



1st MEETING
23 June, Conference Rooms 2, Aviation House
125 Kingsway, London, WC2B 6NH

DRAFT MINUTES

Chairman Professor Alan Jackson

Members: Dr Anthony Williams
Professor Chris Riddoch
Professor Andrew Prentice
Professor Joe Millward
Mrs Stella Walsh
Professor Christine Williams

Secretariat: Dr Alison Tedstone (FSA)
Dr Peter Sanderson (FSA)
Dr Sheela Reddy (DH)
Clifton Gay (FSA)
Gillian Swan (FSA)

Apologies: Dr Anita Thomas
Professor Marinos Elia
Professor Prakesh Shetty

Agenda Item 1

Chairs' introduction and welcome

1. The Chair welcomed members to the first meeting of the SACN Working Group on Energy.

Agenda Item 2

Summarize the role of SACN, code of practice and openness – SACNenergy/05/01, SACNenergy/05/02

2. The role of the secretariat and the Working Group was described, as was the established frame work for risk assessment used by SACN. The need for open decision making that can be scrutinized by interested parties was also noted.

Agenda Item 3

Background to the Energy Requirements Working Group – SACNenergy/05/03

3. The interpretation by SACN of the joint FAO/WHO/UNU expert report on Human Energy Requirements and its implications for the UK population, provided the stimulus for setting-up the Working Group.

4. The FAO/WHO report recommended energy intakes based on aspirational levels of energy expenditure, rather than an observed energy expenditure level. While attainment of this energy expenditure level might benefit health, there is scope for misunderstanding by those using the recommendations.

5. The DRVs for energy form the basis for public health policy, e.g. guidance daily amounts (signposting), school meal provision etc. The DRVs, therefore, need to be as accurate as possible.

6. The SACN paper 05/03 was outlined. Comparison of the NDNS for adults 2000/1 with the NDNS for adults 1986/7 found a decrease in estimated energy intakes, yet an increase in prevalence of obese and overweight individuals.

7. Under reporting and the method used in the NDNS to calculate estimated average requirement (EAR) for energy was discussed, in particular the appropriateness of the assumed physical activity level (PAL). It was noted that the EAR for energy was built on a series of assumptions, e.g. basal metabolic rate (BMR), height and weight, and the physical activity level applied. Variability within populations also needed to be considered.

8. The Working Group were informed that under-reporting within the NDNS for adults 2000/01 had been investigated using an estimation method for energy expenditure using the data collected on physical activity. This method was compared with an assessment using doubly labelled water techniques in the feasibility study. The findings were that in the main survey estimated underreporting approximated to 25% of energy needs and this increased to about 30% of energy needs in obese subjects. It was noted that it would be important to consider whether the extent of under-reporting of energy intakes had changed since the 1986/7 NDNS.

9. The factors affecting the EAR for energy were discussed, e.g. physical activity levels, as was the appropriateness of the PAL used in the calculations for the different age groups. The Working Group questioned whether physical activity levels had changed since the 1986/7 NDNS for adults.

10. The Working Group noted that it was necessary to determine how the information that forms the basis for concern was derived, i.e. the limitations of the methodology employed, such as the use of generic food composition data. It was also noted that it would be necessary to determine how the application of the FAO/WHO recommendations to the data would alter the interpretation, despite the fact that this would probably not alter the current situation.

11. The variability in individuals' BMR was discussed, e.g. an overweight person compared to a lean person, and the change in population patterns, such as body composition. It was noted that increased obesity within the NDNS could lead to increased under-reporting of energy intakes.

12. The Working Group noted that the FAO/WHO report was based more on energy expenditure data than energy intake data, e.g. doubly labelled water experiments, and that similar experimental data were used in the determination of the COMA DRVs for energy.

Agenda Item 4

Terms of Reference – SACNenergy/05/04

13. The Working Group discussed their terms of reference. It was agreed that they should focus on the first two bullet points initially, but that they needed to be careful with the interpretation of the third bullet point. The fourth could be difficult to achieve and it was agreed to remove the text after 'nutrients' in the fourth point. It was noted that further amendments could be introduced at a later date, if necessary.

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Agenda Item 5

Energy requirements of adults – SACNenergy/05/05

14. It was noted that some of the papers presented to the Working Group were confidential, as they had not yet been published.

15. It was noted WHO/FAO recommendations did not take into account optimal body mass indices (BMI), although recommendations were made for different energy expenditure levels. The question of whether there was a minimum level of energy

expenditure and therefore energy intake required for the provision of other nutrients was considered. Equally some population subgroups consume high-energy intakes that are nutrient poor.

16. It was noted that a database of doubly labelled water experimental data, which was updated regularly, was available. Although the predictive equations for BMR estimation were unsatisfactory, nothing better was available. A critique of the Schofield equation was requested.

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17. It was noted that there was variability in doubly labelled water measures of energy expenditure, and that experiments assumed a dietary mix of macronutrients (FQ, food quotient) when measuring CO₂. Gaining or losing weight also affects the macronutrient source assumptions. These effects are only likely to account for a few percent in the variability of average values, although for inter-individual variability this is a matter of debate.

18. It was noted that factors contributing to variability needed to be considered, especially those outside the ‘normal’ range. This was pertinent to the use of metabolizable energy intake values and net metabolizable energy.

19. The limitations of doubly labelled water experiments were discussed - the effect on behaviour of being experimented on, fat mobilization - although it was noted that these would probably need to be very aberrant from the norm to affect the results.

20. The use of BMI was discussed. It was noted that there were ethnic differences, e.g. South Asians have increased fat mass at birth and decreased muscle mass relative to average Caucasians; therefore, for the same BMI they have increased fat mass. The question was raised as to whether this was due to genetic or environmental factors. It was noted that the contribution to resting energy expenditure of fat and muscle mass was

different. This affects understanding of the range of normality. It was, also, noted that there were gender differences in adiposity.

Agenda Item 6

Macronutrients as sources of food energy – SACNenergy/05/06

21. The contribution of different macronutrients as sources of food energy was considered. The question was raised as to whether all calories were equal. It was noted that the human body is well tuned to match substrates to oxidation. Experiments manipulating the macronutrient content of diets have shown that alcohol is oxidized immediately, as there is no storage facility for alcohol, and this dominates the oxidative hierarchy; carbohydrate and possibly protein are next, as there only a small capacity for storage of these; fat is at the bottom of the hierarchy. When the macronutrient ratios are changed oxidation is balanced to match intake.

22. The question was raised as to whether the macronutrient substrate mix in the diet mattered, as energy balance is maintained regardless of substrate. Whether differences in the extent of diet-induced thermogenesis by different macronutrients mattered was also discussed. It was noted that if the macronutrients were given in isolation, protein had a higher specific dynamic action than alcohol, which in turn was greater than carbohydrate, which in turn was greater than fat; however, when the macronutrients were provided in a mixed meal these differences were abrogated. It was noted that experiments using mixed diets with very high proportions of protein had not been conducted.

23. It was noted that the fermentation of non-digestible starch and the energy equivalents, e.g. Atwater factors, should possible be considered. The Secretariat were requested to get additional WHO/FAO report information.

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24. It was noted that some experimental evidence suggested that unsaturated fatty acids were oxidized in preference to saturated fatty acids; however, there was only poor evidence available on this from mixed diet studies.

25. The possible influence of uncoupling proteins on energy expenditure was discussed. It was noted that it was now thought uncoupling proteins 2 and 3 were involved in shuttling fatty acids into mitochondria and quenching reactive oxidation species, rather than uncoupling respiration from adenosine triphosphate generation as a means of energy dissipation.

26. It was noted that appetite and energy balance might be an area of interest, but this was unlikely to be a factor with regard to the DRV for energy; this would be relevant to recommendations for weight loss/maintenance diets. With regard to the regulation of energy intake, the energy density of foods needs consideration. It was noted that the experiments investigating this had not focused on beverage intakes, e.g. sugary drinks, but had shown that the covert manipulation of foods with fat supports this. It was noted that the total volume of foods was sensed more by subjects than their energy content, which they were quite insensitive to.

27. While covert manipulation of the energy density of foods supported this theory, compensation occurred when manipulation was overt. It was noted that a meta-analysis of ad libitum low fat diet trials showed a significant effect on weight loss though it was only modest and it is probable that other factors, e.g. palatability affect energy intakes. The satiating effect of different macronutrients was discussed. It was noted that protein is thought to be more satiating than carbohydrate, which in turn more satiating than fat and alcohol. It was also noted that the evidence base to suggest high protein intakes could be detrimental was not strong.

28. It was observed that increased energy expenditure assists the scope for regulation, e.g. substrate utilization during exercise; therefore, higher energy expenditures enable the body to more easily balance energy intakes. It was noted that specific nutrient

deficiencies can predispose to inadequate energy handling and a higher energy expenditure/intake can result in higher micronutrient intakes.

29. It was noted that the frequency of consumption, e.g. nibbling versus gorging, had been shown to have no effect on energy expenditure; however, it can have effects on cardiovascular disease risk factors, blood lipid profiles and insulin release.

Agenda Item 7 and 8

Energy requirements of illness SACNenergy 05/07 and Energy expenditure – implications for health in UK

30. The effect of physical activity on energy requirements and subsequent health outcomes was discussed. It was noted that the recommendations for energy intake and physical activity need to be considered together. A low level of energy expenditure could be associated with a low intake of nutrients, which in turn could be detrimental.

31. All cause mortality was discussed in the recent report from the Chief Medical Officer on physical activity. It was noted that this was a review of the literature by leading experts rather than a systematic review with a meta-analysis, as only 3 months were allowed for its compilation. The report concluded that for the prevention of obesity, most individuals require 45-60 minutes of physical activity each day. To reduce risk for other chronic diseases 30 minutes each day was necessary. The size of the inverse associations between physical activity and the major chronic diseases – most notably coronary heart disease - observed in prospective cohort studies was on a par with those observed for smoking.

32. The issue of measurement error was discussed. The use of accelerometers to measure physical activity was discussed; it was noted that a combination of methods was necessary if a full picture of the level and pattern of physical activity is required. The

need to validate methods, e.g. by using doubly labelled water experiments, was highlighted.

33. It was noted that the association observed between cardiorespiratory fitness and mortality was independent of BMI, although the extent of fitness among overweight/obese subjects was queried. Both activity levels and fitness levels, though clearly related, were independent risk factors for disease specific and all cause mortality.

34. It was noted that PAL values don't account for different types of physical activity. They are appropriate for weight management, but not all other health outcomes. Cancer and cardiovascular disease may relate to PAL, but bone health is as much dependent on the mode of activity as the quantity. It was suggested that the SACN energy report should map onto the CMO review and that it should be clear in it's understanding of the various dimensions of physical fitness.

35. It was noted that physical activity is particularly associated with endocrine-related cancers, e.g. breast cancer. It is thought that physical activity may reduce risk for colorectal cancer by speeding up gut transit. A low level of physical activity appears to predispose to metabolic syndrome, e.g. fat accumulation by the liver, reduced glucose uptake by muscle.

Discussions and future work programme

36. The Working Group considered the structure for the report. The mismatch between decreasing energy intakes and the increasing prevalence of obesity in the NDNS data was noted. It was suggested that it was not necessarily due to a single factor, but could be multifactorial. There are levels of assumptions based on top of each other. It was also suggested that there has been an increase in the prevalence of deviations from the norm, e.g. increased obesity and increased under-reporting.

37. The recommended levels of physical activity needed careful consideration. It was suggested that a range that included both actual and recommended levels might be appropriate. The process required to define this needs to be determined.

38. The Working Group requested amendments to table 1 describing the NDNS data. In particular the EARs used were average, and the PAL used needs to be stated (determine if these have decreased over time). It was noted that this calculation forms the basis for the terms of reference and, therefore, needs to be correct. A breakdown of the age groups comprising the 19-64 year olds was also requested. It was requested that the EARs in the NDNS adults should be recalculated using BMRs calculated for each individual and PAL values derived from physical activity records. This would give a better assessment of energy intakes compared with requirements.

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Next meeting, 14 September 2005