Food sources of choline for Canadian women of childbearing age. Is it enough?

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Introduction

Choline plays a critical role in reproduction. For example: phospholipids are needed for membrane biosynthesis & lipid transport; acetylcholine is used for neurogenesis & synapse formation and choline and betaine act as methyl donors thereby establishing and maintaining the fetal epigenome (1). There is also evidence that Choline may reduce the risk for neural tube defects (2).

Currently, there is limited evidence of choline intakes in Canadian women of childbearing years, but several studies done in pregnant women estimated average intakes to be between 306-347 mg/d (3,4). The AI for pregnancy is 450mg. It should also be noted that the majority of multivitamin/mineral complexes (and this includes pregnancy vitamins) do not contain choline.

Objectives

1) To derive the percent contribution of the top food sources for choline in women of childbearing years using the Canadian Community Health Survey (CCHS) 2.2
2) To calculate the choline intake and estimate the prevalence of intakes below the AI for women of childbearing years

Methods

- Dietary intake data was derived from the 2004 Canadian Community Health Survey (CCHS) 2.2 for all non-pregnant, non-lactating women between the ages of 18-45 years. The 2001b version of the Canadian Nutrient File (CNF), which was used to calculate the nutritional information in 2004 did not contain information on choline.
- Choline nutrient information was imported from the 2010 CNF and matched to the foods in the CCHS 2.2 dietary data (5). Missing information was hand-coded and calculated (amount choline/g **X** amount food/g).
- The first day of recall was used to calculate the percent contribution using weighted sums for choline in all reported foods as well as the mean intakes. All analysis was done using SAS 9.4. Software for Intake Distribution Estimation (SIDE,1.11, Iowa State University) was used to estimate the prevalence of intakes below the AI.

Results

Table 1. Mean Choline Intake and the Prevalence Below the AI in Women of Childbearing Years

Intake (mg)[1]	AI (mg)	Prevalence below AI (%)[2]
296.8 ± 0.63	425	82-87%

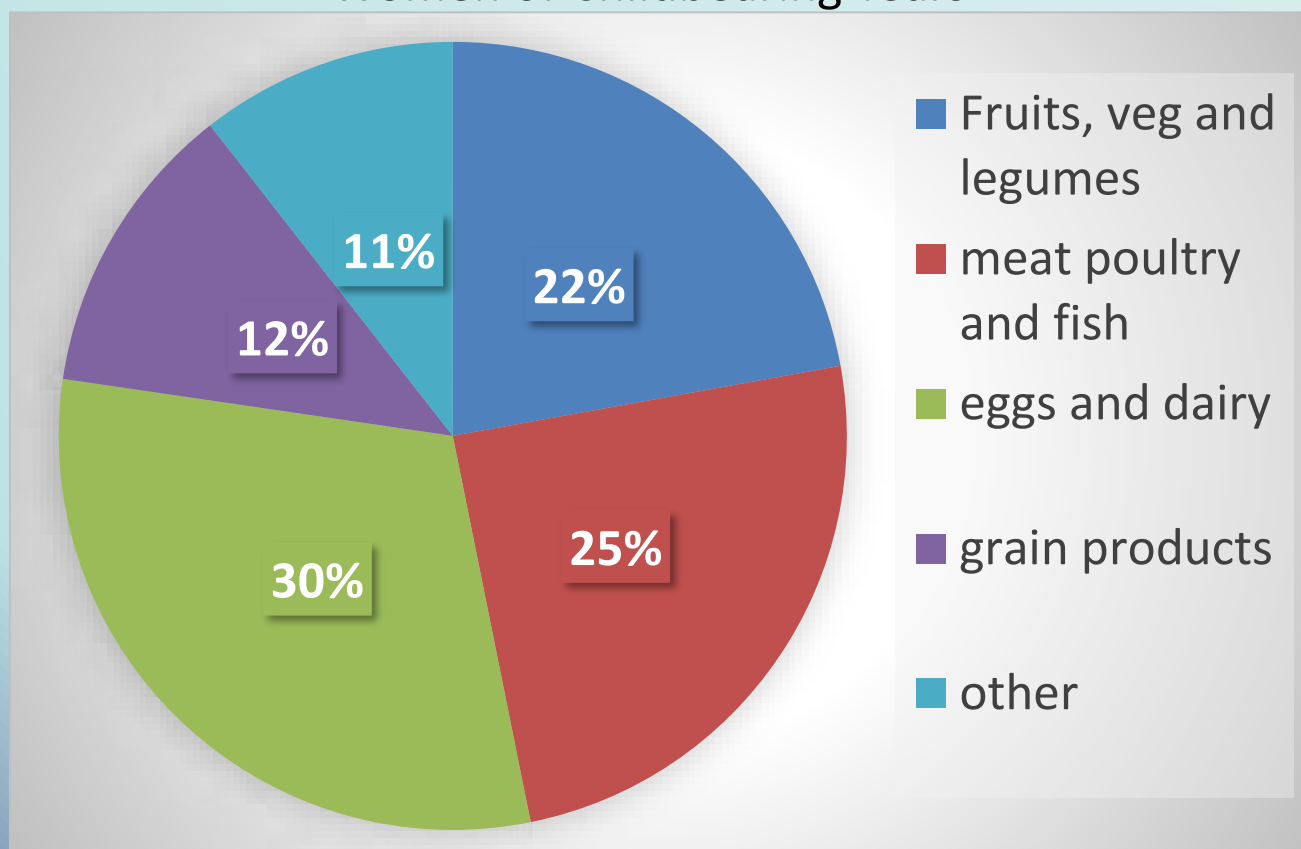[1]Mean ± SE. Generated using survey means. n=4308, Non-pregnant, non-lactating women aged 18 to 45 yrs.

[2]Choline variable created using CNF 2010. Prevalence calculated for two DRI reference groups Females 19-30 & 31-50.

Figure 1. Dietary Sources Contributing to Choline Intake in Women of Childbearing Years

Fruits, veg and legumes — 22%
meat poultry and fish — 25%
eggs and dairy — 30%
grain products — 12%
other — 11%

[1]Non-pregnant, non-lactating women aged 18-45 years. N=4308

Table 2. Top 10 Foods Contributing to the Choline Intake of Women of Childbearing Years[1]

Rank	Food	Percent Contribution
1	eggs	11.5
2	2% milk	6.0
3	chicken	5.9
4	ground beef	4.2
5	1% milk	3.9
6	coffee	3.4
7	cereal grains and flours	2.9
8	fruit juice	2.5
9	onions, garlic	2.3
10	skim milk	2.1

[1] Nonpregnant, non-lactating women aged 18 -45 yrs. N=4308

Conclusions

- The majority of Canadian women of childbearing years are not meeting the AI for Choline
- Foods of both plant and animal origins contribute almost equally to total choline intake and it is essential to improve our knowledge of choline containing foods in order to improve choline intake in women of childbearing years along with the other nutrients essential for reproduction.

References

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Significance to Dietetics

Dietitians need to a) become aware of food sources of choline and b) emphasize consumption of these foods to improve choline intake, along with folate, vitamin B12 and iron, when counselling women of childbearing years.