



## **An Evaluation of the Concept of Food Chemistry, Nutrition and Health**

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**Abstract:** It's evident that diet affects our health. Sugar, Protein, fat, and nutrients in food supply components for biochemical cycles vital to cellular function. Food chemistry refers to studying the chemical processes and interactions of all biological and non-biological ingredients of food. Hence, this current study mainly aims to investigate the issues regarding the formation of the concept of food chemistry, nutrition, and health through the prism of the international legal aspect. To meet that aim, many general scientific approaches and methods and scientific knowledge methods, including synthesis, formal-logical approaches, induction, deduction, analysis, and system-structural, and also private scientific measures – comparative legal, historical-legal, formal-legal, and interpretative are used. Based on the results, it is established that the conceptual foundations of national security (a variety of which includes food chemistry) need constant and close scientific understanding since it is impossible to create an effective state program to guarantee the security of individuals, society and the state in various spheres of their life without a solid doctrinal basis. The points of view of the scientists on the research issue presented in the paper allow identifying the main stages of the evolution of the concept of food chemistry and security at the international level in order to determine and characterize the initial stage of the evolution of this phenomenon – the formation stage of the corresponding concept. The periodization of the development of the notion of food chemistry and security offered in the article is on the basis of such measures as legal documents of a strategic and declarative nature that demonstrate the foundations of state policy in the field of ensuring food security and some generalized doctrinal ideas on the analyzed issues adopted in the scientific community in the relevant period.

**Keywords:** Health, national security, food chemistry and concept evolution.

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## I. INTRODUCTION

Food chemistry is the study of chemical processes and interactions of all biological and non-biological components of foods. Biological materials include items such as meat, poultry, lettuce, beer, and milk as examples similar to biochemistry in its main components such as carbohydrates, fat, and Protein, but including areas such as water, vitamins, minerals, enzymes, additives, Foods, flavors, and colors<sup>1,2</sup>. This field also includes how to change products under certain conditions, food processing methods, or methods to enhance or prevent them from occurring. An example of process improvement can be encouraging the fermentation of dairy products with microorganisms that convert lactose into lactic acid; For example, preventing a process could be stopping the process, browning on the freshly cut surface of the apple, using lemon juice or other acidified water<sup>3-5</sup>. Food safety and quality are a huge concern for customers seeking healthiness and soundness as those desiring to meet taste at a reasonable cost and provide sustainable food production. Regarding that, comprehending the impact of bioactive combinations on food safety and quality appears highly essential<sup>6,7</sup>. Bioactive compounds are regarded as low molecular weight combinations with biological actions available in foods inherently, made throughout the processing and storage, or counted to foods to improve functionality. Bioactive combinations add value by having quality, serving as raw antioxidants, antimicrobials, and flavor retention factors<sup>8-10</sup>. Nevertheless, others include a possible health hazard or reduced storage life; compounds, including biogenic amines, employed as quality indices in regular monitoring by the food industries, maintain safety implications over specific concentrations<sup>11</sup>. First, it should be noted that security (in all its varieties, including food chemistry and security) is the most important category of all branches of modern science and practice<sup>1,12</sup>. At the same time, security, representing the dominant activity of society, is not something permanently frozen and unchangeable but is subject to transformation under the influence of various conditions of the historical evolution of society and the state<sup>5,6</sup>. In this regard, the conceptual foundations of national security need constant and close scientific understanding since it is impossible to create an effective state program to ensure the security of individuals, society, and the state in various spheres of their life without a solid doctrinal basis<sup>10-13</sup>. Initially, it is necessary to turn to the etymology of the concept of "security" as a whole as a generic one in relation to national security and food chemistry. The term "security" has the following meanings: "1) a safe situation or sense; 2) a thing that ensures or guards; 3) a document attesting credit or the ownership of stock, bonds, etc." <sup>12,14</sup>; 4) the State and company security and safety versus spying, stealing, or other hazards; an association for securing that; 5) a thing deposited or promised as a guarantee of fulfilling an undertaking or a loan payment, to be forfeited in case of default. In turn, an analytical review of a number of foreign sources in the field of national security research allows for identifying the following approaches. Thus, according to Romm, "A nation has security when it does not have to sacrifice its legitimate interests to avoid war, and is able, if challenged, to maintain them by war" <sup>15-17</sup>. Looking ahead, we note that following this document, national security is formed by all types of security stipulated by the Constitution of the Russian Federation and the legislation of the Russian Federation. And although food chemistry and security are not literally called national here, broadly interpreting this norm, we can come to the conclusion that food security is a kind of

national security in the Russian Federation <sup>9</sup>. As a result of comparing foreign and domestic concepts of national security, we can conclude that they, in general, contain a common (main) idea – national security represents the protection (preservation) by the state of the most important state, public and personal interests from external and internal threats. And there is every reason to agree with this approach. Based on the identified general approach to the definition of national security <sup>18-20</sup>, this paper further proposes to determine the general conceptual foundations of food chemistry and trace the features of their formation in order to use these results in practice in order to optimize the legal support mechanism for food security in modern conditions. Food security is the access of all members of a society to adequate and healthy food at all times of life to have a healthy and active life, and household income is an important factor in ensuring food security in a social system<sup>18</sup>. Another important factor in ensuring food security in the community is the taste and nutritional knowledge of families in how to allocate funds for the best available food and how food is distributed in the family<sup>19</sup>. This is provided when the per capita food basket of the family is properly selected and prepared, enough for the family members, and cooked properly so that the elements and nutrients reach the cells and organs of the body in a healthy and correct way<sup>20</sup>. In this regard, The FAO reported in a report that to feed the world's 9 billion people by 2050, it must produce twice as much as it currently does and that obstacles such as limited agricultural land, water scarcity, high energy prices, and declining investment must be met considered agricultural research and increased food waste<sup>21</sup>. One of the essential points of food security is microbial quality. Food microbiology is the study of microorganisms that inhibit, create or contaminate food<sup>15</sup>. This includes studying the microorganisms that cause food spoilage. Also, pathogens may cause disease, especially if the food is not cooked or stored properly. Those who used to produce fermented foods such as cheese, yogurt, bread, beer, and wine. Then those researchers with other useful roles such as the production of probiotics<sup>22-24</sup>. Food contamination can occur at any stage of production, packaging, transportation, distribution and even consumption of food<sup>25-27</sup>. One of the major and most common contaminants is chemicals, pesticides, and herbicides used on farms when crops are grown to control pests and agricultural diseases<sup>28,29</sup>.

### 1.1 Challenges Facing Food Security Include<sup>24</sup>

- Agricultural land restrictions
- weather changes
- Lack of water resources
- Rising energy prices
- Increasing the volume of food waste

### 1.2 Challenges Facing Food Safety Include<sup>25</sup>

- Contamination of food with heavy metals
- The emergence of new pathogens and toxins
- Prevalence of hormones and chemical preservatives
- The effect of pesticides on food,
- Lack of a healthy diet and related diseases (such as obesity, diabetes, heart disease, infertility and cancer)

## 2. METHODOLOGY

The survey methodology is on the basis of applying several general scientific techniques and methods and scientific

knowledge methods (synthesis, formal-logical approaches, induction, deduction, analysis, and system-structural)<sup>8-13</sup>, and private, scientific measures – comparative legal, historical-legal, formal-legal and interpretative, in the concept of food security and hygiene and legal problems<sup>16-22</sup>.

### 3. RESULTS AND DISCUSSION

Ethnic and conventional food, and plant-based choices of meat, evolving more common, affect consumption habits of nutrients (fat, Protein, carbohydrates, minerals, and vitamins) and bioactive, such as probiotics and prebiotics, affecting human inflammatory and microbiomes and immunomodulatory procedures. That sort of change may improve the gut microbial variety, enhance the endothelial process as well as cognitive function, and decrease bone loss or other health-related hazards. For instance, more increased phytates intakes from wholegrain cereals may hinder calcium uptake. Therefore, it seems essential to characterize not just bioactive compounds but their relations and effects<sup>13,14</sup>. The connection between dietary patterns and health choices is well-known. The movement still activates the growth and optimization of brand-new analytical techniques to quantify specific combinations in food and biological instances. Regarding that, bioactive mixtures are investigated for various bioactivities utilizing *in vitro*, *ex vivo*, and *in vivo* protocols<sup>3,4</sup>. The majority of study strategies concentrate on boosting the extraction of those metabolites besides there *in vitro* antioxidant, anti-inflammatory, antipyretic, antihypertensive, antihemolytic consequences in human hypolipidemic, erythrocytes and antiproliferative actions, confirmed by various *in vitro* and *in vivo* pharmacological investigations. Even though *in vitro* observances are of key priority, they shall be regarded as screening examinations for additional inquiries in more complicated protocols, including *in vivo* investigations utilizing animals or clinical trials<sup>4,7</sup>. A vast majority of studies have been performed to affirm that various foods and herbal extracts exhibit functional effects in humans while ingested on a regular basis as an element of a healthy diet. Nevertheless, much research only describes one or some *in vitro* and *in vivo* functionalities of those extracts with no conducting clinical tests to certify the alleged functionality. For example, whereas some investigations concentrate upon the presence of statistical relation between antidiabetic effects and antioxidant action in the phenolic formatting of a particular herb, others seek to evaluate the consequences of various extraction techniques on some specified *in vitro* functional outcome<sup>21-26</sup>. Proceeding directly to the consideration of the issues of forming the concept of food security in the international legal perspective, we will make a reservation that the proposed periodization is based on such criteria as legal documents of a strategic and declarative nature, fixing the foundations of state policy in the field of ensuring food security, as well as some generalized doctrinal ideas on the analyzed issues, adopted in the scientific community in the relevant period of time. Thus, a group of scientists, led by professors Napoli et al.<sup>10</sup> propose to identify five main stages in the evolution of the concept of food security: the first (40-50-ies of the XX century) is characterized by the desire of developed countries through the provision of food assistance to developing countries to distribute surplus food from their markets; the second period (60-ies of the XX century) is marked by awareness of the negative consequences of the development of needy states in the medium term as a result of direct food assistance; the third period (70-ies of the XX century) – the food crisis, which led to the need to control the volume of total world grain

reserves in order to ensure food security, price stability at the global and domestic levels; the fourth stage (80-ies of the XX century) is defined by the expansion of the concept of food security (now it includes criteria for economic and physical availability of food); and the fifth period (90-ies and up to the present time) is highlighted in the work, but is not analyzed in detail<sup>10</sup>. For our part, based on the food security concept put forward by the Food and Agriculture Organization of the United Nations (FAO) in 1996<sup>6</sup>, we will clarify that its main goal is to "provide humanity with safe and nutritious food". Accordingly, this period of evolution of the concept of legal provision of food security is referred to as "freedom from hunger and malnutrition"<sup>10-12</sup>. In Russian science, an interesting approach to the issue of the periodization of the evolution of the concept of food security is contained in the paper of E.V. Nekhoda. This author identifies three main stages in this process: the first (from 1946 to the mid-1970s) - food security is personified with food independence, including from food imports; the second stage (mid-70s – mid-90s) - switching attention to the problem of the solvency of demand; the third stage (1996 – to the present) is marked by the events of the 1996 World Food Summit and their implementation in the future<sup>11</sup>. Within the framework of this study (largely due to the limited scope of the article), we propose to consider in more detail the initial stage of the formation of the concept of food security. In this regard, the paper of Brunori is interesting for a systematic understanding of the study subject, in which, in comparison with previous papers, the process of the genesis of the concept of food security is covered by a broader chronological framework, including the background of the issue. So, this author suggests dating this process from the 30s of the last century<sup>1</sup>. And this opinion can be considered fair. Suppose we talk about the concept of food security as a certain way of understanding, interpreting any phenomena, the main point of view, the guiding idea, etc. In that case, we cannot ignore the paper published in 1935 by Frank L. McDougall, called "The Agricultural and the Health Problems", devoted to a comprehensive analysis of food security issues. Here for the first time, the thesis about the lack of proper nutrition in the majority of the world's population was voiced<sup>7,10</sup>. In this regard, the need for international cooperation to solve this problem was proclaimed. An important event in the evolution of the concept of legal provision of food security should be recognized as the conference held during the 1943 Second World War in the United States, which was attended by the representatives of 44 states, including the USSR. During the conference in the food and agriculture sphere, the concept of "freedom from need" was put forward (13, p. 11). This conference formed a comprehensive approach to the content of food security: the availability of food, its nutritional value and quality features, as well as the stability of its supply. Subsequently, with the formation of the Food and Agriculture Organization of the United Nations (FAO) in 1945<sup>14</sup>, the formation and further evolution of the concept of food security was carried out with its direct participation. As mentioned earlier, the priority issue that needed to be resolved after the Second World War was the idea of "freedom from hunger (need)", in connection with which the production of basic agricultural crops was stimulated, while the developed countries sought a state of food independence. Over time, in the course of various studies, international experts have come to the conclusion that countries receiving food aid are gradually losing the ability to self-sufficiency in food, which, in turn, affects the state of food security of the population<sup>8,10</sup>. The International Covenant on Economic, Social and Cultural Rights, adopted on December 16, 1966 had

a certain influence on the formation of the international concept of legal provision of food security. According to Part I of Article 11 of such Covenant, "the state parties identify everybody's right to a sufficient living standard for themselves and their families, such as enough food, clothes, and shelter, and the perpetual growth of living situations. The member states exercise proper steps to guarantee the employment of this right, realizing the significance regarding international collaboration on the basis of free consent"<sup>8,25</sup>. Part 2 of Article 11 is devoted to the obligations of states in connection with the legal provision of food security. Here is what is literally fixed in the analyzed source: "The states parties to the Covenant, recognizing the fundamental right of everyone to be free from hunger, should take the necessary measures, individually and through international cooperation, including the implementation of specific programs, to: (a) improve the methods of production, storage and distribution of food by making extensive use of technical and scientific knowledge, disseminating knowledge of nutrition principles and improving or reforming agricultural systems in such a way as to achieve the most efficient development and use of natural resources; and (b) ensure an equitable distribution of the world's food supply in accordance with the needs and concerns of both food-importing and food-exporting countries"<sup>8,13</sup>. Thus, it can be stated that during the period under review, the problem of food security is reaching the international level, as evidenced by the relevant scientific developments, activities carried out at the international level and adopted normative legal acts containing norms directly devoted to the concept of food security and measures to ensure it. Based on the above, we can talk about the first - the initial stage of the evolution of the concept of food security - the stage of its formation, covering chronologically the 30-ies - early 70-ies of the XX century. At this stage, there was a doctrinal formulation of the concept of food security, its practical testing, including in the crisis conditions of the Second World War and the post-war world order, as well as its legal consolidation at the universal level in the International Covenant on Economic, Social and Cultural Rights.

#### 4. CONCLUSIONS

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Based on the study, we can make the following conclusions: First of all, as a result of comparing foreign and domestic concepts of national security, we can conclude that they contain a common (main) idea – national security represents the protection (preservation) by the state of the most important state, public and personal interests from external and internal threats. Secondly, food chemistry and security is a kind of national security, because it is aimed at ensuring the implementation of the constitutional rights and freedoms of citizens of the Russian Federation (hereinafter - the citizens), decent quality and standard of living, as well as sustainable socio-economic development of the Russian Federation. Thirdly, the periodization of the evolution of the concept of food chemistry and security proposed in the article is based on such criteria as legal documents of a strategic and declarative nature that establish the foundations of state policy in the field of ensuring food security, as well as some generalized doctrinal ideas on the analyzed issues adopted in the scientific community in the relevant period. Fourthly, the initial stage of the evolution of the concept of food security (its initial stage, formation stage), as established in this paper, covers the 30-ies - early 70-ies of the XX century and ends with the food crisis of the 1970s, which required new approaches to the definition and legal provision of food security in the world. At the initial stage, there was a doctrinal formulation of the concept of food security, its practical testing, including in the crisis conditions of the Second World War and the post-war world order, as well as its legal consolidation at the international level in the International Covenant on Economic, Social and Cultural Rights.

#### 5. CONFLICT OF INTEREST

Conflict of interest declared none.

#### 6. AUTHORS' CONTRIBUTION

Galina S. Belyaeva, and Bela B. Bidova, conceived of the presented idea. Evgeniya Yu. Rudenko, Dariusz Szpoper, and Maxim V. Fedorov developed the theory and performed the computations. All authors discussed the results and contributed to the final manuscript.

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