. This was confirmed by the finding in Taiwan that dietary diversity, including dairy, costs were greater and made more consequential by the fact that this in turn affects mortality. Indigenous Taiwanese had problems with accessibility since they were often located in remote areas.
Table 1. Hierarchical determination of optimal dairy recommendations for elderly women in Taiwan

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Corresponding daily dairy intake frequencies for various factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Older adult women</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>No of participants</td>
<td>327</td>
</tr>
<tr>
<td>Dairy intake freq/d</td>
<td>0.86</td>
</tr>
<tr>
<td>Calcium intake</td>
<td>≥2/3 DRIs                                                   &lt;2/3 DRIs</td>
</tr>
<tr>
<td>% of participants</td>
<td>40</td>
</tr>
<tr>
<td>Dairy intake freq/d</td>
<td>1.11</td>
</tr>
<tr>
<td>Serum EGRAC&lt;sup&gt;†&lt;/sup&gt;</td>
<td>Normal                                           Deficient      Normal       Deficient      Normal       Deficient      Normal       Deficient</td>
</tr>
<tr>
<td>% of participants</td>
<td>99</td>
</tr>
<tr>
<td>Dairy intake freq/d</td>
<td>1.11</td>
</tr>
<tr>
<td>The metabolic syndrome</td>
<td>No                                                           Yes</td>
</tr>
<tr>
<td>% of participants</td>
<td>52</td>
</tr>
<tr>
<td>Dairy intake freq/d</td>
<td>1.11</td>
</tr>
</tbody>
</table>

<sup>†</sup>BUA T-SCORE ≤-2.5 SD  
<sup>‡</sup>EGRAC (erythrocyte glutathione reductase activation) <1.4: normal; ≥1.4: vitamin B-2 deficiency indicator  
DRIs: Dietary Reference Intakes
Those who used dairy, used less supplements, smoked less and chewed betel nut less.

Projections that dairy consumption in Asia will continue to rise are based on income and population growth and not necessarily on individual consumption. However, it is also argued that technological advances in Asia may reduce world dairy price.31

CONCLUSIONS
Low or moderate dairy intakes, less than one serving a
day are acceptable to about half of oriental Asians who are lactase non-persistent as judged from Taiwanese studies. Those who consume dairy at these frequencies gain a mortality and morbidity advantage.

**AUTHOR DISCLOSURES**
No conflict of interest.

**REFERENCES**
4. Lee MS, Yang FL, Huang LY, Chen MC. Reappraisal of the appropriateness of the dairy food guidelines in Taiwan by using three NAHSITs datasets. Taipei: Department of Health; 2009.
11. Wahlqvist ML, Worsley A, Harvey P, Crotty P, Kouris-Blazos A. Food-Based Dietary Guidelines for the Western Pacific: the shift from nutrients and food groups to food availability, traditional cuisines and modern foods in

---

**Figure 3.** Dairy food self-sufficiency and servings, Taiwan 1998-2013.

**Figure 4.** Age-gender-specific dairy consumption prevalences, 3 NAHSITs.
Review Article

**Dairy foods and health in Asians:**
Taiwanese considerations

Meei-Shyuan Lee DrPH\(^1,2\), Mark L Wahlqvist MD, FRACP, FAFPHM\(^1,2,3\),
Cheau-Jane Peng MS, MPH\(^4,5\)

\(^1\)School of Public Health, National Defense Medical Center, Taipei, Taiwan, ROC
\(^2\)Monash Asia Institute, Monash University, Melbourne, Victoria, Australia
\(^3\)Institute of Population Health Sciences, National Health Research Institutes, Miaoli County, Taiwan, ROC
\(^4\)Department of Environmental and Occupational Health, College of Medicine, National Cheng-Kung
University, Tainan City, Taiwan, ROC
\(^5\)Office for Planning and Management, Chi-Mei Hospital, Tainan City, Taiwan, ROC

亞洲人的乳製品與健康：臺灣經驗

乳製品與健康的關聯，絕大多數取決於其富含的營養素（蛋白質、鈣和核黃素），而這些建議多半衍生自乳糖酶續存之高加索人群。這些建議外推至多數為乳糖酶非續存的亞洲人，就生物，文化和環境層面可能不恰當。一些研究，尤其是在東北亞的臺灣，提供了他們最佳奶品建議量的指引。在臺灣，NAHSIT（臺灣營養與健康變遷調查），串連到全民健保和死亡登記資料庫，提供了大部分證據。從食物平衡表及重複調查的趨勢分析，反映出文化和社會經濟障礙，產生讓民眾增加乳製品消費的阻力，而無法達成每日一份奶品的建議攝取量。對於亞洲常見的疾病及死亡原因，只要少量而不是太多乳製品是首選。這適用於全死因和心血管疾病死亡率，特別是中風；疾病方面包括過重（測量BMI和腹圍）、糖尿病、骨折及其後遺症的風險。在臺灣，奶類與總癌症死亡率無關，在歐洲人則可能是保護的。從歷史上看，儘管南亞和亞洲部分族群和地區早就食用發酵哺乳動物的奶，但大部分亞洲人的乳品攝取起源於第二次世界大戰後進口的奶粉或鮮奶。透過鼓勵攝取優格，及茶與咖啡的普及，增加了奶品的攝取量。亞洲膳食指南和臨床營養方案，需要鼓勵適度且無症狀的乳製品攝入量。

關鍵詞：乳製品、健康、中風、乳糖酶持久性、臺灣