



## FOOD TOXICITY AND CUMULATIVE POISONING-A REVIEW

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### ABSTRACT:

Food is a nourishing substance that is eaten or otherwise taken into the body to sustain life, provide energy or promote growth. Unsafe food containing harmful bacteria, viruses, parasites or chemical substances, causes more than 200 diseases- ranging from diarrhoea to cancers. Food safety, nutrition and food security are inextricably linked. According to Ayurveda *Ahara*(Food) comes under *Trayopasthamba* (3 pillars of life). But at the current scenario until and unless we farm our own food materials, a significant portion of commercially available food, genetically modified foods, usage of pesticides and fertilizers, preservatives, food adulterants, food dyes or chemicals added, and this may be one the major cause of increase in the prevalence of the diseases which is known to be of unknown origin such as cancer, diabetes etc., Hence food safety and toxicology is of great concern on the global terms due to unfair trade practices in quality and quantity. This can be correlated to a beautiful concept explained in ayurveda i.e., *Dushivisha* (cumulative poisoning). Therefore, an attempt through this article is made to understand how the food that we consume regularly can act as a Cumulative poison and how the concept of *Dooshivisha* can be applied clinically.

**Key words:** Food safety, Toxicology, Cumulative poison, Dushi *Visha*.

## INTRODUCTION

Food is of fundamental importance to life. It is necessary for development and functioning, including maintenance and reproduction. Food components are distinguished in four categories: Nutrients, toxins of natural origin, contaminants and additives. Nutrients accounts for major portion of food. Most of the food is treated in some way to improve its shelf life, texture, palatability or appearance. So it is important to know what happens to the various food products on the way from raw material to the consumer. [1]

Trends to large scale production, longer distribution chains in the food supply, increased eating away from the home and the emergence of new pathogens means foodborne illness continuous to be a significant public health issue.[2] Some of the major factors that cause health hazards in food are Genetically modified crops, Pesticides and Fertilizers, Preservatives, Adulterants, food dyes, Improper packaging techniques and Fast food culture. These factors lead a way to cumulative toxicity and produce acute and chronic effects in the body and thus imparting in negative health effects, societal and economic disturbances. The cumulative toxicity caused by food can be correlated to *Dushi Visha* in *Ayurveda*, which gets settles in body and when favourable conditions arises it produces acute and chronic symptoms in the body.[3]

The term *Dushivisha* is a combination of 'Dushi' means denatured, attenuated, latent, vitiated substance. *Visha* means poison. Thus *Dushi Visha* means denatured poison or attenuated poison. Any

poison that is devoid of *Vishaguna* is incapable of producing acute symptoms of poisoning can also be designated as *Dushivisha*. The poison, which is having lesser potency, attains a hidden stage in the body called is termed as *Dushivisha*. Due to presence of less Guna than *Visha* it is responsible for the delayed action and cumulative toxicity on the body. Because of the low potency of the poison, it usually won't causes sudden death. Because of the Avarana action by Kapha, these low potency poisons is retained in the body for a long period without producing any grave or fatal symptoms. [4]

## GENETICALLY MODIFIED CROPS

Genetic modification is the area of biotechnology which concerns itself with the manipulation of genetic material in living organisms, enabling them to perform specific functions. Genetically modified seeds are significant step forward in the production of agricultural crops. The aim is to introduce a trait to the plant which doesn't occur naturally in the species. Examples in food crops include resistance to certain pests, diseases, Environmental conditions, reduction of spoilage and resistance to chemical treatments or improving the nutrient profile of the crop.[5] These crops have only added to farm incomes by reducing the input costs, improved quality and did value addition but also reduced food insecurity by sustaining yields. Food insecurity becomes an essential point of discussion when it comes to developing world. Another benefit which is attached with GM crops is environmental protection from hazardous

chemicals sprayed for controlling insect pests on non GM crops. [6]

Although this method is more efficient, critics fear that the result a novel gene combination may have health or environmental impacts that are not being adequately addressed. It is believed that Genetic engineering often involves the use of antibiotic-resistance genes as “selectable markers” and this could lead to the production of antibiotic-resistant strains that produce resistance to available antibiotics.[7] One of the other major health concerns with genetically modified crops is its potential to increase allergies, and also several animal studies indicates serious health risks associated with GM foods; including infertility, immune problems, accelerated ageing, insulin regulation, changes in major organs and the gastrointestinal system.[8] A study published in 2009 found clear negative impact on liver and kidney function in rats consuming GM maize varieties for 90 days.[9] Generally the unexpected effects and health risk posed by GM foods can be classified into:-

- Toxicity.
- Allergic Reactions.
- Antibiotic Resistance.
- Immune – suppression.
- Cancer.
- Loss of Nutrition.

#### **PESTICIDES AND FERTILIZERS**

The term pesticide covers a wide range of compounds including insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and

others.[10] These are used for improving productivity of the crops, protection of the crop losses and the vector control. If the credits of pesticides include enhanced economic potential in terms of increased production of food, and amelioration of vector borne diseases, then their debits have resulted in serious health implications to man and his environment.[11]

Pesticides can enter in our body through 3 ways; through skin, ingestion and inhalation. Pesticides can cause short term adverse health effects, called acute effects, as well as chronic adverse effects that can occur month or years after exposure. Examples of acute health effects include stinging eyes, rashes, blisters, blindness, nausea, dizziness, diarrhoea and death. Chronic effects include cancers, birth defects, reproductive harm, neurological and developmental toxicity, immunotoxicity and the disruption of the endocrine system.[12]

In India the first report of poisoning due to pesticides was from Kerala in 1958, where over 100 people died after consuming wheat flour contaminated with Parathion. This prompted the special committee on Harmful effects of pesticides constituted by the ICAR to focus attention on the problem.[13] Data on 186 samples of 20 commercial brands of infant’s formulae showed the presence of residues of DDT and HCH isomers in about 70 and 94% of the samples with their maximum level of 4.3 and 5.7 mg/kg respectively [14], which were higher than those observed in most of the developed countries.

## **PRESERVATIVES**

Preservatives are chemical compounds that have fungistatic, bacteriostatic, antimicrobial or antioxidant properties. They are added to raw, processed foods like vegetables, fruit juices, confectioneries, bakery products, poultry, fish and meat products to inhibit souring, spoilage or growth of contaminants like bacteria, fungi, yeasts or molds. They also maintain determined shelf life of the product. It has been reported that chemicals which are used as preservatives have side effects. The reaction of the preservatives can be mild to life threatening. There are certain harmful effects of using chemicals for preservation such as:-

**Nitrates and Nitrites:** -These are used as curing agents in meat products, it gets converted into nitrous acid when consumed and is suspected of causing stomach cancer, Alzheimer's, Parkinson's and Type 2 diabetes. Studies have shown inconsistent associations of nitrite and nitrate intake with the risk of gastric cancer or its associated mortality.[15]

**Sulphites:** -Common preservatives used in various types of fruits and may have side effects in form of headache, palpitations and allergies.[16]

**Benzoates:** -Used in foods as antimicrobial preservatives, suspected to cause allergies, asthma and skin rashes.

**Sorbates/Sorbic Acid:** -Added to foods as antimicrobial preservatives, have reported of causing Urticaria and contact dermatitis.[17]

**MSG(Monosodium glutamate):-** Commonly used as flavour enhancement. It causes headache, skin rashes, nausea, weakness and even cancer.[18]

## **FOOD ADULTERANTS**

Adulteration of food is defined as the addition or subtraction of any substance to or from food so that the natural composition and quality of the original food substance is affected. It is used to get more profit and sometimes to increase the weight of the product. Food adulteration can have a range of harmful effects in health. It can not only lead to toxicity but also can lead to body paralysis or eventually death.[19]

## **FOOD DYES**

Food dyes are used, to make food more attractive, appealing, appetizing and informative and also provide color to colorless and "fun" foods. Usage of food dyes has been increased and it is difficult to find a food product without food dyes in it, from simple candies to multi cuisine dishes. These food dyes are nothing but chemicals and can cause severe health hazards.

The scenario of usage of synthetic food colours in India is changing. Till recently, eight synthetic dyes were permitted to be added to specified food items at the maximum level of 100 ppm. The permitted colours are erythrosine, carmoisine, ponceau 4R, Indigo carmine, Brilliant blue FCF, Fast green FCF, Tartrazine and sunset yellow FCF. Widespread prevalence of fraudulent practices like use of unpermitted colours or misuse of permitted colours and the inherent toxicity of these dyes has led the authorities to revise the regulatory provisions and make the laws pertaining to use of synthetic food colours more stringent.[20]

Interestingly, some food dyes are banned in some countries and allowed in others. For example,

Yellow 5 and Yellow 6 are dyes permitted to be used in Europe, with warning instructions: 'may have an adverse effect on activity and attention in children'. However, the use of both of these dyes is permitted in the USA and India without any warning.[21]

Researches have proven that some of the commonly used food dyes such as yellow-5, yellow-6 and Red 40- contain compounds, including Benzidine and 4-aminobipheny cause cancer. And also food dyes cause problems in children including allergies, hyperactivity, learning impairment irritability and aggressiveness.[22]

#### **IMPROPER PACKING TECHNIQUES**

The primary aim of the packaging food is to extent its shelf life by protecting its wholesomeness in such a way that safe food will reach consumers table. Interaction between the food and the packaging material is highly undesirable and it draws more attention when the composition of the migrants is unknown or was not proved to be safe. Scientific evidences proved that food components can react with some packaging materials and produce some chemicals that may be dangerous to the consumers.[23]

#### **DISCUSSION**

Due to the consumption of the above said foods in day to day life, It exerts effects over the body both psychologically as well as physically. As the origin and definition of *visha* implies the importance of psychological factors with the term *vishada* and *bhaya*. Various references from *samhitas* and other classical texts collectively give the importance of psychological factors in *visha*. Acharya Charaka's

quote '*Vishada* is *Rogavardhana*' signifies the importance of Psychological factors. In the current scenario, every person has *Chinta*, *Shoka*, *Krodha*, *Bhaya*, *Mada*, due to which there is increased anxiety as well as stress due to which there is increased ROS and also disturbance in the HPA axis. At the same time due to the consumption of *ahita Ahara* and following *ahita vihara*, the normal *prakruta rasa dhatu* gets disturbed which needs to get converted to other *dhatu*. As a result we see the deterioration of *dehabala*. These both Psychological as well as physical factors together make it favourable for the presentation of the symptoms of *Dooshivisha*.

#### **CONCLUSION**

It is very essential to see to that the food that we consume is always safe to prevent long term side effects. Hence it is essential to educate our farmers about growing organic food and crops. It is also our duty to create awareness in the mob about the harmful effects that are associated with junk food. It is advisable to remember that Impediment is always better than medicament and we need to act accordingly. With the growing trend in ayurveda, we can encounter the already accumulated *dooshivisha* with the help of *shodhana* and *rasayana* therapies. *Dooshivisha* (cumulative toxicity) could be considered as the answer for the so called idiopathic causes of many chronic illnesses & we need to focus on agricultural research in these lines. We always need to remember that all that glitters is not gold and all that is pleasing to the eyes may not be pleasing to the body.

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