A simulated Australian diet: discrepancy between composition from food tables and composition from analysis

KZ Walker, A Birkett, ZX Lu, G Jones, K O'Dea, JG Muir

Deakin Institute of Human Nutrition, Deakin University, Malvern, VIC 3144

A simulated Australian diet with a seven day cycle menu has been developed using the most commonly consumed foods and the mean macronutrient profile obtained from the Victorian Nutrition Survey, 1990 (1). The aim is to use this as a baseline diet for intervention studies. In addition we have compared the nutrient density of the simulated diet as calculated from Australian Food Tables with that obtained by direct analysis. Foods for each day of the menu were prepared in ready-to-eat form, weighed and frozen at -20°C. Stored foods were later thawed and homogenized. Samples were freeze-dried before analysis of energy (by combustion), lipid (by GC) protein (by Kjeldahl), ash (by AOAC-14-006) and dietary fiber (by AOAC 43.A14). Total carbohydrate (CHO) was determined by difference. Starch was determined after extraction of sugars using a Megazyme kit, total non-starch polysaccharide (NSP) by the method of Englyst and Cummings (2) and total sugar by HPLC (2 pooled samples only). RS was measured by an in vitro assay (3) except that foods were not chewed but minced to 10 mm.

	Nutrient density[1]		
	In 1990 survey	In simulated diet	
		By calculation	By analysis
Energy (kJ)	10 000	10 000 ± 23	10 900 ± 220[2]
Protein	98.8	99 ± 0.7	91 ± 3.1[3]
Total fat	91.6	91 ± 0.7	76 ± 2.8[2]
P : M : S ratio	0.4 : 0.8 : 1	0.41 : 0.78 : 1	0.48 : 0.88 : 1
Digestible CHO	281	286 ± 1.4	N/A
Total CHO	ND	ND	357 ± 13
Sugar	154	154 ± 0.7	169
Starch	127	127 ± 0.4	111 ± 6.2[3]
Total dietary fibre	30	30 ± 0.2	31 ± 2.0
Total NSP	ND	ND	26.9 ± 1.7
RS	5.8[4]	ND	8.6 ± 1.8
Alcohol	9.6	9.8 ± 0.1	ND

[1] g/10MJ, mean ± SE; [2] P<0.005; [3] P<0.05; [4] from (4)

From the table, nutrient density of the simulated diet as calculated from Food Composition tables corresponds closely with the mean macronutrient intake described in the survey. Differences however, were evident when diet composition was determined by direct analysis. Energy was higher by analysis since this is total energy released by combustion whereas calculated energy is digestible energy only. Similarly, total CHO from analysis is not directly comparable with digestible CHO from calculation. Of greater interest is the difference in total protein ($P < 0.05$), total fat ($P < 0.005$) and starch ($P < 0.05$).

Also sugar content was 9% higher after direct analysis than by calculation. The diet contained 31 ± 2.0 g/10MJ NSP, of which 51% was insoluble and 49% was soluble NSP. Content of RS ranged between 3 and 17 g/10 MJ/day. This study raises questions as to how well Australian Food Composition tables reflect composition of the food supply. In particular, there appear to be difficulties with fat content possibly due to accumulated change with time in the composition of many manufactured foods and from widespread supply of leaner cuts of meat.r

1. Baghurst K, Record S, Powis G, Stafford H. eds. What are Australians eating? Results from the 1985 and 1990 Victorian Nutrition Surveys. Adelaide: CSIRO Division of Huma Nutrition, 1993.
2. Englyst HN, Cummings JH. Improved method for measurement of dietary fiber as non-starch polysaccharide in plant foods. J Ass Anal Chem 1988;71:808-14.
3. Muir JG, O'Dea K. Validation of an in vitro assay for predicting the amount of starch that escapes digestion in the small intestine of humans. Am J Clin Nutr 1993;57:540-6.
4. Baghurst PA, Baghurst KI, Record S. Dietary fibre, non-starch polysaccharides and resistant starch. A review. Food Australia (Suppl) 48:S2-S35.