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## Role Of Nutraceuticals In Health Management Systems.

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### ABSTRACT

The term "Nutraceuticals" can in a way be explained as foods that have medicinal properties as well as some nutritional value. Nutraceuticals are important for the treatment and prevention of certain diseases as well as providing good health. With the advancement in qualitative and quantitative determination parameters, the demand for these products has increased. Due to which the nutraceutical market became a million dollar industry in the world. The era of the birth of nutrients in the form of medicines is very important in the pharmaceutical world. Scientists and researchers uncover many facts about the therapeutic activities of such agents and apply interdisciplinary approaches to design and develop different dosage forms to deliver these herbal products based on their use. Extensive research has revealed these substances in the treatment of cancer, arthritis, metabolic abnormalities, diabetes, asthma and many other diseases. The presented review is an attempt to classify all types of nutrients with examples following their applications in the treatment of various diseases. In addition, the implementation, importance and challenges of the design and development of dosage forms to offer better delivery carriers of nutrients are also mentioned.

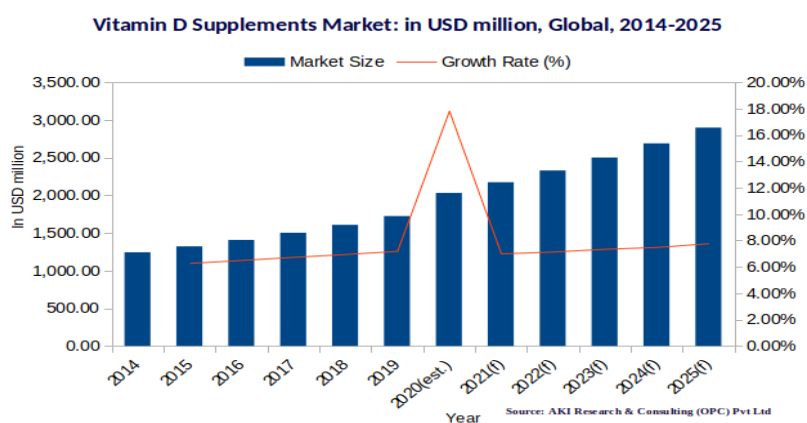
**Keywords:** introduction, increase demand of nutrition, traditional nutraceutical, Herbals, cardiovascular disease, Diabetes.

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## INTRODUCTION

The term nutraceuticals is a nutritive substance that enjoys great potential for growth and expansion in terms of health benefits. [1,2] By virtue of its nature and alternative use as modern medicine, it has shown the latter results in reducing the need for traditional medicines and reduced the potential for adverse effects. [3] Nutraceuticals are derived from food, herbs and pharmaceuticals which are very important in health products. Such products are used in the treatment of many diseases, such as cancer, metabolic problems, cold and cough, depression, and coronary heart disease. The nutraceutical market has been developed over the years due to increasing attention of researchers and qualitative and quantitative parameters and pure techniques. The nutraceutical market has grown into a million dollar industry globally. Global marketing of nutraceuticals was US\$128.4 billion in 2008. Japan holds the largest figure of 70% trade share in all of Asia. Table 1 summarizes current global markets along with the value of nutraceuticals in worldwide market share. The nutraceutical market in India has grown annually at the rate of 20% for the last 3 years which contributes 2% to the global market. Currently, India is in the category of showing promising trends towards nutraceuticals, also known as fast moving health care goods. The value of the nutraceutical market in 2009 was estimated at approximately ₹27 billion and the value of the nutraceutical market in 2021 is US\$382.51 million. The Indian nutraceutical market has almost reached a value of US\$2 billion as India's nutraceutical market accounts for 1.5% of the global nutraceutical industry. This position reflects ongoing trials and efforts to integrate traditional herbal ingredients into the nutraceutical portfolio. The future scope and demand for nutraceuticals depends on the awareness of the Indian consumer. [4] Therefore, it requires special attention and market interest to grow and establish new horizons for the growing nutraceutical industries.



**Table 1: Global market value of nutraceutical sector and current status.**

### History of nutraceuticals discovered

In 1989, the term nutraceutical was formed by combining nutrition and pharmaceuticals. The nutraceutical was created by the founder of Cranford, the Foundation for Innovation in Medicine (FIM), and the president, Stephen Defelice. Defelice stated that a nutraceutical is a food that prevents disease and provides health benefits, which is called a nutraceutical [5]. There is no standardized definition of nutraceutical, which is a substance used in the markets. A functional food for one consumer may act as a nutraceutical for another.

There are several natural remedies for cancer treatment. Vitamin E, selenium, vitamin D, green tea, soy, and lycopene are examples of widely studied nutraceuticals in human health [6]. Although many of these 'natural' compounds have been found to have great therapeutic potential; future studies should include well-designed clinical trials examining a combination of these compounds to determine the interactions that may bring to human health.[7]

### Increased Demand for Nutrition

The profile of today's work has led to new developments in a collection of diseases known as lifestyle disorders. The most common causes of these types of disorders are poor diet and reliance on fast food, deficiency Physical inactivity to biological clock, poor posture, excessive stress and adequate rest.

Nutraceuticals represent a unique combination of modern science and natural agents and perhaps the best health management solutions style diseases. Apart from these lifestyle problems are also considered to be the cause of speculation of a number of complex clinical conditions.[8]

The variety of nutraceuticals on the market can also help prevent the conversion of lifestyle problems into fatal ones. Consumer acceptance of nutritious food began to gain momentum from 1980 onwards following when Scientists began experimenting with the effectiveness of such products media representation. Other factors such as a significant increase in the cost of medical treatment, an increase in life expectancy, increased health awareness and available scientific data confirming the health benefits of nutraceuticals have also had an impact on consumers' acceptance of such products. Global market for nutraceuticals, an estimated 400 billion USD by 2019, is expected to exceed 700 billion with a CAGR of 8.3% by 2027.

New products that are predicted to thrive on the market all contribute to its growth. The influx of generic products may result in a lower cost of nutraceuticals but due to higher consumer acceptance, the overall market for such products is expected to stay steady.[9]

### Concept of nutraceuticals

In the process of drug development, it is necessary to have the results of clinical trials from animal experiments and studies, to confirmation of results. On the other hand, in the case of food, there was no way to guarantee food in the prevention of diseases in the past. In recent years, however, as the composition of food has been scientifically proven to cause lifestyle-related diseases, it has social issue.[10]

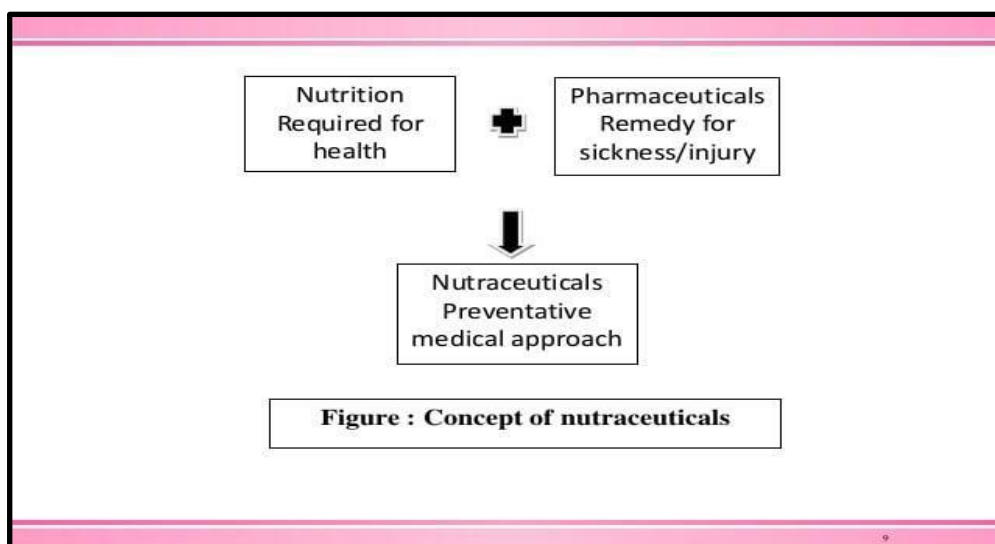


Fig: 1: concept of nutraceuticals

### Benefits Of Nutraceuticals.[11]

From a consumer perspective, diet and nutraceuticals may offer many benefits:

- It may increase the value of our healthy food.
- May it help us to live longer.
- It may help us to avoid certain medical conditions.
- It can be psychologically beneficial to do something for one person.
- It can be considered “more natural” than traditional medicine and is less likely to produce side effects.
- It can deliver food to people with special needs (e.g. nutritious food for adults).

## Division And Supply Of Food Money

There is a large section of nutraceuticals that includes many categories and subcategories. Nutraceuticals have a great contribution in health which provides energy for health and prevents diseases. Medicines have a role in pharmaceuticals to treat diseases but nutraceuticals have a role to eliminate diseases. Pharmaceuticals are recognized and patented by the government, whereas nutraceuticals are not recognized and patented by the government. (12) Mentioning nutraceuticals as "foodstuffs" as food and medicine are considered as one form. Functional food provides proteins, fats, vitamins, carbohydrates for health but when this food helps in preventing and eliminating all diseases other than proteins, fats, vitamins then it is called nutraceutical. (13) Example is, herbal The formulation contains extracts from the roots that women use in menstrual discomfort as a tonic. It is very important to identify all these food products, plants and sources as they have food and medicine properties. Studies have shown that nutraceuticals provide a variety of biologic therapies for the treatment and prevention of disease. To understand their use, nutraceuticals are divided into different classes based on their uses: [14]

- Traditional nutraceuticals
- Nontraditional nutraceuticals
- Fortified nutraceuticals
- Recombinant nutraceuticals
- Potential and established nutraceuticals
- Phytochemicals
- Herbals
- Functional foods
- Dietary supplements and dietary fibers
- Probiotics and prebiotics.
- Nutrients

**Traditional nutraceuticals:** The category contains unchanged foods. The components are natural and have some potential for greater health benefits. Lycopene, part of the tomato, is an example of this component.

**Nontraditional nutraceuticals:** In addition to nutritional content by adding nutrients, dietary components to improve nutritional quality include this category of nutraceuticals. The beta carotene rich rice is an example of this class.

**Fortified nutraceuticals:** Dietary supplementation is the process of adding micronutrients (essential trace elements and vitamins) to the diet to improve efficiency and nutritional value. Examples of it include cholecalciferol-enriched milk used for Vitamin D. deficiency. [15]

**Recombinant nutraceuticals:** It involves the use of biotechnology and genetic engineering in the production of energy products such as yogurt and cheese or the production of bioactive elements by enzymatic or fermentation technology. Gold kiwifruit is genetically modified for high levels of ascorbic acid, Carotenoids, and Lutein and Zeaxanthin. [16]

**Potential and established nutraceuticals:** Potential nutraceuticals hold an assurance of medicinal benefits. These nutraceuticals have become established medicines only after sufficient data demonstration and clinical testing for their efficacy and safety. All nutraceuticals may be available but all available nutraceuticals are not prescribed. [12]

**Phytochemicals:** These are the chemical elements of plants that have a different biological action. These are reported to have active ingredients that exert their effects on metabolism and biochemical reactions and thus, provide health benefits. [17]

**Herbals:** Herbal remedies that should be included in the treatment and prevention of diseases are included in the class. Plant products may contain a new plant used in any component such as dried leaf, fruit, stem, seeds, roots, or excentrated extract. [14]

**Functional foods:** Functional foods are a source of essential nutrients that provide energy in excess of the amount needed for growth. The term is specifically applied to food or food components that provide nutrition for health.[18] The functional food portion includes grains, legumes, and fermented food. Cereals such as rice, maize, wheat, market sorghum and functional food have been found to reduce coronary heart disease, tumors and blood pressure in many ways. Legumes, like grains, are the main ingredients of foods. They are highly nutritious and biologically rich in proteins, bioactives, peptides and amino acids. [19] Examples include kidney beans, split beans, chickpeas, lentils and soybeans. Other types of citrus fruits are functional food that provide therapeutic effects as anticancer, antiviral, antioxidant agents. [20] Fermented milk which is a food that provides good digestive effects. For example, yogurt which is used against cancer and to prevent gastrointestinal infections and atherosclerosis.[21]

**Dietary supplements and dietary fibers:** Food is a product whose deficiencies can lead to many diseases. Diet is given in the treatment of diseases. The diet is given as a tonic in body building and fitness building and at this time this diet has increased manifold to improve body building. A dietary component is one that increases the food and its nutritional value. Many vitamins and energy sources exist in the markets as dietary components.[22] The demand for food has increased significantly in developing countries like Brazil, China, India and Russia. In addition to vitamins and minerals, other dietary supplements include herbs, botanicals, amino acids, and pure extracts.[23]

Product	AOAC (g/100 g) <sup>a</sup>
Apples (with skin)	2.0
Bananas	1.9
Carrots (boiled)	3.1
Baked beans	4.2
Cabbage	2.0
White Bread	2.0
Brown Bread	4.5
Wholemeal Bread	7.4

**Probiotics and prebiotics:** The Probiotic category includes microbial supplements that are beneficial to health. Their action involves sticking to the intestinal tract in certain areas and their survival leads to the elimination of bacteria. The Prebiotic category includes selected fermented ingredients or fiber that promote changes in the intestinal microflora and its function which provides positive effects on the health of the host. They are a composting agent for probiotic bacteria in the colon. These are unaffected by stomach pH and digestive acids. Examples include inulin which when hydrolysis yields oligofructose and galactooligosaccharide.[24]

**Nutrients:** Dried nutrients, such as vitamins, minerals, amino acids and fatty acids, common nutrients as well their related health benefits.

NUTRIENT	FOOD SOURCE	EFFECT OF LONG - TERM INADEQUATE INTAKE
Thiamine (Vitamin B1)	Legumes, Whole Grains, Nuts, Meats	Confusion, Fatigue, Loss of Appetite, Poor Reflexes
Niacin (Vitamin B3)	Wholegrains, Vegetables, Nuts	Depression, Fatigue
Pantothenic Acid (Vitamin B5)	Wholegrains, Vegetables, Meats	Fatigue, Irritability, Numbness in Hands/Feet
Pyridoxine (Vitamin B6)	Wholegrains, Legumes, Eggs, Meats	Depression, Confusion, Cheilitis
Cyanocobalamin (Vitamin B12)	Meat, Fish, Dairy Products, Eggs	Depression, Poor Memory, Fatigue, Muscle Weakness
Folic Acid (Vitamin B9)	Green Leafy Vegetables, Legumes, Liver	Fatigue, Irritability, Diarrhea
Riboflavin (Vitamin B2)	Wholegrains, Eggs, Green Leafy Vegetables	Depression, Fatigue, Swollen Throat, Blurred Vision
Biotin (Vitamin B7)	Liver, Eggs, Fish, Nuts, Sunflower Seeds, Sweet Potatoes	Depression, Lethargy, Hallucinations, Rash, Hair Thinning/Alopecia
Ascorbic Acid (Vitamin C)	Fresh Fruits/Vegetables	Depression, Fatigue, Scurvy
Magnesium	Legumes, Green Vegetables, Fish, Nuts	Depression, Apathy, Fatigue, Muscle Weakness
Selenium	Eggs, Oysters, Tuna, Liver, Brazil Nuts, Legumes, Mushrooms, Sunflower Seeds, Oats, Brown Rice	Depression, Confusion, Fatigue, Infertility, Muscle Weakness
Zinc	Oysters, Nuts, Legumes, Seeds, Fish, Whole Grains, Red Meats, Poultry, Dairy Products	Loss of Appetite, Lack of Motivation (Mental Lethargy), Decreased Immune Function

## Application of nutraceuticals in diseases management:-

**Nutraceuticals against Alzheimer's disease:-** Alzheimer's disease (AD), also called senile Alzheimer's disease (SDAT), major Alzheimer's disease (PDDAT), or simply Alzheimer's, is the most common form of dementia.[25] The various nutritional supplements used to treat Alzheimer's disease are as follows-

**Antioxidants:**Antioxidants play a very important role in the treatment of all diseases as there are many incurable diseases which are associated with high levels of oxidative stress. Oxidative stress plays a major role in neurodegenerative diseases such as Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's disease. disease (HD). Oxidative stress accelerates the aging process and leads to a lack of antioxidants in the diet. A large number of studies have found an association between a high antioxidant diet and a lower risk of AD which is very important because prevention is much easier than cure. That's why prevention is important and research suggests that preventing AD is not really that complicated. Antioxidant treatment is a good opportunity to slow the progression of the disease. Research is underway on vitamin E to determine whether it actually slows AD progression. The trials were conducted by dividing patients into two groups, one being treated with 1000 IU of vitamin E and at least 5 mg of donepezil (Aricept) and the other not taking any vitamin E. The results showed that there was a significant decline in those using the permutation treatment. Diet studies have had similar results. Diets are full of antioxidants, so you get everything from flavonoids to well-known ones. Antioxidants such as vitamin E and vitamin C.

**Alpha-lipoic acid:** Alpha-lipoic acid (ALA) which contributes very significantly to brain function. Alpha Lipoic Acid is an effective antioxidant, which also progresses Also metabolizes glucose in the brain.In an open study lasting 337 days, Hager et al administered 600 mg of ALA daily to nine patients with AD and related dementia who were already receiving acetylcholinesterase inhibitors. The results showed that those receiving ALA had cognitive function stability, as evidenced by stable scores on the MMSE scale and AD test scores.[26]

**Phosphatidylserine:** Phosphatidylserine is a phospholipid and a component of cell membranes. It plays an important role in the characterization of the cell cycle, particularly in relation to apoptosis. It is an important route of virus entry into cells through apoptotic mimicry. Its exposure to the outer surface of a membrane marks the cell for destruction through apoptosis.Decline in memory and thinking skills that occurs normally with age. Taking phosphatidylserine that is made from cow brain by mouth seems to improve attention, language skills, and memory in aging people with declining thinking skills. But most phosphatidylserine supplements are now made from soy or cabbage. It's not clear if these supplements have the same effects.[27]

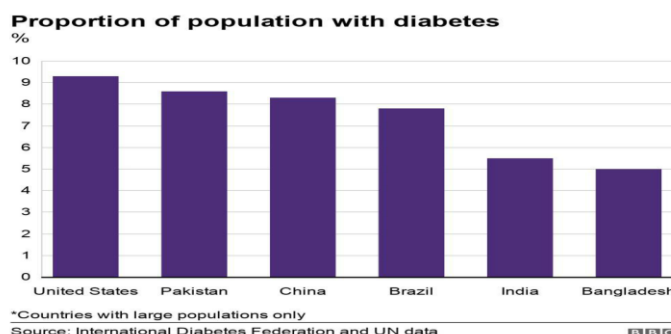
**Cardiovascular diseases:** The number of patients of heart disease, cancer, diabetes and obesity is increasing continuously.In 2001, chronic diseases accounted for about 59% of the 56.5 million reported deaths worldwide, and 46% of the population suffered from the disease worldwide.[28] Cardiovascular disease (CVD) Along with the cardiovascular they include high blood pressure, heart disease, cerebrovascular disease (stroke), heart failure, peripheral vascular disease, etc. In 1999, CVD alone accounted for a third of the world's deaths and in 2010 was the leading cause of death in developing countries. Now most CVDs are preventable and controllable.It has been reported that a low fruit diet as well as a low intake of vegetables increases the risk of a variety of diseases, including heart disease, which is associated with high mortality. [29] Several studies have shown that foods rich in fruits and vegetables play a protective role against CVD.Separately, nutraceuticals in the form of antioxidants, dietary fiber, omega-3 polyunsaturated fatty acids (n-3 PUFAs), vitamins, and minerals are recommended. and exercise for protection and CVD treatment.[30]

**Parkinson's disease:** Parkinson's disease is a brain disease that damages the nervous system in specific areas of the brain that causes muscle stiffness, tremors, and heavy walking, usually mid-adult life.[31] Canadian researchers said that if there is vitamin E in the diet, then it can get rid of Parkinson's disease. Creatine has been shown to alter the characteristics of Parkinson's disease as measured by a reduction in clinical symptoms.Researchers have studied glutathione to determine its effects on nerves and its ability to act as an antioxidant. The appropriate long-term dosage, side effects and most effective management method are still unclear.[32]

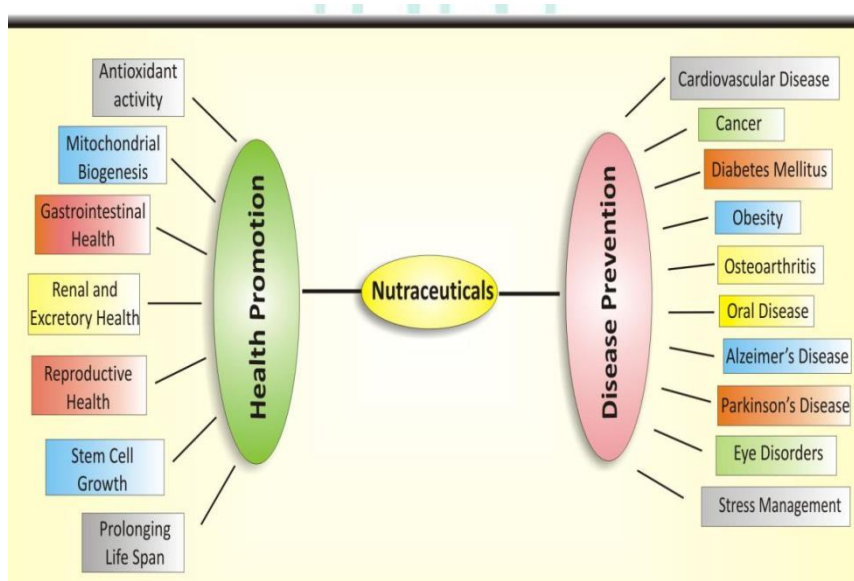
**In Apoptosis and Disease Prevention:** Scientists from various epidemiological studies have suggested that nutrients, especially photochemical compounds found in nutritious or medicinal plants such as tea,

garlic, ginger, soybeans, and others, may have a role in chemoprevention. Their mechanism of reducing cancer incidence in these studies is closely related to apoptosis. There is a wealth of information in the literature that supports the effect of nutraceuticals, in particular on human cells that are increased in apoptosis. In this section, we review selected photochemical effects associated with the following stages of structure: carotenoids, flavonoids, stilbenes, or other sulfur-containing compounds.[33]

**Diabetes:** Diabetes is caused by either insufficient insulin production, or due to an increase in the amount of glucose in the blood. The most common types of diabetes are type 1 diabetes (5%), an autoimmune disorder, and type 2 diabetes (95%), which is associated with obesity.[34] Gestational diabetes occurs in pregnancy. Globally, the number of diabetic patients is increasing continuously. Diabetes patients were 171 million in 2000 and increased to 366 million in 2003 and increased to 537 million in 2021.[35] Docosahexaenoic acid modulates insulin resistance and is also important for neurovisual Development. This is especially important for women with gestational diabetes which promotes recommendation for essential Fatty acids during pregnancy.[36]



**Osteoarthritis:** Osteoarthritis (OA), a degenerative joint disease, is the most common form of arthritis in the United States, affecting about 21 people.millions of people.In 2004, the cost of direct and indirect health care associated with all forms of arthritis was estimated at R86 billion. Discomfort of members from OA and other members disturbance can reduce physical activity to people experiencing this condition, resulting in energy imbalance and weight gain.Weight gain can aggravate the problem with more stress joints Glucosamine (GLN) and chondroitin sulfate (CS) are widely used to alleviate OA symptoms. These are nutraceuticals with both genetic and pharmacological properties and appear to regulate gene expression and synthesis of NO and PGE2, providing a clear description of their anti-inflammatory activities.[37]



## Figure of Nutraceutical in disease management

### CONCLUSION

Scientists have discovered a variety of nutritional elements through studies that play an important role in the prevention and treatment of various types of diseases. Today's people prefer to eliminate any disease in a natural way which can be achieved by including nutrients. Consumption of nutraceuticals is considered good for the improvement of health. Nutraceutical substances are also good for those who do not want to consume chemical substances. Nutraceuticals have become an integral part of human life. In today's time, the marketing graph of nutraceuticals is increasing continuously. The market values reported depicts the public behavior of giving more emphasis on the use of nutraceuticals which ultimately is related to the brighter scope of the nutraceutical industry. However, there is a huge scope for further advancement in the field by introducing delivery carriers and further spreading awareness about the potential of such systems. Therefore, the field undoubtedly has the greatest hidden value associated with it, which just needed to be explored to provide an easy and better healthy life.

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