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Should we reduce consumption of red meat?

PERSPECTIVES

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Recently, a series of systematic reviews on red and processed meat was published. To what degree do these add new knowledge and the direction for how we regard the health effect of red meat?

Illustration: Øivind Hovland

The new systematic reviews on red and processed meat show that a reduction in consumption of processed meat of 21 g per day is associated with a relative risk reduction of 8 % for premature deaths (1). However, mean consumption in Norway is three times as high (approx. 70 g/day) (2), and a reduction that corresponds to the mean consumption is associated with a relative risk reduction of around 35 % for premature deaths (1, 3). For each 50 g per day reduction in unprocessed red meat intake, a 7 % risk reduction in premature mortality was found.

An optimal diet has been estimated to prevent 11 million deaths per year globally, or 255 million years of life lost (4). However, the field of nutrition research is a jungle of published material that can overwhelm clinicians and even researchers, not to mention journalists and consumers. In 2018 alone, more than 60 000 scientific articles on diet and nutrition were indexed in Medline/PubMed. Fortunately, meta-analyses have summarised research on how different food groups impact on the risk of various diseases and early mortality. The effects of fruits and vegetables, whole and refined grains, nuts, legumes, fish, eggs, dairy, red meat and sugar-sweetened beverages, have been summarised (1, 3, 5)-(7). However, sometimes meta-analyses fraught with substantial methodological weaknesses and problematic interpretations are published and these can have negative health consequences if translated into health policy. A recent series of systematic reviews on red and processed meat from the group Nutritional Recommendations Consortium (NutriRecs) is a good example of this, and ignited a debate on how nutrition research should be interpreted (1).

Many excluded studies

The meta-analyses from NutriRecs excluded several of the most recognised studies that have been included in earlier meta-analyses with the same outcomes (8). Especially in the analysis of unprocessed meat, many large-scale cohort studies have been erroneously excluded in the analyses of the effect on mortality, cardiovascular outcomes, colorectal cancers and type 2 diabetes, but also for other outcomes. Two examples are the European Prospective Investigation into Nutrition and Cancer and UK Biobank.

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Further, NutriRecs presented no forest plots, which are seen as essential for meta-analyses. This makes it time-consuming to find which studies are included in each analysis and makes the articles less transparent. They graded the quality of evidence using GRADE, and concluded that there was a low degree of evidence (1). Based on this, and because a small reduction in consumption of meat was considered only a small risk reduction, an 'expert panel' consisting of the authors made the surprising recommendation that most people do not need to reduce their current meat consumption. This contrasts with most nutritional guidelines from other organisations and countries (9).

Inappropriate use of GRADE

GRADE was developed to evaluate the quality of interventional studies, and all observational studies will initially be graded as *low* or *very low degree of evidence* (10). For studies on dietary patterns, activity and smoking, however, blinded randomised controlled trials are rarely possible, or even desirable. Does that mean that we cannot advise against high alcohol consumption, smoking, inactivity, or unhealthy diets?

When evaluating observational studies with GRADE, there are criteria for upgrading the strength of the evidence, such as dose-response effects and strong effect estimates. For nutritional studies an adapted version, NutriGrade, has been recommended, whereby evidence is upgraded for risk differences of 20 % or more (11). Many of the analyses by NutriRecs showed dose-response effects that were strongly significant and far beyond 20 % for moderately increased consumption (1). However, they did not upgrade the evidence, as the authors considered that red and processed meat may have been correlated with other dietary factors that could have confounded the relationship with morbidities and mortality.

> ***«The average Norwegian intake of processed meat compared with a diet without processed meat is associated with an increase in the relative risk of early mortality of about 35 %»***

The authors could nonetheless have investigated this by performing analyses stratified by whether studies adjusted for various dietary factors, but no such subgroup analyses were undertaken. Both measurement errors and changes in meat consumption during the follow-up period can affect the strength of observed associations (12, 13). For example, when using repeated measurements instead of only one baseline measurement and when also correcting for measurement errors, the relative risk for all-cause mortality per portion per day for red and processed meat increased from 1.05 to 1.11 to 1.25 in the *Nurses' Health Study* and from 1.08 to 1.14 to 1.83 in the *Health Professionals Follow-up Study* (and for type 2 diabetes from 1.10 to 1.14 to 1.44). To date, relatively few studies have used repeated measurements of diet and published risk estimates corrected for measurement errors. It is therefore likely that the effect estimates reported in most observational studies are conservative estimates of the true underlying effect.

The use of the GRADE criteria in the new meta-analyses has been criticised by several nutrition researchers. Other systems for classifying strength of evidence, which for example are used in the Nordic nutrition recommendations, also take into account biological plausibility, mechanisms and experimental data. When grading the evidence of the effect of red and processed meat on early mortality with the diet-adapted version *NutriGrade* or the evidence grading developed by the World Cancer Research Fund, which also incorporates experimental data in the evaluation of evidence (3, 14), the evidence is considered moderate to strong.

Most of the studies included in the analyses of red and processed meat and all-cause mortality had low risk of selection bias and scored high on most of the quality criteria by which they were evaluated (1). Studies which scored high on all quality criteria showed clearly that a 50 g per day increase in consumption of processed meat was associated with a 20 % increase in risk of all-cause mortality (12). The studies which the authors judged to have the highest quality came to opposite conclusions to those of the NutriRecs authors. Previous meta-analyses have found that high red and processed meat intake increases the risk of all-cause mortality (3), type 2 diabetes (13), colorectal cancer (15, 16), and cardiovascular disease (17).

Not adapted for the Norwegian context

The effects which are described in figures and tables of the new meta-analyses are partly consistent with previous meta-analyses, but the interpretation is different (1, 3). An important difference between NutriRecs' and previous meta-analyses is that previous meta-analyses presented results per 50 g of processed meat and per 100 g of unprocessed red meat per day (3, 13), while NutriRecs instead used 21 g per day (or 3 portions of 50 g per *week*), as a comparison for processed meat. It is not unexpected that this will show a weaker effect than if they had used the same frames of reference as used in previous meta-analyses.

But how do these amounts fit with the Norwegian diet? In the report '*Trends in the Norwegian diet 2018*' by the Norwegian Directorate of Health (2), it is estimated that the intake of meat in Norway is 76 kg per person per year, of which red meat accounts for 51 kg and white meat for 21 kg (in addition to some by-products of meat). If additional data from the national nutrition survey Norkost 3 (2010–2011) is considered, one can assume that the intake of processed meat in Norway is around 70 g per day on average, while the intake of white meat is probably around 30–60 g/day and unprocessed red meat is around 50–70 g per day (18). This equates to around 10 servings of processed meat per week. The average intake in Norway is therefore three times higher than the basis for comparison used in the new meta-analyses. In addition, many people eat more than these averages. In addition, many people consume far more than the average amount.

The average Norwegian intake of processed meat compared with a diet without processed meat is associated with an increase in the relative risk of early mortality of about 35 % based on both the new and previous meta-analyses (1, 3). For an average Norwegian man aged 45 years, such an increased risk will be associated with a reduction in estimated life expectancy of around 3 years (19). In addition, the intake of unprocessed red meat will be associated with loss of one additional year of estimated life expectancy. This is unlikely to be trivial from a public health perspective. Even though NTB's press release on the 1 October 2019 claimed that red meat is 'not so dangerous after all', these new meta-analyses do not cast doubt on the importance of the current dietary recommendations to reduce the intake of red and processed meat (20).

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