



## TOXICOGENESIS AND ETIOLOGY OF *DUSHI VISH* IN CURRENT ASPECT

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### ABSTRACT

*Dushi Visha* is kind of poison originating from inanimate or animate sources or any artificial poison retained in the body after partial expulsion or which has provisionally undergone detoxification by the anti-poisonous drugs or the poison which devoid of the natural ten properties of *Visha*, incapable of producing acute symptoms of poisoning and it is coated by *kapha dosha*. This entity has not been mentioned by the contemporary science. So the Conceptual study of *dushivish* in current aspect and its toxicogenesis, etiological factors are evaluated, elaborate and discuss. *Dushivisha* is a type of chronic toxicity in which all four types of accumulative poisons are included i.e. Water soluble toxicants, Lipophilic toxicants, Toxicants forming colloid particles, Toxicant having affinity for bones and connective tissue because all are having property same as that of *dushivisha*. These toxicants aggravate their symptoms with *dushit Desh, Kala, Anna* and *Diwaswapn*. These conceptual etiological factors of *dushivisha* and its clinical manifestations may give a clue and direction for the diagnosis and management of *dushivisha*.

**KEYWORDS:** *Dushivisha*, Chronic Poisoning, Cumulative poisoning.

### INTRODUCTION

In Ayurveda all the acharya mentioned the *Dushivish* as a type of poison. The term *Dushi Visha* is a combination of two different words, *Dushi* and *Visha*. *Dushi* means denatured, attenuated, latent, vitiated and *Visha* means poison. Acharya Susruta and Vagbhata described *Dushi Visha* as any kind of poison originating from inanimate or animate sources or any artificial poison (*Kritrima Visha*) retained in the body after partial expulsion or which has provisionally undergone detoxification by the anti-poisonous drugs or the poison which devoid or losses their property by *Agani* (fire), *Vata* (wind) or *Aatapa* (sun light). Any poison that is devoid of the natural ten properties of *Visha*, incapable of producing acute symptoms of poisoning and it is coated by *kapha dosha* is called *Dushi Visha*.<sup>[1]</sup> This entity has not been mentioned by the contemporary science but with the help of Ayurvedic description it is need to find out the current available poison which can be include under the category of *Dushivish* and diagnosed such toxicity and can treat with the principal of *Dushivish* for the better results. Now a day the sources, nature and potency of poison have changed from ancient time due to evolution of living organism and variable changes in environment or biosphere. There are so many artificial chemical or poisonous material has been formulated and produced for various uses. Pesticide food additive like colouring

agent, preservative, flavoring agent, milk adulterant (toxic) or artificial prepared milk and drinking water also vulnerable. Some toxic material and metallic compound has being exposed to human being specially labor working in industry. All this etiological factor has being found responsible cumulative effect in human being which is similar to *dushivish*.

### AIMS AND OBJECTIVES

- Conceptual study of *dushivish* in current aspect.
- To study the toxicogenesis of *Dushivish* in current aspect.
- To evaluate, elaborate and discuss the etiological factor of *Dushivisha* in current era.

### MATERIAL AND METHOD

This article is based on personal clinical experiences and various studies published in national, international, index and non-index journal of Ayurveda, Medical science and biological science. Ayurvedic *samhita* and its relevant commentaries have referred to collect the material for the article. Text of Modern medicine and biology science has also referred to collect material for this article.

## CONCEPTUAL STUDY

### Ayurvedic concept of *Dushivish*

Acharya Sushruta stated that a part of *Sthavar* (Inanimate), *Jangam* (Animate) or *Krutrim* (Artificial) poison, which accumulated and cannot be excreted from body completely due to its chronic and cumulative nature or becomes less potent after digestion or counter action of antidotes & stays in the body for a prolong period and vitiating the body slowly is called *Dushivisha*. The *Veerya* of *Dushi Visha* being less, it does not show any immediate fatality. On the other hand, it becomes *avritta* (covered) by *kapha* (Lipophilic Binding) & stays in that state for years According to this definition *Dushivish* are those substance originated from *Sthavar* (plants and minerals), Animal and synthetic that have the following characteristics.

- Cannot be excreted from body
- Less potent after digestion or counter action of antidotes
- *Swabhavto guna vipraheenam* (Naturally devoid of Property) and *Alpaveerya* (less potent)
- *Kaphaavrita* (covered by *kapha*)
- *Varshagananubandhi*- stays in the body for years.

### Aggravating factors of *Dushivish*

*Dushit* (polluted) *Desha* (land), *Kala* (time or season) *Anna* (food), and *Divaswapna* (Sleeping in day time) this all are aggravate and precipitate the symptoms of *Dushivish*.<sup>[2]</sup>

Polluted land (*Dushita Desha*) can be considered as wet, watery or humid land (*Anupa Desha*) where excess wind, cold weather and increased rainfalls are present. Such land (*Anupa Desha*) influences on *Dosha Kapha* and *Vata*, and leads to aggravation of poison (*Visha*) in the body as *Dushivisha* is enfeebled by *Kapha dosha*.

*Dushit kala* can be considered as cold wind (*Sheet Anila*) and cloudy days (*Durdina*), which may have relation with *Dushivisha*. Rain makes body moist (*Klinna*), cold air reduces the power of digestion (*Pachakagni*) i.e. metabolism or detoxification is deranged and may lead to aggravation of both *Kapha* and *Vata Dosha*.

Aggravating factors like unwholesome food, Sleeping in daytime, anger, indulgence in sex, exercise etc affect both body and the mind are also equally capable to aggravate *Dushivisha*. Hence these factors can be further classified as *Aharaja* (the factors concerned to food) *Viharaja* (the factors concerned to activities like exercise, over strain etc) and (seasonal factors like wetland, cold weather, cloudy weather etc). These causative factors can be broadly classified as Exogenous (external factors) and Endogenous (internal *Kalaja* factors). Endogenous comprises of Psychic (*Manasika*) and dietary (*Aharaja*) factors whereas Exogenous factors comprises Seasonal (*Kalaja*) and lifestyle dependent (*Viharaja*) factors. These above aggravating factors are very beneficial for *Dushivisha* to produce the hidden symptoms which are yet not be produced.<sup>[3]</sup>

### Conceptual Toxicogenesis of *Dushivisha* as Per Modern Science<sup>[4]</sup>

The toxicants which retains in the body and accumulate, can be divided into four main groups according to their affinity, predominant retention and accumulation in a particular compartment

1. Water soluble toxicants
2. Lipophilic toxicants
3. Toxicants forming colloid particles
4. Toxicant having affinity for bones and connective tissue.

Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost. Thus, longer the biological half-life of the substance greater the risk of chronic poisoning, even if environmental levels of the toxin are not very high.

### Water soluble toxicants

Toxicants soluble in the body fluids are uniformly distributed according to the water content of compartments. Generally the water soluble toxicant is easily excreted by renal system and they are not accumulating or retain for longer time. Some of the toxicants which are entered in body due to continue exposure in daily life and those having higher T<sub>1/2</sub> time is retain in blood for longer time.

The well-perfuse internal organs generally achieve the highest concentration of toxicants in the shortest time, as well as equilibrium between blood and this compartment. The uptake of toxicants by less perfuse tissues is much slower, but retention is higher and duration of stay much longer (accumulation) due to low perfusion.

### Lipophilic toxicants

Lipophilic toxicants show a high affinity for lipid-rich organs (CNS) and tissues (fatty, adipose). The "standard man" of 70 kg body weight contains about 15% of body weight in the form of adipose tissue, increasing with obesity to 50%. However, this lipid fraction is not uniformly distributed. The brain (CNS) is a lipid-rich organ, and peripheral nerves are wrapped with a lipid-rich myelin sheath and Schwann cells. All these tissues offer possibilities for accumulation of lipophilic toxicants.

Adipose tissue will accumulate toxicants due to its low vascularization and lower rate of biotransformation. Here accumulation of toxicants may represent a kind of temporary "neutralization" because of lack of targets for toxic effect. However, potential danger for the organism is always present due to the possibility of mobilization of toxicants from this compartment back to the circulation. Despite the blood-brain barrier, numerous neurotoxicants of a lipophilic nature reach the brain (CNS) like anaesthetics, organic solvents, pesticides, tetraethyl lead, organomercurials compound etc.

**Toxicants forming colloid particles**

Toxicants in the form of colloids will be captured by the RES (Reticuloendothelial System) of organs and tissues. Distribution depends on the colloid particle size. For larger particles, retention in the liver will be favored. With smaller colloid particles, more or less uniform distribution will occur between the spleen, bone marrow and liver. Clearance of colloids from the RES is very slow, although small particles are cleared relatively more quickly.

**Toxicant having affinity for bones and connective tissue**

About 60 elements can be identified as osteotropic elements, or bone seekers. Incorporation of toxicants into bone occurs in two ways.

**i. Ion exchange reactions**

occur with physiologically present calcium cations, or anions (phosphate, hydroxyl). The bone mineral, hydroxyapatite, represents a complex ion-exchange system. Calcium cations can be exchanged by various cations. The anions present in bone can also be exchanged by anions: phosphate with citrates and carbonates, hydroxyl with fluorine. Ions which are not exchangeable can be adsorbed on the mineral surface. When toxicant ions are incorporated in the mineral, a new layer of mineral can cover the mineral surface,

burying toxicant into the bone structure. Ion exchange is a reversible process, depending on the concentration of ions, pH and fluid volume. Thus, for example, an increase of dietary calcium may decrease the deposition of toxicant ions in the lattice of minerals. It has been mentioned that with age the percentage of metabolic bone is decreased, although ion exchange continues. With ageing, bone mineral resorption occurs, in which bone density actually decreases. At this point, toxicants in bone may be released (e.g., lead).

**ii. Colloid adsorption**

For toxicants forming colloid particles, adsorption on the mineral surface occurs. Colloid particles are adsorbed as a film on the mineral surface (100 m<sup>2</sup> per g) by Van der Waals forces or chemisorption. This layer of colloids on the mineral surfaces is covered with the next layer of formed minerals, and the toxicants are more buried into the bone structure. The rate of mobilization and elimination depends on remodeling processes. Under conditions of chronic exposure, toxic metals such as lead, aluminium and mercury enter the mineral matrix of bone cells and accumulate.

**Accumulation in hair and nails**

The hair and nails contain keratin, with sulphahydryl groups able to chelate metallic cations such as mercury and lead.

**Etiological Factor****Table 1. Long Effects of Pesticide Chemicals on the Human Body**

S.N.	Chemical Family	Type of Pesticide	Symptoms Chronic Exposure <sup>[5,6,7]</sup>
1.	Organo-phosphates	Insecticides, Acaricides	Loss of appetite, weakness, weight loss, and general feeling of sickness
2.	Carbamates	Insecticides, Acaricides	Loss of appetite, weakness, weight loss, and general feeling of sickness
3.	Organo-chlorines (Chlorinated Hydrocarbons)	Insecticides, Acaricides (HCB is a fungicide)	Some buildup in the fat tissues. May cause nervousness, weakness, and shaking
4.	Pentachlo-rophenol	Herbicides, molluscicides, germicides, fungicides	Weight loss, weakness, anemia
5.	Arsenical Pesticides	Rodenticides, Insecticides, Acaricides, herbicides, fungicides	Accumulates in body. Chronic headaches, dizziness, stomach-aches, salivation, low fever, garlic breath
6.	Methyl Bromide, Ethylene Oxide and Propylene Oxide	Fumigants	Lack of coordination
7.	Halocarbons ethylene	Fumigants	Liver damage, weight loss, and jaundice
8.	Carbon disulfide	Fumigants	Pain, tingling and weakness of arms and legs; loss of mental functions
9.	Phosphine	Fumigants	Pain in eyes and nose; nosebleeds; abdominal pain
10.	Sulfuryl Flouride	Fumigants	Injury to kidneys and lungs
11.	Phenylmercuric Salts	Fungicides	Weakness and lack of coordination in arms and legs; difficulty in talking and swallowing

**Table 2: Long term effects of chronic Metallic Compound exposure.**

S.N.	Metals	Long term effects
1	Arsenic <sup>[8,9]</sup>	GIT – Loss of Appetite & Weight, Malaise, Salivation, Colicky Pain, Constipation or Diarrhea. Skin - Erythematous Hyperkerotic skin, Patchy Pigmentation Anemia, Leucopenia, Thrombocytopenia & Pheripheral Neuropathy
2	Mercury <sup>[10,11,12]</sup>	Mercurial lentis – discoloration of ant. Capsule Lens of the eyes due to Hg deposition, Danbury tremor & Hatter Shake- It is coarse, intentional & affect hand, Arm & Legs mercurial Erythrism & Mad as a Hatter- Excitability, Memory loss, Insomnia & delirium Non Specific- Anorexia, Insomnia, sweating, Lassitude & Headache
3	Lead <sup>[13,14]</sup>	Facial Pallor, Anemia with punctuate basophilic, Lead Line- Bluish black discoloration due to sub epithelial eposition of PbS granules on Gums at junctions of Teeth Retinal Stippling- Deposition of Gryish-glistening lead practical & noticed by Ophthalmoscope Colic & Constipation Hypertensive cardiopathy Lead Palsy- Wristdrop & Footdrap Lead Encephalopathy Lead Osteopathy Reproductive system- Female (Menstrual irregularities) & Male(Sterility)
4	Copper <sup>[15,16]</sup>	Vineyard Sprayer's Lung Disease (VSLD)- due to chronic inhalation of copper Sulphate Spray used as Insecticide Green Hair Discoloration due to chronic contact with swimming pool water containing Algicidal Copper Chemical, Wilson's Disease- it is inborn error of metabolism characterized by excessive accumulation copper in Liver, Brain, Kidney & Cornea

### Health Effects of Chronic / Repeated Exposure of Preservatives

**Ethylene glycol**-Long term or repeated dermal exposures to ethylene glycol may cause dermatitis.<sup>[17]</sup>

**PCBs (polychlorinated biphenyls):-** It is used as coolants and lubricants in transformers, capacitors, electrical equipment and found in fish, surface soil, and drinking water. It stored in fatty tissues and the accumulation of PCBs causes liver damage, brain disorders, skin problems, cancer, hormone imbalance, birth defects.

**Dioxins** is a product of chlorine bleaching, burning plastics, pesticide production and found in contaminated beef, pork, chicken, fish, milk, eggs. The accumulation of dioxin causes skin lesions, hormone imbalance, sterility, nervous system dysfunction, cancer.

### DISCUSSION AND CONCLUSION

*Dushivish* is an important part of clinical toxicology which plays a major role since ancient time. Hence all the text book of Ayurveda including *Vrihatriya*, and *Laghutriya* has found detail description about *Dushivish*, its clinical manifestation and management. Today the source, nature and potency of drugs, chemical or poison substance has been changed due to evolution of living organism and various changes in biosphere. Various artificial chemicals have being added in foods, milk and soft drinks and some of additive material which are continuously persistent exposed to human being and produce ill effect. Utilisation of pesticide has been increase after green revolution in all over the world along

with India. The pesticide accumulates in body which produces long term hazards due to prolonged continuous persistent exposure. Some metallic compound like Mercury, Arsenic, Copper, lead etc. also accumulates and produced chronic hazards to human being. Thus food additives drink additive, milk adulterance, pesticides and metallic compounds may produce chronic toxicity by accumulation of these toxicants or toxic metabolites in human being which is similar to *Dushivish*. The toxicant is accumulating in body due to the covering of *kapha dosh*. It is seen in lipophilic toxicants and toxicants forming colloid particles. The *nirukti* (origin of word) of *kapha* is from "*Shlish Alingne*" It means the substance which binds the two particles. So here Colloid particles are adsorbed on bone as a film on the mineral surface (100 m<sup>2</sup> per g) by Van der Waals forces or chemisorptions. In other words any accumulating substance always accumulates in the body due to the karma of *kapha dosha*. *Dushivisha* is a type of chronic toxicity in which all four types of accumulative poisons are included i.e. Lipophilic toxicants, Toxicants forming colloid particles, some water soluble toxicants, Toxicant having affinity for bones and connective tissue because all are having property same as that of *Dushivisha*. These toxicants aggravate their symptoms with *dushit Desh*, *Kala*, *Anna* and *Diwaswapn*. These conceptual etiological factors of *Dushivisha* and its clinical manifestations may give a clue and direction for the diagnosis and management of *Dushivisha*.

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