A Review Study on Human Health Implications of Organic food & Organic Agriculture

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ABSTRACT: Organic food intake may lower the incidence of allergic illness, overweight, and obesity, but the data is inconclusive owing to probable residual confounding, since organic food consumers generally live better lives. Animal studies, on the other hand, indicate that similarly constituted feed from organic or conventional agriculture affects growth and development in distinct ways. Pesticide usage is limited in organic agriculture, whereas residues in conventional fruits and vegetables are the primary source of human pesticide exposure. Although epidemiological studies have shown that some pesticides have negative impacts on children's cognitive development at current levels of exposure, these findings have yet to be included in official risk evaluations of specific pesticides. The current evidence on the effect of organic food on human health is summarized in this review. It compares organic and conventional food production in terms of human health indicators and analyzes the possible effect of organic management methods, with a focus on EU circumstances. These variations, however, are most likely of little nutritional importance. The widespread use of antibiotics in conventional animal agriculture, which is a major cause of antibiotic resistance in society, is of greater concern; antibiotic usage is less intense in organic animal husbandry. Overall, this study highlights many proven and probable human health advantages connected with organic food production, and the use of such production techniques in conventional agriculture, such as in integrated pest control, is likely to be beneficial.

Keywords: Agricultural crops, Antibiotic resistance, Food safety, Nutrients, Organic food, Pesticide residues.

1. INTRODUCTION

Several international organizations regard the long-term aim of creating sustainable food systems to be a top priority. Different agricultural management methods may have an effect on food system sustainability by affecting human health, animal welfare, food security, and environmental sustainability. We examine the existing data on the relationship between agricultural systems (conventional vs organic) and human health in this article. It's not always simple to categorize food production techniques. The quantity and variety of conventional and organic agricultural systems, as well as the overlap of these systems, contribute to the complexity. In this article, we refer to "conventional agriculture" as the most common form of intensive agriculture in the European Union (EU), characterized by high synthetic pesticide and mineral fertilizer inputs, as well as a large proportion of conventionally manufactured concentrate feed in animal production[1]–[4].

Organic agriculture, on the other hand, is in compliance with EU laws or equivalent requirements for organic production, which includes the use of organic. Farmyard and green manure as fertilizers, a heavy dependence on ecosystem services and non-chemical pest prevention and management, and cattle access to open air and roughage feed. In 2015, approximately 50.9 million hectares of organic land were farmed in 179 countries across the globe, including areas in the process of conversion. In the European Union, where binding organic production standards have been established, the area under organic management (completely converted and in-conversion) has grown during the past decades. Over the past three decades, the proportion of organically farmed land in total agricultural area has gradually increased in the 28 nations that make up the European Union. Organic farming accounted for 0.1 percent, 0.6 percent, 3.6 percent, and 6.2 percent of agricultural land in 1985, 1995, 2005, and 2015, respectively, totaling 11.2 million hectares. At least 10% of agricultural land in seven EU member states is organic. Organic agriculture was practiced on 125,000 farms in the EU in 2003, and this figure rose to 185,000 in 2013 [10]. The organic retail market in the EU grew by 107 percent from 2006 to 2015, reaching €27.1 billion[5]–[8].

Furthermore, the agricultural production system may influence elements of environmental sustainability, such as biodiversity and greenhouse gas emissions, as well as human health through food security. Although these indirect connections are outside the scope of this study, they are briefly mentioned in the discussion. Also, although these problems are addressed as part of the epidemiological data on pesticide impacts, the emphasis of this article is on

public health, not on the occupational health of agricultural employees or local inhabitants. While agricultural standards differ by country and area, we keep a global view where necessary and concentrate on the European perspective otherwise[9], [10].

Through the end of 2016, the literature search for this review was conducted using the PubMed and Web of Science databases, using the terms "organic food" or "organic agriculture" together with the most relevant keywords (more recent references were included, when relevant, although they were not identified through the systematic search). When feasible, we drew on previous systematic reviews and meta-analyses. We incorporated grey material, such as reports from authorities and international organizations, in certain instances where scientific research was limited. References mentioned in the sources found were also taken into account.

1.1.Human studies show a link between organic food intake and good health:

An increasing body of research aims to characterize individual lifestyles, motives, and dietary habits in relation to organic food intake, as measured by answers to food frequency questionnaires. Nonetheless, as compared to other nutritional epidemiology issues, current research on the impact of organic food intake on human health is limited. Long-term interventional studies aimed at identifying possible connections between organic food intake and health are particularly few, owing to the high expenses of doing so. Although compliance evaluation is difficult, prospective cohort studies are a viable method to investigate such connections. Because there are no biomarkers for exposure, the assessment of exposure, such as organic food intake, will have to rely on self-reported data, which may be subject to measurement error.

Recent reviews have collected the results of clinical trials examining the link between organic food intake and health. These studies are few, and most of them are based on small populations and short time periods, limiting statistical power and the ability to detect long-term impacts. Consumers who purchase organic food on a regular basis select more vegetables, fruit, wholegrain goods, and less meat, and have overall better eating habits, according to observational research. Each of these dietary features has been linked to a lower risk of death or the development of certain chronic illnesses. Customers who purchase organic products on a daily basis are also more physically active and less prone to smoke. In order to account for variations in dietary quality and lifestyle variables, correlations between organic versus conventional food intake and health outcomes must be properly adjusted for differences in dietary quality and lifestyle factors, as well as the possibility of residual confounding.

Several studies have shown that families that choose organic foods had a reduced prevalence of allergies and/or atopic illness in their children. However, in most of these research, organic food intake is part of a larger lifestyle and is linked to other lifestyle variables. Exclusive use of organic dairy products throughout pregnancy and infancy was linked with a 36% decrease in the incidence of eczema at age 2 years in the Koala birth cohort of 2700 women and infants from the Netherlands. Organic food choice was linked to a greater concentration of ruminant fatty acids in breast milk in this cohort, which was linked to a reduced odds ratio for parent-reported eczema until age 2 years.

1.2.Effects on health in animals:

Animal studies provide some promise for investigating long-term health impacts of foods in vivo, given the difficulty of doing long-term dietary intervention trials in humans. Extrapolating findings from animal research to people, on the other hand, is not easy. This field has been studied for almost a century. A study of a large number of studies found that organic feed may have beneficial impacts on animal health, but further research is needed to validate these results. Here, we'll concentrate on the most important elements of health.

Second generation chickens fed conventionally produced feed grew at a quicker pace in one of the well-designed animal experiments. Chickens fed organic feed, on the other hand, recovered more rapidly following an immunological assault. This ability to persevere in the face of adversity has been regarded as a sign of improved health.

The production method had an evident impact on plasma-IgG concentrations but not on other indicators of nutritional or immunological health in one well performed crop production experiment followed by a rat feeding study. The production method had an impact on many physiological, endocrine, and immunological parameters in the offspring, according to a two-generational rat research based on feed produced in a factorial design (fertilization x plant protection) of organic and conventional techniques. The majority of the side effects were linked to the

fertilization method. None of these research showed that one feed production method was better for animal health than the others.

1.3.Pesticides:

In both organic and conventional agriculture, plant protection is important. The usage of synthetic pesticides is heavily reliant on plant protection in traditional agriculture. Organic farming, on the other hand, focuses on plant protection via preventive and biological techniques, such as crop rotation, intercropping, resistant cultivars, biological management using natural enemies, cleanliness practices, and other methods. However, some pesticides are permitted in organic farming. Pesticides (in this case, chemical plant-protection products; micro- and microbiological agents are not included in this discussion owing to their minimal significance for human health) are authorized in the EU after a thorough review, which includes a variety of toxicological testing in animal studies. Acceptable residual amounts in food are determined using the same paperwork and anticipated quantities for pesticides that have been authorized for use. In the EU, 385 chemicals are now approved as pesticides. Twenty-six of them have also been authorized for use in organic agriculture, based on the same regulatory basis.

1.4.Exposure to pesticides and the consequences on one's health:

Because a wide variety of toxicological effects are addressed in animal and other experimental investigations, the regulatory risk assessment of pesticides presently performed in the EU is thorough. However, there are concerns that this risk assessment is insufficient in addressing mixed exposures, particularly for carcinogenic, endocrine-disrupting, and neurotoxic consequences. Furthermore, there are worries that test procedures lag behind independent research, that independent scientific studies are not properly examined, and that data gaps are easily accepted. These worries are mostly about the long-term consequences of exposure and the long-term impacts of acute exposure, which are more difficult to detect than the short-term effects. The majority of pesticide metabolite studies depend on urine excretion, and it's a frequent assumption that the participants were exposed to the parent chemicals rather than the metabolites.

1.5.Toxins produced by molds:

In terms of fungal toxins in crops, one meta-analysis found that organic cereal crops were less contaminated with deoxynivalenol (DON), a toxin produced by some fusarium species, than conventional cereal crops. Fungicide treatments may change fungal populations on wheat leaves, possibly decreasing disease-suppressive species, but the exact mechanism is unknown. Crop rotations that include non-cereal crops may also help to reduce fusarium infestations, whereas N availability is linked to cereal DON content. These considerations support the finding of reduced DON contamination in organic grains. The average chronic exposure of toddlers, babies, and children to DON in the EU is higher than the tolerated daily intake (TDI), with cereals and grain-based products accounting for the majority of overall exposure. The TDI is based on a reduction in body weight growth in mice. Another important fungal toxin in grain production, ochratoxin A (OTA), has no impact on the concentration of the production system.

1.6.Foods derived from animals:

Herbivores in organic agriculture are required to consume at least 60% of their diet as roughage on a dry matter basis. Roughage may be fresh, dried, or silage, depending on the seasonal availability of pastures. Roughage is also included in the daily diet of omnivores in organic agriculture, and poultry gets access to pasture. In most cases, such restrictions are absent in traditional animal agriculture. As a result, organic animal production feeding methods contain a greater percentage of roughage than conventional systems, such as for dairy cows.

1.7.Fatty acids are a kind of fatty acid:

The fatty acid composition is a significant focus of current research on the compositional differences between organic and conventional animal-based meals, with omega-3 FAs being of particular interest owing to their significance for human health. Some studies additionally look at mineral and vitamin content. The fatty acid content of milk, eggs, and meat is strongly influenced by the FA composition of the diet [190, 191]. Roughage feeds such as grass and red clover have between 30 and 50 percent omega-3 FA of total FA, while concentrate feeds such as grains, soy, maize, and palm kernel cake contain less than 10 percent omega-3 FA of total FA [190].

Farm animals, like humans, use elongase and desaturase enzymes to convert a tiny portion of dietary alpha-linolenic acid into long-chain omega-3 fatty acids.

2. DISCUSSION

Two types of evidence must be used to evaluate the human health consequences of diets based on organic food production. The first piece of data comes from epidemiological research comparing demographic groups with significantly different eating patterns when it comes to organic vs. conventional product selections. Experimental investigations utilizing animal models and in vitro models supplement these findings to some degree. The second type of data is based on circumstantial evidence, such as chemical tests of food items to determine their nutritional and pollutant content, or antibiotic usage and resistance trends as a result of agricultural production techniques. Both sets of outcomes are linked to certain strengths and limitations.

Organic food consumers had a reduced incidence of childhood allergies, adult overweight/obesity, and non-Hodgkin lymphoma (but not overall cancer) than non-organic food consumers, according to the few human studies that have explicitly examined the impact of organic food on human health. It is currently impossible to establish if organic food has a causal effect in these findings due to the paucity or absence of prospective research and the lack of mechanistic data. Organic foods are thought to offer certain health advantages, according to dietary studies. Organic food consumers are exposed to pesticides at a lower rate than non-organic food consumers. Although chemical pesticides are subjected to a thorough risk evaluation before being released on the market in the EU, there are significant gaps in this assessment. Epidemiological studies have shown indications of detrimental effects on cognitive development in children as a result of organophosphate pesticide exposure during pregnancy in certain instances. Organic agriculture reduces pesticide residues in food and, by offering a large-scale laboratory for nonchemical plant protection, may aid conventional agriculture's transition to integrated pest management.

Pesticide exposure from conventional food production is a major health issue, according to this study. Early-life exposure, particularly prenatal exposure that may impair brain development, is a significant problem that has just lately been addressed in scientific research. Most insecticides are intended to be harmful to the nervous system of insects, however many higher animals rely on comparable neurochemical processes and may therefore be susceptible to these chemicals. Production and consumption must be addressed together in the future for the development of healthy and ecologically sustainable food systems. While an assessment of the overall impacts of various food systems on environmental sustainability would be beneficial [270], the current review has attempted to assess human health issues in relation to organic production methods and consumer preferences for organic food, both important aspects of sustainability.

3. CONCLUSIONS

Organic food intake seems to decrease the incidence of allergic illness, overweight, and obesity, although residual confounding is probable because organic food consumers tend to live better lives overall. When comparing similarly constituted feed from organic and conventional agriculture, animal studies indicate that feed type affects growth and development. Pesticide usage is limited in organic agriculture, and residues in conventional fruits and vegetables are the primary source of human exposure. Although epidemiological studies have shown that some pesticides have negative impacts on children's cognitive development at current levels of exposure, these findings have yet to be included into official risk evaluations of specific pesticides.

The nutritional makeup of organic and conventional crops varies very little, with organic fruit and vegetables containing somewhat greater levels of phenolic compounds. Organic cereal crops are also likely to have lower cadmium levels. Organic dairy products, and perhaps meats, contain more omega-3 fatty acids than conventional dairy products, but this difference is likely of little nutritional importance. The widespread use of antibiotics in conventional animal agriculture, which is a major cause of antibiotic resistance in society, is of greater concern; antibiotic usage is less intense in organic animal husbandry. As a result, organic food production offers a number of proven and prospective health advantages, and expanding the use of these production techniques in conventional agriculture, such as in integrated pest control, would almost certainly improve human health.

REFERENCES:

[1] A. Mie *et al.*, "Human health implications of organic food and organic agriculture: A comprehensive review," *Environmental Health: A Global Access Science Source*. 2017, doi: 10.1186/s12940-017-0315-4.

[2] A. L. Brantsæter, T. A. Ydersbond, J. A. Hoppin, M. Haugen, and H. M. Meltzer, "Organic Food in the Diet: Exposure and Health Implications," *Annu. Rev. Public Health*, 2017, doi: 10.1146/annurev-publhealth-031816-044437.

[3] E. Röös *et al.*, "Risks and opportunities of increasing yields in organic farming. A review," *Agronomy for Sustainable Development*. 2018, doi: 10.1007/s13593-018-0489-3.

[4] S. Cahill, K. Morley, and D. A. Powell, "Coverage of organic agriculture in North American newspapers: Media: Linking food safety, the environment, human health and organic agriculture," *Br. Food J.*, 2010, doi: 10.1108/00070701011058244.

[5] S. Cahill, K. Morley, and D. A. Powell, "Coverage of organic agriculture in North American newspapers," *Br. Food J.*, 2010, doi: 10.1108/00070701011058244.

[6] P. Yanakittkul *et al.*, "Agriculture Census 2010-11," *Livest. Prod. Sci.*, 2017.

[7] C. A. Watson *et al.*, "Using soil and plant properties and farm management practices to improve the micronutrient composition of food and feed," *J. Geochemical Explor.*, 2012, doi: 10.1016/j.gexplo.2012.06.015.

[8] A. Cano Estrada, D. Vélez Díaz, and C. A. Morgado Hernández, "The role of biotechnology in agricultural production and food supply TT - El papel de la biotecnología en la producción agrícola y en el abastecimiento de alimentos," *Cienc. e Investig. Agrar.*, 2017.

[9] R. Cruz, S. C. Cunha, A. Marques, and S. Casal, "Polybrominated diphenyl ethers and metabolites – An analytical review on seafood occurrence," *TrAC - Trends in Analytical Chemistry*. 2017, doi: 10.1016/j.trac.2016.12.005.

[10] A. Cano and C. Morgado, "The role of biotechnology in agricultural production and food supply," *Cienc. e Investig. Agrar.*, 2017, doi: 10.7764/rcia.v44i1.1567.