



Organic Food Quality & Health

Organic Food Quality & Health Newsletter November 2008

Edition No. 1/2008

Dear Reader,

With pleasure we present to you the renewed FQH newsletter of 2008.

Since FQH started, a regular Newsletter was published by FQH with news on topics relevant for FQH members, and in the last years only with articles on research by FQH members.

The FQH Board decided to renew the FQH Newsletter. Once more, the focus will be to make information on topics, relevant to FQH, visible and easy to find. This means hints on interesting information (Websites, Journal articles, other publications, Conferences and Workshops, etcetera), together with the source of this information and if possible a link to this source.

We wish you pleasure and inspiration reading this Newsletter.

More information on Organic Food Quality and Health you can find on the FQH-website www.organicfqhresearch.org. We heartily thank the members who provide us with information. Contributions to a next Newsletter or to the Agenda can be sent to the FQH-coordinator: fqh@louisbolk.nl.

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1 FQH News

1.1 FQH Research Agenda 2008 - 2011

The FQH Research Agenda 2008 - 2011 identifies the most important topics for research in the field of Organic Food Quality and Health for the coming years, as defined by the members of FQH:

Introduction

The FQH Association (14 members - research institutes working on the topics of food quality & health - in 9 European countries) aims to stimulate research on the subject of organic food quality and health. In this context it is relevant that the practice, and connected agricultural science, of organic agriculture is characterized by a systems approach.

Broadly accepted is the statement in 1943 by Lady Eve Balfour (1899 -1990) “A healthy soil leads to healthy plants, which lead to healthy animals, and both lead to healthy food, to bring forth healthy humans”.

When dealing with organic food quality and health, the concepts of ‘quality’ and of ‘health’ need to reflect this systemic view.

In terms of research FQH intends to stimulate the development of a ‘scientific community’ that performs scientific projects on the topics:

- Development of concepts for ‘quality’ and ‘health’ that do justice to organic systemic thinking.
- Development of methods to measure these concepts in reality through (partly new) quality parameters.
- Plant and animal research in relation to the concept(s) is needed.
- Research on health effects of products of best, good and minor quality.

All according to scientific rules of conduct, aiming at validation and publication in high ranked scientific journals.

1. Conceptual development

Conceptual development is needed concerning basic concepts like ‘holistic’ versus ‘systemic’, as well as ‘nutrition’, being broader than the mere intake of nutrients.

Secondly organic ‘food quality’, related to food products needs conceptual development. Connected concepts are ‘authenticity’, ‘naturalness’, ‘coherence’, ‘organisation’.

Thirdly conceptual development is needed concerning ‘health’ and related concepts like ‘resilience’, ‘robustness’ and ‘self regulation’ or ‘self organisation’, in a sense that connects to the systemic views in organic thinking.

These concepts need to be operationalized and validated according to scientific standards.

2. Development of methods to measure this/these (concepts of) quality

Evaluation, improvement and standardisation of (new) methods to assess the defined quality of organic produce is needed. This includes conventional but also holistic quality assessment methods (like the biocrystallization method and others).

Validation is necessary through the accumulation of references, in relation to different production conditions.

Insight needs to be developed in the relation between production measures and quality.

When holistic methods are used it is of great importance to link these to analytical data.

Strive to connect analytical, as well as holistic outcomes to health endpoints.

3. Plant and animal research in relation to the concept(s)

On the one hand reworking on and integration of already existing results from crop and animal research into the new concepts is needed. Secondly new research is needed to establish references for quality, in relation to cultivation practices.

4. Choice of study designs to measure effects of quality on health

Evaluation, improvement and standardisation of (new) methods to assess the effects of defined quality on defined health parameters.

First these parameters (biomarkers) need to be identified in relation to the test objects.

Different subjects can be identified for health research:

1. Human studies
2. Animals studies, with different types of animals
3. Studies with simple organisms like bacteria etc.

In these different levels, types of research can be accomplished:

1. Intervention studies
2. Observational studies
3. Studies to explore working mechanisms, like in vitro studies

Note: from 1. to 3. decreasing strength of convincing evidence: intervention studies in humans are most convincing.

However, different types and subjects of study are needed and together will build a strong 'body of evidence' about the effect of good quality food on good human (and animal) health.

1.2 FQH Scientific Workshop on concept development

FQH organizes twice a year a Workshop for members, where topics of scientific content are discussed and worked out. 2008's first Scientific Workshop was in June in Modena, Italy. One of the topics on the agenda was the content of the FQH Research Agenda. This Agenda contains the research items that members consider most important to be worked, out in relation to the development of Food Quality & Health themes in organic agriculture and nutrition.

On November 10th 2008 again FQH members met, this time in Witzenhausen, Germany, for the 2nd Workshop of 2008. The theme of the day was the concept development of central terms in organic nutrition, which is topic 1 of the Research Agenda. Terms like "organic food quality", "authenticity", "naturalness", "coherence" and "systemic versus holistic research" were discussed in a lively setting with 16 participants. Now a next step will be taken, being a round of "concept mapping" about these terms in a much larger group. The results of this round will be discussed in a next Scientific Workshop for members in May 2009 at FiBL in Switzerland.....

1.3 FQH General Assembly 2009

The General Assembly 2009 of FQH will be held in Nuremberg on 21 February 2009, 10 – 12 am, during the BioFach Fair.

2 Articles and other relevant information

2.1 The potential benefits of organic food

New results of comparative quality studies

Alberta Velimirov (FiBL Austria) (presented at the Alpe-Adria Symposium, 20.-21. Nov 2008 in Maribor)

Introduction

A healthy diet is characterised by its food components and their quality. While there is sufficient evidence to show the beneficial influence of a plant-based diet on the reduction of nutrition-related diseases, most nutritional scientist would argue, that hard facts proving any additional benefits of organic food are still lacking. But regarding the results of comparative quality studies it is possible to extrapolate and highlight production principles with defined impacts on safety and quality parameters. The nutritional quality of food is determined by analysing negative and positive components, but also includes its influences on consumers, humans and animals.

Food safety

With regard to value-decreasing contents such as cultivation-related biocides and veterinary drug residues, organic food is presently the safest available on the market. Biological risks such as mycotoxins in plant foods and pathogens in foods of animal origin can not be excluded so easily. In a recently published comparison of 24 matched pairs of organic and conventional foods mycotoxins were found 50% more often in the conventional samples and at average level a little over twice as high. These good results have been ascribed to the use of compost and cover crops enhancing the diversity of soil fungi, lowering the odds that one strain will dominate as well as to the fact that high levels of N fertiliser and fungicides heighten the danger of mycotoxin contamination (Benbrook 2005).

According to a review of scientific papers by the same author Benbrook (2006) organic methods are also able to reduce the risk of *Escherichia coli* contamination. Most importantly publications show the connection between feed and *E. coli* 0157 colonization of the bovine digestive system. When cows are fed high-energy, grain-based rations, the pH in their digestive system changes to favour *E. coli* 0157. Organic feed is based on high-roughage with little grain or corn silage. Furthermore composting of cow manure reduces the danger of spreading the pathogen and in soils on organic farms the decline of *E. coli* levels is accelerated, which could be due to higher microbial activity.

The latest survey of the prevalence of *Salmonella* species on commercial laying farms in the United Kingdom, published in The Veterinary Record, showed that 23.4 % of farms with caged hens tested positive for *Salmonella* compared to 4.4 % in organic flocks and 6.5 % in free-range flocks (Survey 2007). Another study comparing conventional and organic poultry production practices found no difference in the prevalence of *Campylobacter* species, but significantly higher antimicrobial resistance rates and multidrug resistance in the conventional samples (Taradon Luangtonkum et al. 2006). A German comparative investigation at least showed that organic meat products manufactured according to the guidelines of the approved associations like Demeter and Bioland do not represent an increased health risk to the consumer as compared to conventional products (Kröckel, 2005).

Summarising the recently published results the risk of pathogen contamination can partly be reduced but not excluded in organic products. Generally speaking these dangers can be avoided by maintaining hygienic conditions which applies to all food producers and is therefore not a system-inherent risk.

During the last few years a new type of contamination poses a threat to organic foods: GMOs. Under current European GM labelling rules conventional and organic food needs no GM labelling as long as the contamination is below 0,9% and accidental or technically unavoidable. It has to be remembered, that the use of genetic modification or genetically modified organisms is not accepted in organic agriculture. So far this has been an important asset of organic food for consumers who want to avoid GMOs, the majority in Europe.

Food quality

But safety is of course the prerequisite of food. The focus of nutritional quality lies on beneficial compounds and health-promoting secondary metabolites in plants and fatty acids in foods of animal origin. This topic is also the focus of controversial discussions about potential advantages of organic foods. In the last years a number of overviews summarising all scientific results of comparative quality investigations have been published (e.g. Woese *et al.* 1995; Alföldi *et al.* 1998; Worthington 1998; Heaton for the Soil Association 2001; Bourn & Prescott 2002; Williams 2002; Tauscher *et al.* 2003; Velimirov & Müller 2003c). Although it has mostly been emphasized, that occurring differences are generally small, some common trends and indications could be defined:

Vijver & Huber (2007):

- Organic dairy products contain a higher amount of good fatty acids (omega 3 and CLA).
- Organic leaf vegetables have higher Vitamin C content
- Organic fruit and vegetables contain more antioxidants
- The protein content of organic grain products is of higher quality
- Organic products have higher dry matter content, resulting in relative more nutrients per portion

In cases, where no cultivation-related compositional difference was found, it has to be kept in mind, that the “same” quality in the organic comparators could be achieved in an environmentally friendly way. But furthermore it is of fundamental interest for all to link production methods to measurable quality parameters and provide an understanding for the potential of organic agriculture to optimise food quality. Two recently published investigations, one on tomatoes and one on milk production, can be analysed with this aim.

At the Davis University in California a 10-year comparative field trial with tomatoes has been conducted (Mitchell *et al.* 2007). The main results were significantly and increasingly higher contents of flavonoids in the organic samples. This increase corresponds not only with increasing amounts of soil organic matter accumulating in organic plots but also with reduced manure application rates. The average yields did not differ, but were more stable in the organic variant. From this experiment we can deduce several principles: plant-adapted organic fertilising methods intensify the formation of health-promoting secondary compounds, thereby increasing soil fertility (structure and microbial activity), reducing fertiliser rates and providing stable yields over the years.

Organic dairy products present an example for foods of animal origin. There is already substantial evidence, that organic dairy products contain more “healthy” fatty acids (poly-unsaturated fatty acids, omega 3 FA) than conventional ones due to high amounts of roughage and low amounts of corn silage in the feed (Jahreis *et al.* 2001; Bergamo *et al.* 2005; Eichinger 2006; Slots *et al.* 2006). But this good result could also be obtained by suitable feed additives (certain grains, oils ect) in

conventional farms. The big and basic difference is, that this quality result is attained in the case of organic dairy products by supplying feed appropriate to cows as well as enough out door grazing.

Thus in both examples an appropriate nutrition, of the soil and plants in the 1st case as well as the animals in the 2nd case are fundamental necessities to achieve high quality foods. They also show, that the presentation of isolated results concerning the product only without its history of production loses sight of the environmental quality aspects and high animal protection standards characterising all organic production systems and reflecting their true value.

Influences on animals

Since food is produced to be eaten, the main focus should be on food effects. It has been shown that test feeds, equally satisfying nutritional needs, but differently grown, can have significantly different effects on test animals in food preference tests as well as feeding experiments. In a number of food preference tests with organic and conventional products the test animals (laboratory rats and mice, chicken, rabbits) significantly preferred the organic samples (Pfeiffer 1931, Edelmüller 1984, Plochberger 1989, Plochberger & Velimirov 1992, Velimirov 2002 and 2003). These choices could not be corroborated by compositional differences. To investigate long-term food effects multi-generation feeding experiments have been conducted with laboratory rats (Velimirov et al. 1992; Lauridson et al 2007; Barańska et al. 2007), rabbits (Edelmüller 1984) and chicken (Plochberger 1989; Huber et al. editor 2007). Although these experiments involved different animals, were conducted in different years by different scientists in different countries, the common results show, that animals fare better with organic feeds. Significantly higher survival rates of the offspring as well as increased immune reactivity were among the most interesting results.

Of course the interpretation of the outcomes of whole food experiments is difficult, since systemic research is not about simple cause-effect-chains, but rather about interrelated potentiality. Thus Williams (2002) remarks, that the very small differences in nutrient contents of organic and conventional crops would be very unlikely to provide a nutritional basis for the differences found. Therefore the controversial question arises, whether analysing food compounds is enough to reflect food quality? Foods can be seen as biological systems in themselves as well as being part of agricultural systems. A number of so called "holistic quality assessment methods" have been developed to define food quality more comprehensively according to the thesis: the whole is more than the sum of its parts. The focus here lies on synergistic effects in organisms, vitality and non-linear interactions, which characterise biological systems. Therefore the above mentioned food preference tests and feeding experiments as well as holistic methods such as biophotone measurements, bioelectrical analyses, sensory evaluation, picture forming methods, decomposition tests can provide more comprehensive and meaningful results concerning food quality.

Conclusions

Talking of nutrition the interdependence of environmental issues, quality of life and product quality must not be neglected. Western nutritional scientists recommend a diet, that is fresh (regional), seasonal and plant-based. Some of the main goals of organic production such as fewer animals, feed from domestic organic cultivation, short transport and regional markets fulfill these recommendations perfectly. Thus a balanced fresh diet is an organic system-inherent trait. But the question whether organic food might result in additional health benefits still remains. It might be true that there are not enough studies proving this notion beyond doubt, but there is sufficient evidence showing production related effects on quality and safety parameters as well as on animals' well-being. In the face of environmental challenges and the increase of nutrition-related health problems

I think it wiser to focus on the potential benefits of organic production than delaying sustainable problem solving by long lasting controversial discussions.

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2.2 Influence of diets from conventional and organic productions on fertility of rabbits.

Einfluss von Diäten aus konventioneller und biologischer Erzeugung auf Fruchtbarkeitsparameter bei Kaninchen

Anna Bieber, Kathrin Seidel, Gabriela S. Wyss, Veronika Maurer, Esther Zeltner (FiBL-Switzerland)

Abstract

In order to test the effect of organic vs. conventional diets on fertility traits we conducted an on-farm study with female rabbits. Four groups of seven to eight female rabbits kept in systems with litter were fed ad libitum with either organic or conventional pellets. Offspring was weaned with approx. 28 days. In the so far analysed first series, conception rate was higher in the conventional groups but diet type had no significant influence on that trait. On the other hand, a significant influence of diet on litter size was found: organically fed female rabbits produced more offspring per litter. Mortality of offspring was lower in the organic group and resulted in higher rates of weaned animals, but differences were not significant compared to conventional animals. Inconsistency of findings in the first series of this study concerning the effect of different diets on fertility traits are also found in literature. Data from the currently running second series will show whether the slightly positive effect of organic diet will become more evident.

There will be a German lecture according this topic at the 10. Wissenschaftstagung Ökologischer Landbau, ETH Zürich, 11-13 February 2009, <http://www.wissenschaftstagung.de/>.

2.3 Effect of plant cultivation methods on content of major and trace elements in foodstuffs and retention in rats

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Abstract

BACKGROUND: Many consumers perceive organic foods as more nutritious than conventional foods. However, the existing evidence is insufficient to support or refute this belief. The purpose of the present study was to investigate the effect of three different model cultivation systems on selected major and trace element contents of dried foodstuffs (carrots, kale, peas, potatoes and apples) grown in two consecutive years, as well as mineral retention determined in 36 rats (second generation in a multi-generation study) fed diets based on these foodstuffs from one year.

RESULTS: Overall, there was no evident trend towards differences in element content of foodstuffs or diets due to the use of different cultivation systems, and differences between harvest years exceeded those seen between cultivation methods. Also, no significant differences in the retention of

elements in rats fed diets derived from different cultivation systems were seen, since higher intake resulted in correspondingly higher excretion.

CONCLUSION: This study does not support the belief that organically grown foodstuffs generally contain more major and trace elements than conventionally grown foodstuffs, nor does there appear to be an effect on the bioavailability of major and trace minerals in rats. □ 2008 Society of Chemical Industry

Keywords: elements; organic food production; conventional food production; retention of elements, rats

The full article is published in: [Journal of the Science of Food and Agriculture](#), Volume 88, Number 12, September 2008 , pp. 2161-2172(12)

3 Related Newsletters

Below we offer you some information from other Newsletters that are related to FQH:

3.1 The Scoop, Newsletter of The Organic Centre:

3.1.1 Berries and Brightly Colored Fruits Top the Antioxidant Chart

[\(The Scoop, October 2008\)](#)



A team of Cornell University scientists subjected 25 fruits to a series of tests of antioxidant content and cellular activity. Wild and domesticated blueberries, blackberries, cranberries, strawberries, and pomegranates topped the various lists in varying orders. All brightly colored fruits scored very well in all measures used in the study.

Across all fruits in the diet, apples were found to provide 33% of total phenolics, reflecting very high consumption and moderate phenolics content. Oranges provided 12%, grapes 12.8%, and strawberries, 9.8%.

In urging increased consumption of nutrient-dense, brightly colored fruits and vegetables, the team cited the latest report from the USDA's Economic Research Service on fruit and vegetable intakes. The ERS reports that Americans are still lagging in terms of fruit and vegetable intake. On average in 2005, we consumed 0.9 cups of fruit per day, instead of the 2.0 cups (four servings) recommending in the 2005 Dietary Guidelines for Americans. And we consumed 1.7 cups of vegetables, instead of the recommended 2.5 cups (five servings), based on a 2,000 calorie diet.

The authors conclude (cautiously) that –“Antioxidant activity provided by fruits may be important in the prevention of cancer and other chronic diseases.”

Source: Kelly L. Wolfe et al., “Cellular Antioxidant Activity of Common Fruits,” Journal of Agricultural and Food Chemistry, Vol. 56, No. 18, pages 8419-8426.

3.1.2 Nutrition Making a Comeback on the Agenda of Some Plant Breeders

[\(The Scoop, Oktober 2008\)](#)

Some fruit and vegetable breeders are heeding the call for greater attention on nutrient density, as opposed to high yields and the capacity of produce to ship long distances.

Echoing themes addressed in the Center's report "Still No Free Lunch," the lead horticulturist with the W. Atlee Burpee Co. is quoted as saying –

"Before, they were breeding for higher yields, stronger plants, produce easier to ship and more ornamental in appearance. Now, they're looking at improvements in flavor and smell, in addition to more nutrients. Enriching the colors is attached to nutritive value."

Source: Associated Press, October 2, 2008.

3.1.3 Superior Nutrient Content Reported in Organic Blueberries

[\(The Scoop, July 2008\)](#)



The Bluecrop variety of highbush blueberries were grown on five organic and conventional farms in New Jersey. The farms shared comparable soils and weather conditions, and the berries were harvested in precisely the same way. The scientists carrying out the study are based at the USDA's Genetic Improvement of Fruits and Vegetables Laboratory in Beltsville, Maryland, and at Rutgers University in New Brunswick, New Jersey.

The team found consistent and significant differences in nutrient content. The organic blueberries contained 46 ORAC units, a measure of total antioxidant capacity, while the conventional berries contained 31 ORAC units.

Accordingly, the organic berries had over 50% more total antioxidant activity. They also contained about 50% higher levels of total anthocyanins, the natural plant phytochemicals that give blueberries their dark color.

The organic blueberries also had 67% more total phenolics. The authors' concluding sentence reads:

"Blueberries produced from organic culture contained significantly higher amounts of phytonutrients than those produced from conventional culture."

Source: S.H. Wang et al., "Fruit Quality, Antioxidant Capacity, and Flavonoid Content of Organically and Conventionally Grown Blueberries," Journal of Agricultural and Food Chemistry, published on web July 1, 2008.

3.1.4 Lycopene Works as Well as Statins in Promoting Artery Health

[\(The Scoop, July 2008\)](#)



Scientists in China compared the impact of lycopene in the diet of rabbits to the impacts of statin drugs in the prevention of the plaque in arteries that lead to atherosclerosis. The rabbits were fed enough lycopene to sustain blood levels roughly comparable to levels in humans who consume a diet high in lycopene.

The lycopene was as effective as statins in the rabbits fed a high-fat diet, and was superior to statins in one measure (reduction in LDL levels). The authors conclude that –

“These findings provide a theoretical rationale for the use of lycopene as a preventive in atherosclerosis.”

Source: ” Min-Yu Hu et al., “Comparison of lycopene and fluvastatin effects on atherosclerosis induced by a high-fat diet in rabbits,” *Nutrition*, published online June 30, 2008.

3.1.5 Organic Production Increases Antioxidant Levels and Sensory Quality of Mandarin Orange Juice

[\(The Scoop, June 2008\)](#)



Spain is the second leading producer in the world of mandarin oranges, and the main supplier of mandarin oranges and juice moving through international markets. A team of Spanish scientists grew conventional and organic oranges on the same farm, using the same irrigation methods and variety of tree. The study was carefully designed to eliminate or control other sources of variation in the nutrient and sensory quality parameters addressed by the team.

The conventional blocks of oranges were treated with up to nine herbicides and four insecticides. Weeds were controlled in the organic trees with cultivation, and insects were controlled with neem oil and pheromone traps.

Interestingly, the team reported few differences between the conventional and organic oranges at the time of picking, although the organic fruit was marginally smaller and contained 13% more Vitamin C. But in the juice, the team reports that organically grown mandarin oranges produces juice that

- Is more intensely colored, and has a superior aroma and taste,
- Contains higher levels of all eight minerals studied (in three cases by 50% or more),
- Has a 40% higher concentration of total carotenoids (Vitamin A).

Source: F. Beltran-Gonzalez et al., □ *Effects of agricultural practices on instrumental colour, mineral content, carotenoids composition, and sensory quality of mandarin orange juice, cv. Hernandezina*, □ *Journal of the Science of Food and Agriculture*, 2008

3.2 ICROFS Newsletter:

3.2.1 New research on organic food, metabolites and health

[\(Newsletter from DARCOF | January 2008\)](#)

By Charlotte Lauridsen, University of Aarhus, and Søren Husted, University of Copenhagen, Denmark

The DARCOF project OrgTrace sets out to study the impact of different agricultural management practises on the ability of crops to assimilate trace elements from the soil and to synthesise bioactive compounds with health promoting effects. Also, the project will extend previous observations, using rats as model animals, that have indicated significant effects of diets on health aspects that have rarely been assessed, e.g., immune status, sleep/activity pattern, and vitamin E status.

3.3 QLIF Newsletter:

3.3.1 Differences in composition between organic and conventional milk

[\(QLIF News, October 2008\)](#)

by Gilian Butler, Jacob H. Nielsen, Tina Slots, Chris Seal, Michael D. Eyre, Roy Sanderson and Carlo Leifert

Differences in the composition between organic and conventional milk in relation to fatty acid and fat soluble antioxidant concentrations were demonstrated in a study of 109 milk samples from 25 commercial farms. The farms represented three different production systems: conventional, high input farms; organically-certified low input farms; and non-organically certified low input farms.

4 Agenda

[4.1.1 QLIF Workshop “Towards improved quality in organic food production”](#)

Driebergen, 21 – 23 January 2009

At January 21-23 2009 the 5th QLIF training workshop is organised in Driebergen, NL. Product quality and how to achieve it is the central theme, with scientific specialists sharing their knowledge and experience with junior scientists and students. Registration is open and some bursaries will be available.

[4.1.2 Wissenschaftstagung Ökologischer Landbau](#)

Zurich, 11 – 13 February 2009

The 10th Scientific Conference on Organic Agriculture takes place 11. - 13. February 2009 in Switzerland.

The Conference is organized by the Forschungsanstalt Agroscope Reckenholz-Tänikon ART, the Research Institute of Organic Agriculture, the Eidgenössischen Technischen Hochschule (ETH) and the Stiftung Ökologie & Landbau (SÖL).

The successful concept of earlier conferences will be kept alive also in. In addition, in selected presentations specifically organic advisors and farmers will be addressed.

4.1.3 [BioFach](#)

Nuremberg, 19 – 22 February 2009

The yearly World Organic Trade Fair takes place in Nuremberg, Germany, from 19 – 22 February 2008.

4.1.4 Workshop at the BioFach Congress, organised by FQH and ICROFS

Nuremberg, 21 February 2009

Parallel the BioFach Congress is organized, with questions like “In which direction is the industry developing? What are the promising trends, targets and strategies?” During this Congress FQH organizes, in cooperation with ICROFS, an Workshop on the “**Latest Research Results on Organic Food Quality and Health**”.

Imprint

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