

Consumption of red and processed meats in relation to colorectal cancer

– *Risk and benefit management report*

by Rickard Bjerselius, Åsa Brugård Konde and Jorun Sanner Färnstrand

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Introduction

This risk management report is based on the World Cancer Research Fund's (WCRF) two reports that have compiled the scientific literature with respect to the various factors that can increase or decrease the risk for cancer occurrence. The first report was published in 1997 and in an updated version, in 2007. The latter report gives ten recommendations intending to reduce cancer incidence, based on current knowledge on the role of food, nutrition and physical activity. One of the conclusions in the 2007 WCRF Report is that there are compelling scientific evidence that consumption of red meat and processed meats are risk factors for the incidence of colorectal cancer (cancers in the colon and rectum).

The National Food Agency's risk and benefit assessment department have published a risk assessment report in which they have considered WCRF's ongoing updates, a compilation of relevant articles 2005-2013 as well as the latest survey of Swedish dietary survey with consumption data from 2011-2012. The main question answered in the risk assessment report is if WCRF's recommendations are justified and valid also for Swedish consumers. The report is published in the Swedish National Food Agency's rapport 3/2014 (Colorectal cancer-incidence in relation to consumption of red and processed meat. Darnerud, P.O. and Ilbäck, N-G; in English).

This report presents the National Food Agency's conclusions of the compilations of the scientific literature, as well as considerations made where other relevant factors also have been taken into account, in order to judge the relevance of the advice.

Relevant factors considered in this risk and benefit management report are environment, animal protection, antibiotic resistance, Swedish food culture and traditions as well as trade consequences. Other relevant factors taken into account are whether the consequence of the action taken are proportionate in relation to the possible risk or benefit it is estimated to have and/or if an action is practically viable and judged to be effective.

The purpose of this report is to clearly state how the National Food Agency justify its advice.

Members of the project group working with the risk assessment are Rickard Bjerselius, toxicologist, Jorun Sanner Färnstrand, communications strategist and Åsa Brugård Konde, nutritionist.

The National Food Agency, 16th June 2014

Advice for consumers

An advice to restrict consumption of red meat and processed meats to approximately 500 grams meat/week (cooked weight), particularly the consumption of processed meats, and to choose meat for consumption with regard to environmental and animal health concerns.

Motive for the advice

Risk and benefit assessment

World Cancer Research Fund (WCRF) is an independent organisation which co-operates with the American Cancer Institute. WCRF have in two reports compiled the scientific data with respect to various factors that respectively can increase or decrease the risk for cancer incidence. The first report was published in 1997 and a thoroughly revised version published in 2007. The latter report resulted in ten recommendations, which are derived from the evidence on food, nutrition, and physical activity. One of the conclusions in the 2007 WCRF Report is that there are compelling scientific evidence that consumption of red and processed meats are a risk factor for the incidence of colorectal cancer. WCRF therefore recommend on an *individual level*, to restrict the intake of red meat to 500 grams per week (cooked weight), which corresponds to 700 grams raw meat, and to avoid consumption of processed meats. A corresponding recommendation at the population level is 300 grams cooked red meat per week.

- Colon and rectal cancer (colorectal cancer) is the third leading cause of cancer in Sweden, the second leading cause in Europe and the third leading cause of cancer in the world.
- Approximately 3,45 million new cancer cases were reported in Europe during 2012.
- There are approximately 6 200 new cases of cancer in the colon and rectum annually in Sweden (Cancer i siffror 2013 (*Cancer in numbers*), Socialstyrelsen and Cancerfonden). This type of cancer is fatal for almost half of the cases.
- Most scientific evidence agree that food and substances therein have a very important role in preventing as well as initiating cancer in the colon and rectum.
- The process of carcinogenesis probably requires several factors acting together in a sequence of events, through initiation, promotion and progression. Potential factors and mechanisms behind all of these steps may be present in red and processed meats, probably in variable amounts.

Definition of red and processed meats in the report

Definitions of different types of meat included in the WCRF Report:

Red meat

Beef, pork, lamb and goat meat from domestic animals.

Meat from wild animals such as elk, deer, and boar may be considered as red meat, but are not included in the WCRF Report definitions, and studies on consumption of these meat types in relation to colorectal cancer are lacking. Poultry, such as chicken and turkey, are *not* included in the WCRF definition of red meat.

The National Food Agency's opinion is that reindeer meat might as well contain similar risk factors as red meat.

Meat products that do not consist entirely of red meat, and have not been produced with any of the methods of preservation mentioned below, are included in the WCRF's definition of red meat. Examples of such products common in Sweden are meatballs, burgers, ready to eat meals with meat, etc.

Processed meat products

Processed meat products are meat preserved with one or more methods, for example nitrite curing, smoking and/or drying. Processed meats include bacon, ham, heated sausages (*e.g.*, hot dogs), raw sausages (*e.g.*, salami), smoked sausage, brawn, black pudding, pate, liver pate, cold cuts, cold meats and canned meat. Poultry may also be treated with the same preservation methods.

This report refers to "red meat" and "processed meats" according to the above description. The amounts recommend in the WCRF Report is the weight in grams of cooked meat. 500 grams cooked red meat per week is equivalent to about 700 grams raw meat per week.

The association between consumption of red meat and colorectal cancer

- The conclusions made in the 2007 WCRF Report regarding red meat and colorectal cancer are based mainly on results from 16 cohort studies¹ with a participant number from 23 000 to 478 000.
- Studies of consumption of red meat as a risk factor for colorectal cancer (13 studies) have, when comparing the highest intake group to the lowest, a relative risk above 1 in all 13 studies. A relative risk above 1 is indicative of a positive connec-

¹ Cohort study: A cohort study is a longitudinal study which follows a limited group with common characteristics, a cohort. Cohort studies are often the best alternative for studying health risks. Subgroups within the cohort who, without the scientists' involvement, have received different treatment or been exposed to different health risks, are compared. Large and long-term cohort studies may for instance show unusual or late injury as a result of treatments or behaviour. A well-known example is a British cohort study which in the 1950's proved the relation between smoking, diseases and death.

tion between consumption and cancer occurrence. The results were statistically significant in four of them.

- A dose-response relationship could be observed from cohort data, where the study design (5 studies) allowed so. An increased risk of colorectal cancer could be seen at five or more servings of red meat per week.
- Seven meta-analyses² and 15 cohort studies showed a relatively increased risk for colorectal cancer at a consumption of 100 and 120 grams raw red meat per day (700-800 grams per week), compared to a lower consumption of red meat.
- Cohort studies and review articles published after the latest 2007 WCRF Report largely support the conclusions of an association between consumption of red meat and colorectal cancer.
- The reports for an increased risk of these types of cancer have varied in different studies. According to estimates by Pan *et al.* (2012) 9,3 per cent (men) and 7,8 per cent (women) of the total number of deaths may be avoided if people consumed less than approx. 300 gram red meat per week (cooked weight).
- The most discussed and examined proposed specific risk factors found in scientific data are linked to heme iron, fat, heterocyclic amines, cholesterol, salt, protein and virus.
- Other factors connected with an increased risk of cancer are for example alcohol, high energy intake, and low intake of vegetables. These and other life style factors have been adjusted for in the studies, but the connection between consumption of red and processed meats and colorectal cancer nevertheless is clearly shown.

The association between consumption of processed meat and colorectal cancer

- The conclusions made in the 2007 WCRF Report regarding processed meat and colorectal cancer are based mainly on the result from 14 cohort studies with 1 524 to 478 000 participants.
- 12 of the 14 cohort studies reported an increased relative risk of cancer from processed meats consumption, when comparing the groups of highest and lowest intake. The results were statistically significant in three of them.
- A dose-response relationship exists between the consumption frequency of processed meats and an increased risk for colorectal cancer.
- Meta-analyses of 5 and 14 of the cohort studies showed a relative increased risk of colorectal cancer at a consumption of 30 and 50 grams, respectively, of processed meats per day (210-350 grams per week), compared to a lower consumption of processed meats.
- Cohort studies and review articles published after the latest 2007 WCRF Report mainly supports the conclusion of a connection between consumption of processed meats and colorectal cancer.
- The proposed specific risk factors that are most discussed and examined in scientific data are linked to heme iron, fat, heterocyclic amines, nitrite and nitrosamines, cholesterol, salt, protein and virus.
- Other factors connected to an increased risk of cancer are for example alcohol, high energy intake, low intake of vegetables. These and other life style factors as well,

² Meta-analyses: a statistical method using and summarizing results from a varied number of completely independent studies, to illustrate for example the value of a certain treatment for a particular disease.

have been adjusted for in the studies, but the connection between red and processed meats and colorectal cancer nevertheless remains.

- The participants in the studies have a very small intake of processed meats from poultry. It is therefore not clear if consumption of processed meats from poultry affect the risk of colorectal cancer.

Uncertainties in the risk assessment

- The causation is not fully established, since a single mechanism able to explain how red and processed meats can lead to colorectal cancer is missing.
- There is a large variation in what is described as processed meats, and the categories of processed meats may differ between studies. This quite often causes large difficulties, when it comes to evaluation and comparison of epidemiologic³ studies and a possible connection of consumption of specific processed meats and colorectal cancer incidence.

Conclusion of the association between consumption of red and processed meats and colorectal cancer

- To summarize, the National Food Agency's review of current scientific data shows that there are clear scientific evidence showing a correlation between consumption of red and processed meat products, totalling more than 500 grams per week, and an increased risk for colorectal cancer.
- The 14 cohort studies that passed the inclusion criteria in the systematic literature outline show that intake of red and processed meats may be a risk factor for colorectal cancer.
- The data review shows a relatively larger risk regarding processed meats compared to red meat, when estimated on weight basis.
- Cohort studies and review articles published after the latest 2007 WCRF Report mainly supports the conclusion that intake of red and processed meats may be a risk factor for colorectal cancer.

Other risks associated with the consumption of red meat and/or processed meats

- Consumption patterns associated with a low risk for chronic disease include a very restricted amount of meat from sheep, beef and pork as well as processed meats from various types of meat (Wirfalt et al., 2013).
- Population studies have associated red meat and processed meats with an increased risk for type 2 diabetes (NNR 2012, Food, food patterns and health outcomes, Guidelines for a healthy diet).
- Processed meats are often high in salt and high salt intake is associated with hypertension and cardiovascular disease (NNR 2012, Sodium as salt).
- A number of studies published in the scientific literature have shown a connection between consumption of red meat and/or processed meats and other cancer forms such as pancreas, liver, lung, oesophagus and mammary gland (*e.g.*, Cross et al., 2007; Larsson and Wolk, 2012; Farvid et al., 2014).

³ Epidemiologic study: a scientific study that aim to illustrate the magnitude of a disease or another health problem in the population and/or illustrate its causes (risk factors), mainly of an environmental art (*e.g.*, life or food habits).

Benefits with red meat and processed meats

- Meat is a good source for many nutrients. According to the National Food Agency's latest Swedish dietary survey of adult eating habits (*Riksmaten* – adults 2010-11), (red) meat and meat dishes contributed with more than 20 per cent of the zinc intake and 13 per cent of the iron intake in the population. They contributed also with 10-20 per cent of the intake of several B-vitamins and 16 per cent of the intake of protein.
- Blood products and liver pate are especially rich in iron and may therefore be important when it comes to meet certain groups' intake of iron, *e.g.*, children, pregnant women and fertile women/women with high menstrual bleeding.

Risks with low consumption of red meat and processed meats

- An evaluation based on consumer data and scenario estimates were made, to study whether decreased meat consumption to the WCRF level (500 grams per week) and exclusion of processed meats would have negative nutritional consequences. The general conclusion was that an adjustment of the meat consumption according to the WCRF recommendation would have negligible nutritional consequences for the population (TemaNord 2013:506).
- Further reduction of red meat intake may result in not meeting the need for specific nutrients, such as iron, zinc and selenium. This applies especially to children and fertile women. A well-balanced diet with no red meat may, however, cater to the nutritional needs also in these groups.

Consumption of red meat and processed meats in Sweden

- The average consumption of cooked red meat and processed meats were, according to *Riksmaten* – adults 2010 (18-75 years), 320 grams and 160 grams respectively per week (for women). This gives a total of circa 480 grams per week, whereof 34 per cent is processed meats.
- The average consumption of cooked red meat and processed meats were, according to *Riksmaten* – adults 2010-11 (18-75 years), 520 grams and 280 grams respectively per week (for men). This gives a total of circa 800 grams per week, whereof 35 per cent is processed meats.
- The average consumption in Sweden shall be compared to the WCRF's recommendation for the population level, which is 300 grams red meat per week. The average consumption of red meat and processed meats in Sweden are approximately 160 and 270 per cent compared to the WCRF's 300 grams.
- The corresponding comparison with the WCRF's recommendations on an individual level, 500 grams per week, shows that 42 per cent of Swedish women and 72 per cent of Swedish men have a consumption exceeding 500 grams of red meat and processed meats per week (Appendix 1).
- Swedish men with the highest consumption (the 5 per cent who consumed the most) consumed approximately 1 670 grams cooked red meat (including intestinal and blood food) and processed meats per week. The corresponding figure for Swedish women was approximately 1 000 grams.
- The Swedish food survey among the adult population (18-75 years), *Riksmaten* 2010-11, shows that the average consumption at population level, as well as the consumption on an individual level of cooked red meat and processed meats are

high in Sweden, compared to the average and individual consumption recommended by the WCRF, which is 300 grams per week and 500 grams per week respectively.

Other factors taken into account

Current advice to Swedish consumers

- The National Food Agency's current advice is to eat less salted meat and processed meat products, as a way of reducing the salt intake, and to choose meat and processed meats with *Nyckelhålet* (the Keyhole symbol) as a way of reducing the intake of saturated fat.
- The National Food Agency advice on the environmental impact from different food categories. The environmental impacts from meat are large and cover many areas such as climate change, eutrophication and biodiversity.
- The National Food Agency advice that meat is a good source for many nutrients and that blood food and liver pate are rich in iron and therefore may be important in meeting the iron need in certain groups. Meat is, however, not a prerequisite for a nutritionally healthy diet pattern, but can be replaced by other foods.

Red meat and processed meats' effect on the environment

Meat, and red meat especially, is the food which has the largest impact on the environment. The meat consumption in Sweden has increased with 40 per cent since the 1990's ("Environmental effects from livestock products – meat, milk and egg", National Food Agency, Report 17/2013).

Positive environmental effect

- All livestock production in Sweden contributes to farmland being cultivated.
- Especially cattle and sheep are kept in woodland and thus, they contribute the most to avoid farmland being abandoned.
- The manure from animals contributes to humus content and soil structure in farmland.
- Grazing animals help to keep Swedish pastures open, which benefit the many endangered species that are dependent on that these fields do not overgrow.
- Ruminants create a need for grass cultivation, which is good for the fertility of the land.
- It is good to use the entire slaughtered animal from an environmental as well as a waste point of view, and various processed meats are important in this respect.

Negative environmental effect

Climate

- Livestock production accounts for almost 15 per cent of the world's total greenhouse gas emissions.
- The emissions derive mainly from feed production, animal digestion, manure and also conversion of natural land like rainforest into farmland for grazing and feed cultivation.

- Ruminants like cattle and sheep cause, because of their digestion, especially high emissions of greenhouse gases.
- The feed accounts for a relatively large share of the meat productions' greenhouse gas emission, especially feed for chicken and pork.

Biodiversity

- Biodiversity are, in a global perspective, decreasing due to today's livestock production, usage of plant protection products in feed cultivation, manure discharge and cultivation of the landscape (for feed cultivation or pasture).

Eutrophication

- How much the meat production contributes to eutrophication depends partly on where production occurs, how the manure is managed and disseminated, which feed that are used and the amount the animals eat.
- Emissions from farming will decrease if the number of animals bred on cultivated feed would decrease.

Use of plant protection products

- Large amounts of plant protection products are often used when cultivating grain feed and soy bean feed (this particularly applies to soy bean cultivation).

Animal welfare issues and antibiotic use

- Sweden have more stringent standards than most member states in the EU, which means that food producing animals in Sweden have, from an animal welfare perspective, a relatively good environment until slaughter (Source: the Swedish Board of Agriculture).
- Tail docking is prohibited according to EU common rules but may, if seen as necessary, be permitted in exceptional cases. This exception is often used in many member states, however not often used in Sweden (Source: the Swedish Board of Agriculture).
- The Swedish use of antibiotics to animals is the lowest in the EU, reducing the risk of occurrence and spread of multi-resistant bacteria that is also, in the long term, relevant to public health (EMEA/236501/2013).
- Sweden is one of the European countries with the lowest incidence of multi-resistant bacteria in food producing livestock (EFSA Journal 2014, 12(3):3590). The low use of antibiotics is among other things a result of animal welfare and consequently low morbidity.
- Slightly more than 40 per cent of meat from pig and 55 per cent of meat from beef were imported during 2013, mainly from countries within the EU (www.jordbruksverket.se).

Food culture and tradition

- Meat and processed meats are a considerable part of the food consumption for many consumers and potential health risks in relation to this are an important issue that affect many.

- Meat and processed meats are an important part of Sweden's food culture and tradition.
- Grazing animals help in keeping Swedish landscape open, that otherwise would be overgrown. This is positive for the Swedish cultural landscape and tradition.
- A reduction in meat consumption may, apart from a reduced risk of colorectal cancer, have positive nutritional effects, *e.g.*, if part of the consumption of meat and processed meats would be replaced with healthy alternatives such as legumes and vegetables. Swedish consumers eat considerably less vegetables and legumes than recommended.
- Game meat represents a relatively large proportion of meat consumption for a relatively larger number of Swedes.

Economic impact on the industry

- If advice on limited intakes of red meat and processed meats will have an impact, it may have economic consequences for, among others, primary producers, slaughter houses, processing companies, importers and retailers in Sweden. The extent of the impact will depend on whether the reduction will be of meat produced within or outside of Sweden. As of today, over 40 per cent of pig meat and 55 percent of the beef are imported, mainly from countries within the EU (www.jordbruksverket.se).

Summary

The Swedish National Food Agency (*Livsmedelsverket*) believes that it is justifiable to recommend consumers to limit their consumption of red meat and processed meats to approximately 500 gram meat per week (cooked weight) and of this amount especially limit the consumption of processed meats as well as to choose meat for consumption with regard to environmental and animal health concerns. The advice is to be applied on an individual level.

Motive for the advice

- There is clear scientific evidence that consumption of red meat and processed meats totalling more than 500 grams per week is a risk factor for colorectal cancer, which is the third most common cancer in Sweden. Intake of processed meats should have a larger reduction in relation to the red meat.
- The number of Swedish men and women who eat more than 500 grams red meat and processed meats per week is high, 72 and 42 per cent respectively.
- Accessible epidemiological studies indicate that consumed processed meats involve a greater risk of colorectal cancer per gram, but due to the studies' different definition of processed meats, there is difficulty in establishing a minimum amount for when the risk occurs. Therefore, the National Food Agency does not consider it necessary, based on scientific health reasons, to completely abstain from the consumption of processed meats. Environmental causes, animal-ethical causes and Swedish food tradition, are other reasons not to completely abstain from processed meat.
- Other negative health effects have also been connected to consumption of red meat and processed meats, for example an increased risk of type 2 diabetes.
- Processed meats often contain a high level of salt and high salt intake is associated with hypertension and cardiovascular disease.
- The environmental impact from meat is large and covers many areas such as climate, eutrophication and biodiversity. The meat production is, for example, responsible for almost 15 per cent of the world's total greenhouse gas emissions. Therefore, a reduction in meat consumption would be positive from an environmental perspective.
- The National Food Agency believes that the principle of proportionality is taken into consideration, when an advice to the consumers to limit consumption of red meat and processed meats involves such large benefits to human health and the environment, that the impact the advice may have on affected companies, Swedish tradition and food culture is not reason enough to refrain from giving an advice.

Decided on 16 June 2014

Ulla Nordström

Head of Unit

The Guidance Unit, National Food Agency

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Data behind the weekly consumption of red and processed meat

Annex 1.

The results that have been used come from the dietary survey (adults), Riksmaten vuxna 2010-2011, Swedish National Food Agency.

The number of participants in the study was in total 1797; 1005 women and 792 men.

The weekly consumption data result from a predicted daily intake from the study population in Riksmaten. The definition of red and processed meat is taken from 'Nutritional evaluation of lowering consumption of meat and meat products in the Nordic context' (Tetens et al, TemaNord 2013:506).

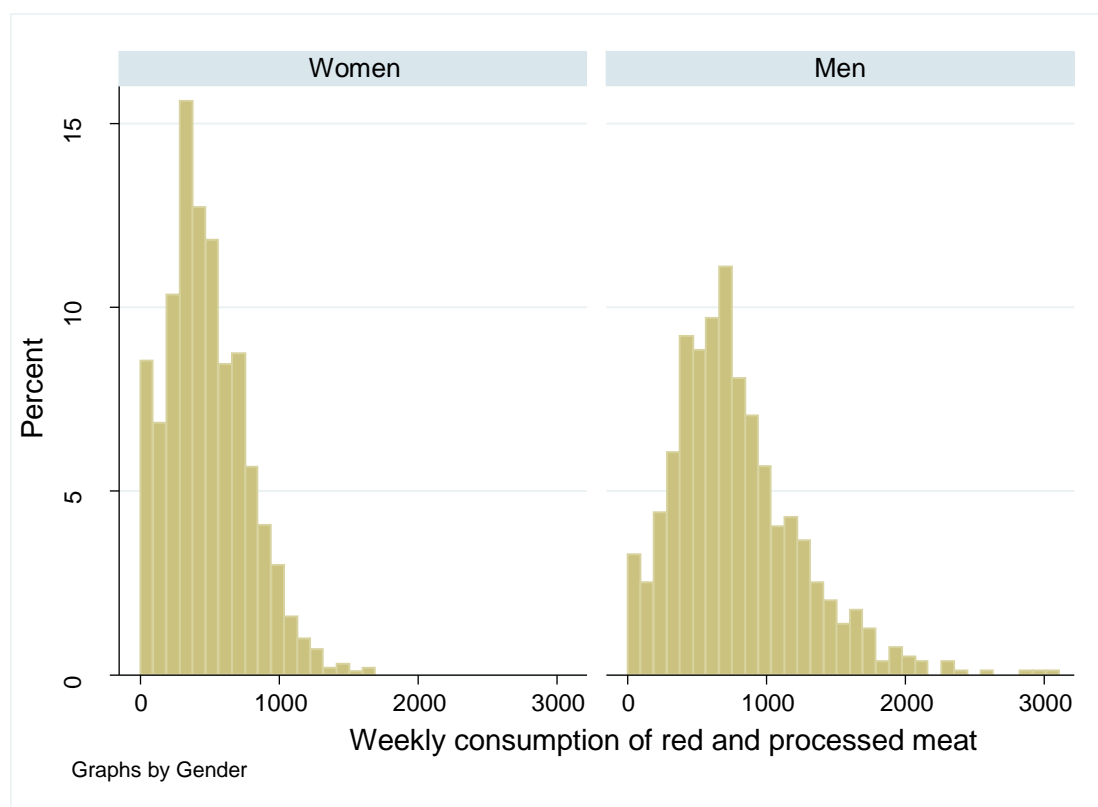
The daily intake is multiplied with 7 (days) to reach a weekly intake (table below).

	p5	p25	mean	sd	p50	p75	p95
Women	41	270	477	292	437	663	997
Men	154	469	786	462	710	1022	1669
Total	63	333	613	406	539	805	1387

The percent with an intake equal to, or more than 500 g, was then calculated.

à 425 women (42 %) och 568 men (72 %) have an intake of red and processed meat equal to, or more than 500 g, per week.

The histogram below describes the distribution of the weekly consumption of red and processed meat by women and men.



1. Contaminants and minerals in foods for infants and young children – analytical results, Part 1, by V Öhrvik, J Engman, B Kollander and B Sundström.
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3. Gluten i maltdrycker av Y Sjögren och M Hallgren.
4. Kontroll av bekämpningsmedelsrester i livsmedel 2010 av A Wannberg, A Jansson och B-G Ericsson.
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7. Cryptosporidium i dricksvatten – riskvärdering av R Lundqvist, M Egervärn och T Lindberg.
8. Proficiency Testing – Food Microbiology, April 2013 av L Nachin, C Normark, I Boriak and I Tillander.
9. Proficiency Testing – Drinking Water Microbiology, March 2013 by T Šlapokas and K Mykkänen.
10. Grönsaker och rotfrukter – analys av näringsämnen av M Pearson, J Engman, B Rundberg, A von Malmborg, S Wretling och V Öhrvik.
11. Riskvärdering av perfluorerade alkylsyror i livsmedel och dricksvatten av A Glynn, T Cantilana och H Bjeremo.
12. Kommuners och Livsmedelsverkets rapportering av livsmedelskontrollen 2012 av L Eskilsson.
13. Kontroll av rests substanser i levande djur och animaliska livsmedel. Resultat 2011 av I Nordlander, B Aspenström-Fagerlund, A Glynn, I Nilsson, A Törnkvist, A Johansson, T Cantillana, K Neil Persson Livsmedelsverket och K Girma, Jordbruksverket.
14. Norovirus i frysta hallon – riskhantering och vetenskapligt underlag av C Lantz, R Bjerselius, M Lindblad och M Simonsson.
15. Riksprojekt 2012 – Uppföljning av de svenska salmonellagarantierna vid införsel av kött från nötkärr, gris och fjäderfä samt hönsägg från andra EU-länder av A Brådenmark, Å Kjellgren och M Lindblad.
16. Trends in Cadmium and Certain Other Metal in Swedish Household Wheat and Rye Flours 1983-2009 by L Jorhem, B Sundström and J Engman.
17. Miljöpåverkan från animalieprodukter – kött, mjölk och ägg av M Wallman, M Berglund och C Cederberg, SIK.
18. Matlagningfettets och bordsfettets betydelse för kostens fettkvalitet och vitamin D-innehåll av A Svensson, E Warensjö Lemming, E Amcoff, C Nälén och A K Lindroos.
19. Mikrobiologiska risker vid dricksvattendistribution – översikt av händelser, driftstörningar, problem och rutiner av M Säve-Söderbergh, A Malm, R Dryselius och J Toljander.
20. Mikrobiologiska dricksvattenrisker. Behovsanalys för svensk dricksvattenförsörjning – sammanställning av intervjuer och workshop av M Säve-Söderbergh, R Dryselius, M Simonsson och J Toljander.
21. Risk and Benefit Assessment of Herring and Salmonid Fish from the Baltic Sea Area by A Glynn, S Sand and W Becker.
22. Synen på bra matvanor och kostråd – en utvärdering av Livsmedelsverkets råd av H Enghardt Barbieri.
23. Revision av Sveriges livsmedelskontroll 2012 – resultat av länsstyrelsernas och Livsmedelsverkets revisioner av kontrollmyndigheten av A Rydin, G Engström och Å Eneroth.
24. Kött – analys av näringsämnen: hjort, lamm, nötdjur, ren, rådjur, vildsvin och kalkon av V Öhrvik.
25. Akrylamid i svenska livsmedel – en riktad undersökning 2011 och 2012 av Av K-E Hellenäs, P Fohgelberg, U Fäger, L Busk, L Abramsson Zetterberg, C Ionescu, J Sanner Färnstrand.
26. Proficiency Testing – Food Microbiology, October 2013 av L Nachin, C Normark and I Boriak.
27. Proficiency Testing – Drinking Water Microbiology, September 2013 by T Šlapokas and K Mykkänen.
28. Sammanställning av analysresultat 2008-2013. Halt av polycykliska aromatiska kolväten (PAH) i livsmedel – matfetter, spannmålsprodukter, kosttillskott, choklad, grillat kött och grönsaker av S Wretling, A Eriksson och L Abramsson Zetterberg.

1. Exponeringsuppskattningar av kemiska ämnen och mikrobiologiska agens – översikt samt rekommendationer om arbetsgång och strategi av S Sand, H Eneroth, B-G Ericsson och M Lindblad.
2. Fusariumsvampar och dess toxiner i svenskodlad vete och havre – rapport från kartlägningsstudie 2009-2011 av E Fredlund och M Lindblad.
3. Colorectal cancer-incidence in relation to consumption of red or precessed meat by PO Darnerud and N-G Ilbäck.
4. Kommunala myndigheters kontroll av dricksvattenanläggningar 2012 av C Svärd, C Forslund och M Eberhardson.
5. Kontroll av bekämpningsmedelsrester i livsmedel 2011 och 2012 av P Fohgelberg, A Jansson och H Omberg.
6. Vad är det som slängs vid utgången hållbarhetsdatum? – en mikrobiologisk kartläggning av utvalda kylvaror av Å Rosengren.
7. Länsstyrelsernas rapportering av livsmedelskontrollen inom primärproduktionen 2012 av L Eskilson och S Sylvén.
8. Riksmaten – vuxna 2010-2011, Livsmedels- och näringsintag bland vuxna i Sverige av E Amcoff, A Edberg, H Enghart Barbieri, A K Lindroos, C Nälsén, M Pearson och E Warensjö Lemming.
9. Matfett och oljor – analys av fettsyror och vitaminer av V Öhrvik, R Grönholm, A Staffas och S Wretling.
10. Revision av Sveriges livsmedelskontroll 2013 – resultat av länsstyrelsernas och Livsmedelsverkets revisioner av kontrollmyndighete av A Rydin, G Engström och Å Eneroth.
11. Kontrollprogrammet för tvåskaliga blötdjur – Årsrapport 2011-2013 – av M Persson, B Karlsson, SMHI, M Hellmér, A Johansson, I Nordlander och M Simonsson.
12. Riskkaraktärisering av exponering för nitrosodimetylamin (NDMA) från kloramin använt vid dricksvattenberedning av K Svensson.
13. Risk- och nyttovärdering av sänkt halt av nitrit och koksalt i charkuteriprodukter – i samband med sänkt temperatur i kylkedjan av P O Darnerud, H Eneroth, A Glynn, N-G Ilbäck, M Lindblad och L Merino.
14. Kommuners och Livsmedelsverkets rapportering av livsmedelskontrollen 2013 av L Eskilsson och M Eberhardson.
15. Rapport från workshop 27-28 november 2013. Risk- och sårbarhetsanalys – från jord till bord. Sammanfattning av presentationer och diskussioner.
16. Risk- och nyttovärdering av nötter – sammanställning av hälsoeffekter av nötkonsumtion av J Bylund, H Eneroth, S Wallin och L Abramsson-Zetterberg.
17. Länsstyrelsernas rapportering av livsmedelskontrollen inom primärproduktionen 2013 av L Eskilson, S Sylvén och M Eberhardson.
18. Bly i viltkött – ammunitionsrester och kemisk analys, del 1 av B Kollander och B Sundström, Livsmedelsverket, F Widemo, Svenska Jägareförbundet och E Ågren, Statens veterinärmedicinska anstalt.

Bly i viltkött – halter av bly i blod hos jägarfamiljer, del 2 av K Forsell, I Gyllenhammar, J Nilsson Sommar, N Lundberg-Hallén, T Lundh, N Kotova, I Bergdahl, B Järholm och P O Darnerud.

Bly i viltkött – riskvärdering, del 3 av S Sand och P O Darnerud.

Bly i viltkött – riskhantering, del 4 av R Bjerselius, E Halldin Ankarberg och A Kautto.
19. Bra livsmedelsval i Sverige baserat på nordiska näringsrekommendationer 2012 av L Björck, Å Brugård Konde och H Eneroth.
20. Consumption of red and processed meats in relation to colorectal cancer – Risk and benefit management report by R Bjerselius, Å Brugård Konde and J Sanner Färnstrand.