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Comparison of Organic and Conventional Food and Food Production Part V: Human Health – Pesticide Residues

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Authors' contributions

This work was carried out in collaboration between all authors. The opinion has been assessed and approved by the Panel on Plant Protection Products of VKM. All authors read and approved the final manuscript.

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Grey Literature

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ABSTRACT

The present report is based on data from the 2010 EFSA Report on pesticide residues in food, the Norwegian monitoring programmes 2007-2012 and data from peer reviewed literature and governmental agencies. It is a challenge to perform quantitative estimates and comparative studies of residue levels due to large variation in the measured levels, and the large number of different pesticides present in the samples. Thus, the focus is on the frequency of observed contaminations in relation to regulatory limits and to present examples to illustrate the variation in residue values and number of detected substances.

Pesticide residues in conventional and organic products:

Of the 12,168 samples (plant- and animal products) in the 2010 EU-coordinated programme, 1.6% exceeded the respective maximum residue level (MRL) values, and 47.7% had measurable residues above the limit of quantification (LOQ), but below or at the MRL. Of the 1168 samples analysed in Norway in 2012 (from both imported and domestic products), 1.9% exceeded MRL and 53% contained measurable pesticide residues. Direct comparison of these values is however not possible, since they contain different types of food samples, and are analysed for a different number of pesticides.

When organic and conventional samples from fruit, vegetables and other plant products in the 2010 EU-coordinated programme were compared, 4.2% of the conventional and 1.0% of the organic samples exceeded the MRL values, while 43.2% of the conventional and 10.8% of the organic samples had measurable residues below or at the MRL value. Most of the pesticide residues detected in organic samples are not permitted for use in organic farming.

Of the 624 organic samples analysed in Norway 2007 - 2012, 0.2% (one sample) had residues exceeding MRL, while measurable residues were detected in 1.8% of the samples (11 samples).

Conventional products were often found to contain different pesticides while most organic samples were found to contain few or only one type of pesticide.

Lack of data on pesticide residue levels of organic samples in the EU-coordinated programme, and few Norwegian samples do not allow for a quantitative comparison of pesticide residue levels in organic and conventional samples. Comparative estimation of pesticide residues faces a number of challenges and uncertainties. However, it seems unquestionable based on available data that organic plant products contain fewer and substantially lower amounts of pesticide residues than conventional products.

Health risk associated with pesticide residues:

The general level of pesticide residues in both conventional and organic food is low, and well below what is likely to result in adverse health effects. This conclusion is based on the comparison of estimated dietary exposure with toxicological reference values i.e. acceptable daily intake (ADI) for chronic effects, and acute reference dose (ARfD) for acute effects. The finding of pesticide residues that exceeds established regulatory limits in a minority of tested samples is not considered to represent a health risk.

When dietary exposure that was estimated in six different food commodities in the 2010 EUcoordinated programme was compared with their relevant reference values, EFSA concluded that for 79 of 18243 conventionally grown fruit and vegetable samples, a short-term acute consumer health risk could not be excluded. The conclusion was based on the exceeding of ARfD. None of these 79 samples were organic. It is important to also consider that the exceeding of the acute reference value only occurred in 0.4% of the samples and that the scenario used for acute intake assessment is conservative, suggesting that the toxicological implications are limited. This is also reflected in the chronic exposure assessment, where none of the samples were found to

exceed the toxicological reference value ADI.
Dietary exposure assessments on the basis of Norwegian samples of apples, tomatoes, carrots, strawberries and lettuce did not show an exceeding of any toxicological reference value.

Combined exposure and cumulative risk assessment of pesticide residues:

No generally accepted methodology is at present established for cumulative risk assessment of combined exposure to pesticide residues. Available data suggest however that combined exposure is not likely to result in increased human health risk.

Keywords: Pesticide residues; organic food; conventional food; health risk; combined and cumulative effects.

Available:https://vkm.no/download/18.13735ab315cffecbb51386fe/1509703970306/Comparison%20of%20organic%20and%20conventional%20food%20and%20food%20production%20Part%205%20Human%20health%20%E2%80%93%20pesticide%20residues.pdf

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NOTE:

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COMPETING INTERESTS

Authors have declared that no competing interests exist.