


Problems with red meat in the WCRF2

Dear Sir:

The World Cancer Research Fund's (WCRF's) 2007 review of food, nutrition, physical activity, and the prevention of Cancer (WCRF2) (1) does not appear to have been reviewed yet in the Journal, but its conclusions must have an effect on nutritional advice around the world. I have found that there are omissions and errors in its most controversial section, which discusses red meat and colorectal cancer, and the AJCN, one of the leading nutrition journals, would seem the best place to air these concerns.

The WCRF's first report (2) concluded that red meat probably increases the risk of colorectal cancer. However, the Joint WHO/FAO Expert Consultation (3) concluded that high consumption of preserved meat probably increases risk of colorectal cancer. In its 2007 report (1), the WCRF concludes that red meat is a convincing cause of colorectal cancer. This very significant change of judgment is based on evidence that is presented in only one page of text of the 517-page report. This section on meat and colorectal cancer contains a number of omissions and errors. The main ones are summarized here:

- 1) Elsewhere in the report, case-control studies are presented in forest plots (even with abundant cohort studies), but the 71 published case-control studies on meat and colorectal cancer are not presented.
- 2) The report omits 13 cohort studies on red meat and colorectal cancer with a total of 1,578,970 subjects, including a very large 1992 study by the American Cancer Society (4) and studies by Hirayama (5), Heilbrun et al (6), Goldbohm et al (7), Knekt et al (8), Gaard et al (9), Hsing et al (10), Jansen et al (11), Flood et al (12), Kojima et al (13), Chao et al (14), and Sato et al (15). All but 2 of these studies found no significant association with red meat.
- 3) The report omits the follow-up of 5 groups of vegetarians compared with socially matched omnivores by Key et al (16). They found no difference in mortality from colorectal cancer.
- 4) Phillips (1975) was superseded by Phillips and Snowden (17), with more cases, and who found that meat was not positively associated with colorectal cancer.
- 5) In Pietinen et al (1999), the relative risk of colorectal cancer for beef, pork, or lamb was 0.9 or 0.8 and not significant (not 1.20 as in the WCRF2).
- 6) The data from Giovanucci (1994) in the WCRF2's Figure 4.3.2 (which only reported colon cancer) should be replaced by the 2004 study by Wei et al (18), which reported on more cases, had longer follow-up of the cohort, and had relative risks of 1.69 for colon and 1.0 for rectal cancer (not 2.20 as in the WCRF2).
- 7) Similarly, the data from Willett (1990) should not be used in Figure 4.3.2. That article had 150 cases, but in 2004 Wei et al (18) reported 876 cases in the same cohort of US nurses and the multiple risk factor relative risks (MVRR) were not significant (0.92 in the top quintile for rectal cancer).
- 8) The 2 dose-response lines in Figure 4.3.4 attributed to Kinlen et al (19) cannot be found in any publication by Kinlen in 1983. Three of the 5 lines in this figure are flat.
- 9) Finally, the CD accompanying the WCRF2 publication states that mechanisms for involvement of meat in colorectal cancer are "far from plausible."

It is not clear who among the hundreds of names at the front of the report was responsible for pages 120–121. The evidence here is incomplete, inaccurate, and does not explain why the risk of colorectal cancer from red meat was moved up from "probable."

The author had no commercial conflict of interest.

A Stewart Truswell

The University of Sydney
Human Nutrition Unit Biochemistry Building G08
Sydney, NSW 2006
Australia
E-mail: s.truswell@usyd.edu.au

REFERENCES

1. World Cancer Research Fund. Food, nutrition, physical activity, and the prevention of cancer. Washington, DC: American Institute for Cancer Research, 2007.
2. World Cancer Research Fund. Food, nutrition and the prevention of Cancer. Washington, DC: American Institute for Cancer Research, 1997.
3. Report of a Joint WHO/FAO Expert Consultation. Diet, nutrition and the prevention of chronic diseases. World Health Organ Tech Rep Ser 2003; 916:147–8.
4. Thun MJ, Calle EE, Nambodiri MM, et al. Risk factors for fatal colon cancer in a large prospective study. *J Natl Cancer Inst* 1992;84:1491–500.
5. Hirayama T. Lifestyle and mortality: a large-scale census-based study in Japan. Basel, Switzerland: Karger, 1990.
6. Heilbrun LK, Normura A, Hankin JH, Stemmerman GN. Diet and colorectal cancer with special reference to fiber intake. *Int J Cancer* 1989;44:1–9.
7. Goldbohm RA, van den Brandt PA, van't Veer P, et al. A prospective cohort study on the relation between meat consumption and the risk of colon cancer. *Cancer Res* 1994;54:718–23.
8. Knekt P, Steineck G, Järvinen R, Hakulinen T, Aromaa A. Intake of fried meat and risk of cancer: a follow-up study in Finland. *Int J Cancer* 1994;59:756–60.
9. Gaard M, Tretli S, Loken EB. Dietary factors and risk of colon cancer: a prospective study of 50,535 young Norwegian men and women. *Eur J Cancer Prev* 1996;5:445–54.

10. Hsing AW, McLaughlin JK, Chow WH, et al. Risk factors for colorectal cancer in a prospective study among US white men. *Int J Cancer* 1998;77:549–54.
11. Jansen MCJF, Bueno-de-Mesquita HB, Buzina R, et al. Dietary fiber and plant foods in relation to colorectal cancer mortality: the Seven Countries Study. *Int J Cancer* 1999;81:174–9.
12. Flood A, Velie EM, Sinha R, et al. Meat, fat and their subtypes as risk factors for colorectal cancer in a prospective cohort of women. *Am J Epidemiol* 2003;158:59–68.
13. Kojima M, Wakai K, Tamakoshi K, et al. Diet and colorectal cancer mortality: results from the Japan Collaborative Cohort Study. *Nutr Cancer* 2004;50:23–32.
14. Chao A, Thun MJ, Connell CJ, et al. Meat consumption and risk of colorectal cancer. *JAMA* 2005;293:172–82.
15. Sato Y, Nakaya N, Kuriyama S, Nishino Y, Tsubono Y, Tsuji I. Meat consumption and risk of colorectal cancer in Japan: the Miyagi Cohort Study. *Eur J Cancer Prev* 2006;15:211–8.
16. Key TJ, Fraser GE, Thorogood M, et al. Mortality in vegetarians and non-vegetarians: a collaborative analysis of 8300 deaths among 76,000 men and women in five prospective studies. *Public Health Nutr* 1998;1:33–41.
17. Phillips RL, Snowdon DA. Dietary relationships with fatal colorectal cancer among Seventh-Day Adventists. *J Natl Cancer Inst* 1985;74:307–17.
18. Wei EK, Giovannucci E, Wu K, et al. Comparison of risk factors for colon and rectal cancer. *Int J Cancer* 2004;108:433–42.
19. Kinlen LJ, Herman C, Smith PG. A proportionate study of cancer mortality among members of a vegetarian society. *Br J Cancer* 1983;48:355–61.

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Reply to AS Truswell

Dear Sir:

We are grateful for the opportunity to respond to Dr Truswell's comments. Truswell presents the conclusions of the 2007 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) report (1) as "a change of judgement." Although it is true that the conclusions of the 2007 report are different from those in the 1997 report (2), it is important to note that the processes used were entirely new—formal systematic literature reviews (SLRs) and meta-analysis. The literature was reviewed, and the evidence analyzed and displayed, in a standard format by using a new specification developed specifically for this purpose (3). The report's panel drew conclusions on the basis of predefined criteria that were different from those used in 1997.

Truswell notes the conclusion of the 1997 report that red meat is "probably" a cause of colorectal cancer but not its conclusion that processed meat is "possibly" a cause. He also notes the conclusions of the WHO/FAO report (his reference 3) on preserved meat but not red meat. He does not mention the 1998 UK Department of Health report, which concluded that there was moderate evidence that lower consumption of red or processed meat would reduce risk of colorectal cancer (4). Since these reports were published more evidence has become available on the link between red meat and colorectal cancer—in particular, results from a large international European multicenter study (5).

Truswell notes that the conclusion on red meat is summarized in only a couple pages of the 2007 report. However, the 2007 report is only a summary of the voluminous evidence reviewed by the panel. The full SLR can be found on the CD that is provided with the 2007 report. Pages 120–122 in the printed report present only key information related to red meat. The conclusions of the panel were

based on a detailed discussion of the whole SLR, not simply the summary evidence provided in the report.

Here we briefly respond to the Truswell's specific comments:

- 1) A uniquely large number of both cohort and case-control studies were identified for colorectal cancer. Because of the large number of published cohort studies, and in view of potential biases of case-control studies and the consequent questionable additional value of expending resources on summarizing them, the panel agreed in this case to restrict the evidence to the cohort studies alone, as stated in the report (page 121, paragraph 4.3.5.1.1)
- 2) Truswell lists 13 cohort studies that he says were not included in the SLR under red meat. Most of these studies did not report on red meat specifically (references 4, 5, 6, 7, 9, 10, 12, 14). Some studies reported on red and processed meat combined, and others on total meat. All except Hirayama (reference 5), as well as several others not mentioned by Truswell, were included in the SLR. His reference to Hirayama is to a book and not a peer-reviewed journal. The SLR did address the broader combined group of red and processed meat, and this was part of the panel's deliberations, although there was no summary in the report. One study was an ecological study (reference 11), one reported on beef only (reference 13), and another only on fried meat (reference 8). Papers published after 2005 were not included in the SLR and meta-analyses but were identified in a prepublication update and included the article by Sato in 2006 (reference 15).
- 3) A more recent version of the Key et al 1998 article (his reference 16) was identified (6). However, it was not included in the SLR because it was a reanalysis of 5 studies, not an original study.
- 4) Phillips and Snowdon 1985 study (reference 17) was not included under red meat because it reported on meat and poultry combined.
- 5) Truswell is correct that, in Pietinen 1999, for beef, pork and lamb the risk estimate for red meat is 0.8 or 0.9. The value of 1.2 for red and processed meat combined was erroneously used in the highest compared with lowest forest plot and the per 100-g/d meta-analysis. Although this risk estimate might have an effect on the summary estimate, it does not change the overall picture. Most studies reported a risk estimate in the direction of increased risk. In addition, the panel gave more weight to the article by Norat 2005 (5) than the article by Pietinen 1999. Pietinen 1999 is a study limited to a specific group of male smokers from the Alpha-Tocopherol, Beta-Carotene study in Finland, whereas Norat 2005 is a study carried out across Europe.
- 6, 7) Wei 2004 was used in the highest compared with lowest forest plot. However, the year was erroneously given as 2003 rather than 2004. Wei 2004 gives exposure categories as ranges, whereas Giovannucci 1994 gives medians more suitable for the per unit meta-analysis.
- 8) Truswell is correct regarding Kinlen 1983. The 2 dose-response lines in Figure 4.3.4 were mislabeled and should have read Tiemersma 2002.
- 9) The SLR centers were asked to present their reviews of the evidence without interpretation. Nevertheless, the WCRF/AICR took the view that the SLR report should be