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ORGANIC FOOD AND IMPACT ON HUMAN HEALTH: ASSESSING THE STATUS QUO AND PROSPECTS OF RESEARCH

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ABSTRACT:

The paper gives a review of late examinations exploring the wellbeing estimation of natural sustenances and presents a structure for assessing the logical effect of these investigations. Besides, the issues associated with the distinctive research approaches are being talked about. Various near investigations demonstrated lower nitrate substance and less pesticide buildups, yet generally more elevated amounts of vitamin C and phenolic mixes in natural plant items, and more elevated amounts of omega-3 unsaturated fats and conjugated linoleic corrosive in drain from naturally raised creatures. Be that as it may, the variety in results of near examinations is high, contingent upon plant treatment, aging stage and plant age at gather, and climate conditions. Besides, there showed up no straightforward connection between wholesome esteem and wellbeing impacts. It is troublesome along these lines to reach inferences from expository information about the wellbeing impacts of natural sustenances. Some in vitro considers looking at wellbeing related properties of natural versus regular nourishments indicated higher antioxidative and antimutagenic movement and in addition better hindrance of malignancy cell expansion of naturally delivered sustenance. On the off chance that 'wellbeing impacts' are characterized as consequences for characterized sicknesses in people, confirm for such impacts is by and by lacking. Creature ponders completed so far have shown constructive outcomes of a natural eating regimen on weight, development, ripeness lists and insusceptible framework. Late human epidemiological investigations related utilization of natural sustenances with bring down dangers of hypersensitivities, though discoveries of human mediation thinks about were as yet vague. The theory may be that natural nourishment builds the limit of living beings towards strength. To affirm this, impact considers on particular markers for wellbeing are vital.

KEYWORDS: Review Organic food Health Humans Intervention Observational In vitro studies

1.INTRODUCTION

Consumer studies continue to show that expectations concerning health effects of organic food are about the strongest motives for consumers to buy organic products, and research results on this topic can count on high societal interest. However, until now these expectations lack sound scientific proof . Different kinds of research are being performed to investigate the health value of organic products compared with conventionally produced products. An increasing number of studies are being published, including studies comparing the contents of ingredients of products from conventional and organic production systems, as well as review studies. Apart from this, a much smaller number of studies have been published on effects of organic food consumption. These include animal and human studies on bioavailability and health effects, in vitro studies comparing effects

of organic and conventional products on different parameters in the laboratory. In this paper an overview of recent studies on the topic is given, with a framework for estimating the scientific value of these studies. In addition, the problems connected with the different approaches are being discussed. A hypothesis is presented about the possible health effects that organic products might have, and suggestions are made for future research.

2. COMPARATIVE STUDIES ON NUTRITIONAL VALUE

2.1. Plant products

A number of studies have looked at the contents of primary and secondary metabolites of food from different production systems, e.g., organic and conventional systems. The older studies have been reviewed. The main conclusion was that organic products had a higher dry matter and lower nitrate content and contained less pesticide residues. Regarding vitamins they concluded that there were trends towards higher vitamin C contents in organic products, while data on mineral content were inconclusive. Since then, over 200 papers concerning nutrient content of organic vs. conventionally produced foods have been published and it is evident that the interest in this field has increased dramatically over the years. However, conclusions since 1997 have not changed as dramatically. In plants, the focus during the last 10 years has been on the contents of vitamin C, carotenoids and phenolic compounds. Various fruits and vegetables have been investigated under different climatic conditions, with different varieties and on different soil types.

In a review paper, Worthington presented a meta-analysis showing that in most studies the level of vitamin C was significantly higher in organically than in conventionally produced plant foods. Also in more recent studies, higher vitamin C contents were found in many organic products, e.g., peaches and tomatoes , although other studies reported similar or lower contents of vitamin C in organic tomatoes, broccoli, bell peppers, pears and peache. A higher carotenoid content was found in organically grown sweet peppers, yellow plums, tomatoes and carrots, whereas others found lower or similar contents of carotenoids in organically grown blanched carrots and tomatoes. From a study of Barrett et al. it is known that the content of carotenoids may depend on soil type, genotype, as well as the fertilizers and pesticides used. This might explain the inconsistency of the findings in the above-mentioned studies.

2.2. Animal products

Also in animal products differences between organic and conventional production systems have been observed. Milk studies from the Netherlands, UK, Denmark and the USA have shown that milk from organically raised animals has higher contents of n-3 linolenic acids and conjugated linoleic acid (CLA) compared with milk from conventional systems. Such differences with conventionally raised animals are observed especially in summertime, when the organically raised animals have their outdoor grazing facilities. A recent study from the UK showed that milk from low-input systems, both organic and non-organic, has higher contents of n-3 linolenic acid and CLA, although the highest contents were found in the non-organic low-input system. Outdoor grazing, a high biodiversity in pastures, low levels of concentrates and no silage feeding were found to be predominant factors for beneficial milk fatty acids composition.

3. TRANSLATION OF COMPOSITIONAL INFORMATION TO IMPACT ON HUMAN HEALTH

Comparative studies on chemical composition of food products from organic and conventional production systems are valuable and may provide indications for possible health effects. However, it should be recognized that hypotheses about effects of compounds are often revised. Considering that plant physiologists estimate the plant world to contain up to 75,000 or even 100,000 different compounds, or 7500–10,000 per plant, that act synergistically in the plant organism, it becomes clear that even advanced methods, like in systems biology that analyse hundreds or even thousands of compounds, only portray the top of the iceberg of plant chemistry. Let alone the interaction between such a complex food product and the likewise complex organism of the consumer. The first clear complicating factor is the way in which compounds are resorbed by an organism, measured as bioavailability. Secondly, it is not predictable how the consuming organism will react biologically to a food product, as this depends on individual constitutional differences, as well as the actual health status. And in

real life, products are integrated in a food matrix, with chemical interactions between products. This complicates the question about hypothesized effects even more. So some reticence in speculations about effects based on analytical outcomes is due here. This is why studies that measure factual effects of food products are more informative, although not simple. Some approaches will be described, with a framework for estimating the scientific value of these study designs.

4. TYPES OF STUDIES ANALYSING THE EFFECTS OF ORGANIC PRODUCTS

4.1. Intervention studies

Societal interest in health effects of organic products comes from consumers. Seeking for scientific proof to answer the inquiries of this group, studies among humans are most convincing, especially so-called 'intervention studies'. In this study design as many factors as possible need to be controlled for a group of people (as so many factors other than nutrition do affect people's health and well-being) and only the food under study is clearly varied in order to make possible effects become visible. So either a set-up needs to be created where a group of people is brought voluntarily into a controlled situation, or special situations need to be found where groups of people live daily under the same conditions and in the same routine, like children's homes, monasteries or prisons. In such a controlled situation ideally two matched groups should consume parallel either organically or conventionally grown food, blinded. Or a 'cross-over' situation is created where the different test foods are presented, one after the other with sufficient time in between. Health effects will be measured using 'biomarkers', identified as reliable reflection measurements for a person's health status, and that can in such a study design be measured in all study objects at the same moment. The choice of food products and the way in which they are presented are factors to take into consideration. This point will be touched upon later.

4.2. Observational studies

Another way to study health effects in humans are the so-called observational or epidemiological studies, where a large group of people is studied using questionnaires usually supplemented with some measurements in a smaller part of the group. Control is much less as people themselves report. Investigations can look back at eating habits in the past, being 'retrospective', or follow a group from a certain moment into the future, being 'prospective'. Questions need to address many more factors than food, e.g., life-style factors and social status, to be able to rule out confounding. So a large group of people needs to be included in the study.

4.3. Intervention studies in animals

As highly controlled blinded human dietary intervention studies, especially if intended to examine long-term physiological responses, are very expensive and difficult to realize, health effects of foods are usually tested in animal models. Similar to human intervention studies, in such experiments laboratory animals such as rats, mice, chickens and rabbits are fed organically or conventionally grown feeds, and selected physiological parameters reflecting measurements of health status are analysed. By choosing genetically homogenous populations of animals and keeping them under highly controlled conditions it is easier to point out health effects of a diet. Moreover, the short life cycle of animals allows examining effects of diets on more than one generation. Systematic reviews of such animal studies can give indications of possible health effects, though differences between animals and men need to be taken into account. Final confirmations of hypothesized effects need eventually to be verified in humans.

5. RECENT IN VITRO STUDIES

To our knowledge, in recent years, two in vitro studies have been published comparing health-related properties of organic vs conventional foods. The first study analysed antioxidative and antimutagenic activity of organically vs conventionally produced green vegetables (qing-gen-cai, Chinese cabbage, spinach, Welsh onion and green pepper). The authors found antioxidative activity in the organic vegetables to be much higher than that in the conventional ones. Moreover, organic vegetable juices exhibited significantly stronger suppresive effects against mutagens. The second study compared the effects of extracts from organically and conventionally grown strawberries on the proliferation of colon- and breast-cancer cells. The results showed higher antiproliferative activity of extracts from organically grown strawberries on both types of cancer cells, which was

probably due to a higher content of secondary metabolites with anticarcinogenic properties in these fruits. These results suggest a possible mechanism by which organic foods could reduce human cancer risks.

6. RECENT ANIMAL STUDIES

During the last 50 years several animal dietary intervention studies have been carried out investigating the health effects of organic vs conventional feeds. Most of these studies confirmed beneficial effects of organic feeds on development rate and reproductive abilities of laboratory animals. Moreover, animal studies published in recent years indicated increased immune parameters in organically fed laboratory animals. In a dietary study with rats, comparing the effects of protein-poor organic and conventional feed Finamore et al. found higher levels of stimulated lymphocyte proliferation in the rats fed organic feed. Lauridsen et al. found higher immune system reactivity in organically fed rats, indicated by the level of IgG in blood serum, as well as a lower amount of fat tissue and more relaxed behaviour. A pilot experiment by Barańska et al. showed higher splenocyte proliferation in male organically fed rats. According to a study performed in the Netherlands, chickens fed an organic diet had lower body weights, higher immune reactivity and stronger catch-up growth after a challenge. In this study the concept of 'resilience' was proposed, as to indicate physiological elasticity to come back to homeostasis after a disturbance. Resilience is a well known concept in ecology and psychology, and is worth investigating for its value in evaluating physiological effects of organic food products, as these are grown with the aim to be more 'robust' than conventional products.

7. RECENT STUDIES IN HUMANS

7.1. Observational studies

To our knowledge, only a few observational studies investigating the health effects on humans of organic compared with conventional foods have been performed in recent years. According to one of these studies, commonly named the PARSIFAL study (14,000 children, 5 European countries), children representing an anthroposophical lifestyle (including biodynamic and organic food) were found to have less allergies and a (not statistically significant) lower body weight compared with a group consuming conventionally produced foods. At the same time the results of the KOALA Birth Cohort Study in the Netherlands (about 2700 newborns) associated the lower eczema risk in children at the age of 2 years with the consumption of organic dairy products. Moreover, organic dairy consumption resulted in higher CLA levels in breast milk of their mothers. According to a study of Rembialkowska et al. consumers of organic food assessed their health status significantly better than consumers of non-organic food. However, apart from the organic diet, this might also been related to several aspects of consumers' lifestyle (e.g., nutritional pattern, living conditions, physical activity, ways to manage stress).

7.2. Intervention studies

As several authors have stated previously, interpretation of the results from comparing organic and conventional foods is extremely difficult due to differences in methodologies related to the use of different varieties, growing conditions and sampling procedures. Furthermore, the contents of nutrients and secondary metabolites in the plants cannot be directly related to a potential health effect. First of all, the contents of primary and secondary metabolites in food do not give any indication of how much they are actually absorbed, as the absorption depends on a number of factors, such as the amount of promoters and inhibitors available in the food, as well as the food matrix itself. In order to obtain more information on uptake of valuable compounds, studies on bioavailability and effects on specific markers for health are necessary.

8. DISCUSSION

The overall number of studies comparing the nutritional value of organic vs. conventional foods is growing. There also is an increasing interest in investigating the health effects of organic food consumption. Results of comparative studies, as well as in vitro analyses, animal intervention trials and human observations are promising. However, the results are still insufficient to formulate explicit conclusions.

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