Scientific Advisory Committee on Nutrition

Paper for discussion: Dietary Reference Values for Lactating Women.

Agenda Item: 2

Please see paper and accompanying tables attached.

DIETARY REFERENCE VALUES FOR LACTATING WOMEN

1. At the last SMCN meeting in September 2011, the Secretariat was asked to tabulate those nutrients where a specific increment has been established for lactation in the Committee on Medical Aspects of Food Policy (COMA) Dietary Reference Values (DRVs) report and in the United States Institute of Medicine (IOM) Dietary Reference Intakes reports.

2. Tables 1-3, attached, list the dietary reference values for energy and micronutrients set for lactating women in the UK, the USA, and internationally by the World Health Organization/Food and Agriculture Organization.

3. For most nutrients, increments in the dietary reference values for adult females for lactation are set to replace the amount incorporated into breast milk, calculated on the basis of an average daily milk volume of approximately 850ml and the average milk concentration of the nutrient (or the total daily milk secretion). For some nutrients, no increment for lactation has been set for the UK population.

4. Although no Reference Nutrient Intake (RNI) is set for vitamin D for most adults in the UK, an RNI was set for those groups at risk of vitamin D deficiency, including pregnant and lactating women. Breastfeeding women are advised to take a daily supplement containing vitamin D to achieve the RNI of 10µg/day. COMA deemed this an appropriate increment to ensure adequate levels of the vitamin in breast milk. However, more recent evidence suggests that breast milk is not a good source of vitamin D. DRVs for vitamin D will be considered collaboratively by SMCN and SACN's Working Group on Vitamin D.

5. The Secretariat was also asked to prepare a table detailing those nutrients where dietary intakes of the mother may modify breast milk composition, within the range of normal intakes. This is provided in Table 4 and is informed by the review of the nutrient composition of human breast milk carried out by the Diet and Nutrition Survey of Infants and Young Children Secretariat in 2010 (SMCN/11/06).

6. **The Subgroup is asked to consider whether the dietary reference values for lactating women are justified and which, if any, may need revising.**

Table 1. Dietary Reference Values for Energy

	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Requirement for lactation**
Energy		1.38MJ/d (330kcal/d) in the 1st 6 months (SACN 2011)		+1.38MJ/d (330kcal/d) in the 1st 6 months and +1.68MJ/d (402kcal/d) in the 2nd 6 months	+2.1MJ/d (505kcal/d) for well-nourished women with adequate gestational weight gain

Table 2. Dietary Reference Values for Vitamins

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 years)**
Vitamin A	RNI = 600 µg retinol equivalents/d	+350µg retinol equivalents/d Increment set to cover that supplied in milk	RDA = 700µg/d	For young women (14-18yrs): RDA = 1,200µg/d. For women aged 19-50yrs: RDA = 1,300µg/d.	850µg retinol equivalents/d (+350) Recommended safe intakes instead of RNIs
Vitamin D	None set It is assumed the majority of vitamin D is obtained from sun exposure.	RNI = 10 µg/d Supplements are recommended to achieve the RNI. Set to ensure adequate levels of the vitamin in breast milk	For women aged 14-50yrs, EAR = 400 IU (10µg); RDA = 600 IU (15µg); and UL = 4000 (100µg)	No increment for lactation	No increment for lactation (5µg/d)
Vitamin E	None set	None set	RDA = 15mg/d	For women aged 14-50yrs, RDA = 19mg/d	None set
Vitamin K	None set	None set		No increment for lactation	No increment for lactation (55µg/d)
Vitamin C	RNI = 40mg/d for women aged 15-50+yrs	+30mg/d Increment set to replace losses in milk and to ensure breast milk levels are in the upper half of the physiological range for human milk	For young women (14-18yrs), RDA = 65mg/d For women aged 19-50yrs, RDA = 75mg/d	For young women (14-18yrs), RDA = 115mg/d For women aged 19-50yrs, RDA = 120mg/d	70mg/d (+45)

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 years)**
Riboflavin	RNI = 1.1mg/d for women aged 15-50+ yrs	+0.5mg/d Increment set to cover that supplied in milk	RDA = 1.0mg/d (14-18yrs) RDA = 1.1mg/d (19-50yrs)	For women aged 14-50yrs, RDA = 1.6mg/d.	1.6mg/d (+0.5)
Thiamin	RNI = 0.4mg/1,000kcal	No increment for lactation Loss of thiamin in milk will be met by the recommended increase in energy intake	RDA = 14mg/d (14-50yrs)	For women aged 14-50yrs, RDA = 17mg/d.	1.5mg/d (+0.4)
Niacin	RNI = 6.6mg/d for women aged 15-50+ yrs	+2.3mg/d Increment set to cover that supplied in milk	RDA = 1.0mg/d (14-18yrs) and 1.1mg/d (19-50yrs)	For women aged 14-50yrs, RDA = 1.6mg/d.	17 mg/d (+3.0) (niacin equivalents)
Vitamin B_6	RNI = 15µg/g protein	No increment for lactation	RDA = 1.2mg/d (14-18yrs) and 1.3mg/d (19-50yrs)	For women aged 14-50yrs, RDA = 2.0mg/d.	2.0mg/d (+0.7)
Folate	RNI = 200mg/d for women aged 15-50+ yrs	+60 µg/d Increment set to cover that supplied in milk (taking into account incomplete absorption and utilisation of dietary folates)	RDA = 400µg/d	For women aged 14-50yrs, RDA = 500µg/d.	500µg/d (+100) (dietary folate equivalents)
Vitamin B_{12}	RNI = 1.5µg/d for women aged 15-50+ yrs	+0.5 µg/d Increment set to cover that supplied in milk	RDA = 2.4µg/d	For women aged 14-50yrs, RDA = 2.8µg/d.	2.8µg/d (+0.4)

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 years)**
Pantothenic acid	None set. Intakes of 3-7mg/d deemed adequate including in pregnancy and lactation	None set	AI = 5mg/d	For women aged 14-50yrs, AI = 7mg/d.	7.0mg/d (+2.0)
Biotin	None set	None set	Young women (14-18yrs): AI = 25µg/d Women 19-50yrs: AI = 30µg/d	For women aged 14-50 yrs, AI = 35µg/d	35µg /d (+5)
Choline	None set	None set	Young women (14-18yrs): AI = 400mg/d Women 19-50yrs: AI = 425mg/d	For women aged 14-50 yrs, AI = 550mg/d	None set

Table 3. Dietary Reference Values for Minerals

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women (19-50yrs)	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 yrs)**
Calcium	RNI = 700mg/d for women aged 19 - 50+ yrs	+550mg/d Increment in lactation based on an the additional Ca required for milk production of 300mg/d	For young women (14-18yrs): EAR = 1,100mg; RDA = 1,300mg; UL = 3,000mg. For women aged 19-50yrs: EAR = 800mg; RDA =1,000mg; UL = 2,500mg.	No increment for lactation	No increment for lactation (1000mg/d)
Iron	RNI = 14.8mg/d	No increment for lactation Secretion in breast milk is offset by lactational amenorrhea	For young women (14-18yrs): RDA = 15mg For women aged 19-30yrs: RDA = 18mg/d	For young women (14-18yrs): RDA = 10mg For women aged 19-30yrs: RDA = 9mg/d	15% bioavailability = 10mg/d 12% bioavail. = 12.5mg/d 10% bioavail. = 15mg/d 5% bioavail. = 30mg/d
Phosphorus	RNI = 550mg/d	+440mg/d RNI for phosphorus set to equal the RNI for calcium in mmol. The increment for lactation therefore reflects the increment set for calcium	For young women (14-18yrs): RDA = 1,250mg For women aged 19-50yrs: RDA = 700mg/d	No increment for lactation	None set
Magnesium	RNI = 300mg/d for women aged 19 -50 yrs	+50mg/d Increment set to cover that supplied in milk	For young women (14-18yrs): RDA = 360mg For women aged 19-30yrs: RDA = 310mg/d For women aged 31-50yrs: RDA = 320mg/d	No increment for lactation	270mg/d (+50)

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women (19-50yrs)	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 yrs)**
Zinc	RNI = 7.0mg/d for women aged 19-50 yrs	+6.0mg/d (0-4 months) and +2.5mg/d (4+ months) Increment set to cover that supplied in milk	For young women (14-18yrs): RDA = 9mg For women aged 19-50yrs: RDA = 8mg/d	For young women (14-18yrs): RDA = 13mg For women aged 19-50yrs: RDA = 12mg/d	<u>High bioavailability</u> 0-3mo = 5.8mg/d 3-6mo = 5.3mg/d 7-12mo = 4.3mg/d <u>Moderate bioavailability</u> 0-3mo = 9.5mg/d 3-6mo = 8.8mg/d 7-12mo = 7.2mg/d <u>Low bioavailability</u> 0-3mo = 19mg/d 3-6mo = 17.5mg/d 7-12mo = 14.4mg/d (all increments from adult female 19-50 years values)
Copper	RNI = 1.2mg/d for women aged 19-50 yrs	+0.3mg/d Increment set to cover that supplied in milk	For young women (14-18yrs): RDA = 890µg/d For women aged 19-50 yrs: RDA = 900µg/d	For women aged 14-50 yrs, RDA = 1,300µg/d	None set
Selenium	RNI = 60 µg/d for women aged 15-50+ yrs	+15 µg/d Increment set to cover that supplied in milk	For women aged 14-50yrs: RDA = 55µg /d	For women aged 14-50yrs: RDA = 70µg /d	0-3mo = 35µg /d (+9) 3-6mo = 35µg /d (+9) 7-12 mo = 42µg /d (+16)
Iodine	RNI = 140µg/d for women aged 15-50+ yrs	No increment for lactation	For women aged 14-50 yrs: RDA = 150µg /d	For women aged 14-50 yrs: RDA = 290µg /d	200µg/d (+50)
Potassium	RNI = 3500mg/d	No increment for lactation	For women aged 14-50yrs: AI = 4.7g /d	For women aged 14-50yrs: AI = 5.1g /d	None set
Manganese	None set	None set	For young women (14-18yrs): AI = 1.6mg/d For women aged 19-50 yrs: AI = 1.8mg/d	For women aged 14-50yrs: AI = 2.6mg /d	None set

Nutrient	UK DRV		US DRI (Institute of Medicine)		WHO/FAO
	DRV for non-lactating, non-pregnant women (19-50yrs)	**DRV for lactation**	**DRI for non-lactating, non-pregnant women**	**DRI for lactation**	**Recommended Nutrient Intake for lactation (plus increment from RNI for adult females 19-50 yrs)**
Molybdenum	None set	None set	For young women (14-18yrs): RDA = 43µg/d For women aged 19-50 yrs: RDA = 45µg/d	For women aged 14-50yrs: RDA = 50µg /d	None set

Table 4: Categorisation of nutrients in human breastmilk according to whether they are likely to be affected by maternal dietary intake.

Nutrients present at generally stable concentrations within breast milk.	Nutrients for which maternal dietary variation is likely to affect breast milk composition.
Energy	Monounsaturated fatty acids
Protein	Polyunsaturated fatty acids (LA, ALA, AA, DHA)
Total fat	Trans fatty acids
Saturated fatty acids	
Carbohydrate (lactose)	
Sodium	Vitamin A (retinol and carotenes)
Calcium	Vitamin C
Magnesium	Vitamin E
Phosphorus	Niacin
Iron	Thiamin
Copper	Riboflavin
Zinc	Vitamin B_6
Chloride	Vitamin B_{12}
Manganese	Folate
Selenium	Pantothenic acid
Potassium	Biotin
Vitamin D	Iodine

Source: Jensen RG (1995). *Handbook of Milk Composition*. California: Academic Press Inc., and Lawrence RA & Lawrence RM (2005). Breastfeeding: A Guide for the Medical Profession. Chapter 4: Biochemistry of Human Milk. Elsevier Science.

References

COMA (1991). *Dietary Reference Values for Food Energy and Nutrients for the United Kingdom*. London: TSO

Institute of Medicine, Food and Nutrition Board (1997). *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride*. Washington, DC: National Academy Press.

Institute of Medicine, Food and Nutrition Board (1998). *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline*. Washington, DC: National Academy Press.

Institute of Medicine, Food and Nutrition Board (2000). *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids*. Washington, DC: National Academy Press.

Institute of Medicine, Food and Nutrition Board (2001). *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*. Washington, DC: National Academy Press.

Institute of Medicine, Food and Nutrition Board (2004). *Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate*. Washington, DC: The National Academies Press.

Institute of Medicine, Food and Nutrition Board (2011). *Dietary Reference Intakes for calcium and vitamin D*. Washington, DC: The National Academies Press.

Joint FAO/WHO Expert Consultation on Human Vitamin and Mineral Requirements (2004). Vitamin and mineral requirements in human nutrition. Second edition. Report of a joint FAO/WHO expert consultation, Bangkok, Thailand, 21–30 September 1998.

FAO (2004). *Human energy requirements*. Report of a Joint FAO/WHO/UNU Expert Consultation. Rome 17-24 October 2001.

SACN (2011). *Dietary Recommendations for Energy* [Pre-publication copy].