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REVIEW ARTICLE

CONCEPT OF DIETETIC XENOBIOTICS IN AYURVEDA BY SUSHRUTA

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ABSTRACT

Various types of chemicals are found with food taken in present era. These chemicals are used for preservation of ready to eat food or junk foods. The other chemicals are used as drugs, cosmetics and beauty products. All such chemicals are harmful for human body if taken at more than a permissible amount or concentration. These are known as Xenobiotics. The most studies say that these are very near contact with food and ingested with the same parental root. Xenobiotics either affect the body by developing any pathology of disease or even death. *Sushruta* had also given detailed explanation for such types of Xenobiotics in *Sushruta Samhita*. The present study was done for understanding of salutary and harmful dietetics under the heading of Xenobiotics. *Sushruta* has explained harmful dietetics which causes disease and even death which may be classified under endogenous type of Xenobiotics. He has further classified them in four categories. This concept requires further study in the manner of its absorption and metabolism, and which not eliminated from body may create disease.

Keywords: Xenobiotics, Ayurveda, Sushruta Samhita

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INTRODUCTION

How does our society deal with questions about the quality and safety of our food, given that apples have been found with Iprodione and that lemons and oranges commonly have significant levels of Imazalil on their peels? These fungicides are used to prevent mold during storage and transport of fruits and vegetables. Worldwide monitoring programs to detect pesticides, pharmaceuticals, and banned substances in food are in practice. Each country sets tolerance limits for the consumption of these food products separately as it estimates the hazard or toxicity. Generally, the values are based on toxicity studies and an index of safety or tolerance that is constantly being reviewed and updated.[1]

Man's use of Xenobiotics dates from antiquity but interest in foreign compound metabolism dates from only the mid-19th century when the knowledge and techniques of organic chemistry were first applied to its study. Xenobiotics can produce a variety of biological effects including – cancers, immunological responses, toxicity, pharmacological responses. Of necessity, scientists working in such diverse fields as clinical and basic pharmacology, biochemistry, toxicology and oncology became drawn into metabolism studies both in universities and research institutes in the pharmaceutical, chemical, agro-chemical, food processing, tobacco and cosmetic industries.

Ayurveda is the time tested science of health. The evidences are available of Xenobiotics which can be understood with knowledge of contemporary sciences. This study is based on the factors which can develop Xenobiotics in human body, mentioned in ancient *Ayurvedic* treaties under the dietetics and life style, especially in *Sushruta Samhita.*

The term Xenobiotic is derived from the Greek word Xenos [foreign, stranger] and Bios [of or pertaining to life]. The term Xenobiotic is often used in the contest of pollutants such as dioxans and poly chlorinated biphenyls and their effect on biota because they are understood as substance foreign to entire biological system[2] i.e. artificial substances, which did not exist in nature before their synthesis by humans. Examples of Xenobiotics are compounds that include drugs, food additives, and environmental pollutants. The definition of Xenobiotics as compounds 'foreign to life' exhibiting 'unnatural' structural features does not necessarily imply that Xenobiotics are toxic compounds, but many Xenobiotics indeed are harmful to living organisms.[3]

Definition:

A Xenobiotic is a foreign chemical substance found within an organism that is not

normally naturally produced by or expected to be present within that organism. It can also cover substances which are present in much higher concentrations than are usual. Specifically, drugs such as antibiotics are Xenobiotics in humans because the human body does not produce them itself, nor are they part of a normal diet.[4, 5] Xenobiotics are chemicals which may be accidently ingested or taken as drugs or compounds produced in the body by bacterial metabolism. Epidemiologic studies in humans suggested that diet is an important vehicle of exposure to various Xenobiotics.[6] Natural compounds can also become Xenobiotics if they are taken up by another organism, such as the uptake of natural human hormones by fish found downstream of sewage treatment plant outfalls, or the chemical defenses produced by some organisms as protection against predators.[7]

Types of Xenobiotics

a) ***Exogenous –*** The foreign molecules which are not normally ingested or utilized by the organism but they gain entry through dietary food stuffs, or in the form of certain medicines / drugs used for a therapeutic cause or are inhaled through environment. Examples – Drugs, food additives, pollutants, insecticides, chemical carcinogens etc.

b) ***Endogenous –*** Though they are not foreign substances but have effects similar to exogenous Xenobiotics. These are synthesized in the body or are produced as metabolites of various processes in the body. Examples – bilirubin, bile acids, Steroids, eicosanoids and certain fatty acids**[8]**

Absorption, Metabolism & Excretion:

Xenobiotics must cross the intestinal epithelium, basement membrane and capillary endothelium before they reach the blood stream. Mammals do not absorb the Xenobiotics through any special transport processes but share the same transport processes which are used absorption of nutrients. There are five possible processes of Xenobiotics transport across the intestine. They are active transport, pinocytosis, filtration through “pores”, lymphatic absorption and passive diffusion. The intestinal absorption, excretion and metabolism of Xenobiotics may be, at least partly, regulated by food factors.[9] The metabolic activity developed by the gut microbiota contributes to the digestion of dietary compounds, salvage of energy, supply of [micro] nutrients and transformation of Xenobiotics.[10] Some of the most abundant bacterial enzymes involved in the degradation Xenobiotics are β-glycosidases and β-glucuronidases, which may play both

beneficial and harmful roles[11] Xenobiotics are normally eliminated from the body after metabolism to compounds that are excreted through the bile, kidney, lung or dermis.[12]

Salutary & Unsalutary Substances

While giving explanation about salutary and unsalutary substances and its effectiveness, *Sushruta* mentions example of drugs and dietetics used for *Vata prakopa* can be adverse to *Pitta prakopa.* Hence no drugs or substance can be termed as entirely wholesome or unwholesome. According to *Sushruta's* school of thought the articles in their natural form or in combinations may be always *Ekanta hita* (always beneficial), or *Ekanta ahita (*always non beneficial) or of mixed values. As water, *ghrita* and milk etc. being congenial by nature are always beneficial to the human beings. But cautery, caustics and poisons, due to their burning, consuming and killing effects, are always non beneficial; as also some other substances may become equivalent to poisons, when used in various combinations. The substances can sometimes be both, beneficial as well as non beneficial, for example, those which are salutary for *Vayu* can be unsalutary for *Pitta*. So some of the substances are salutary for one person may be unsalutary for the other. ***[13]***

Various diseases have innumerable stages and according to that the drugs should also been used. Some drugs are beneficial at a particular stage of the disease whereas the same will be non beneficial in the other stage. Due to the disease, etc. being in innumerable stages no drug should be considered to have an exclusively beneficial or non-beneficial action; however, one should consider these only in the context of the preservation of normal health.

Sushruta had listed out some natural sources of nutrients in both vegetarian and non vegetarian category, and certain regimens, which are *Ekanta hita* to all living beings. Further he classifies the unsalutary diets in four categories of incompatibility, like combination, functional, quantitative and tastes.

Some of the different food materials or drugs which are incompatible if used in combination may become harmful to the human being. Such kind of incompatibility is called as combination incompatibility, i.e. *Mulaka* and honey or milk; *Mulaka*, mango, jamboo, meat of *shvavit* pig, all fishes, specially *chillichima* and *godha* with milk; *Kakamachi* with piper longum and piper nigrum; Honey with hot water or drink; wine with *krusara* and *payasa*; Banana with *talaphala*, milk, yoghruta and butter milk; Domestic, swampy and aquatic meat with new germinated paddy, fat, honey, milk, *guda* and *masha*; The vegetables *rohini* and *jatuka* with

milk and honey; Balaka meat with wine and gruel; The *Nadibhanga* vegetable, chicken and yoghrut together; Raw meat with bile; *Tilashashkuli* with *sauvira* [a type of alcoholic preparation]; *Kakamachi* and *guda*; Pork and *guda* or honey and Lakuchphala with milk, yoghruta and soup of masha pulse. These combinations when used are not nutritional and after metabolism may develop harmful substances like Xenobiotics which causes pathology in body.

The cooking methods may also become incompatible. For example the pigeon fried in mustard oil; the meat of *kapinjala* peacock, *lava tittira* and *godha* cooked in *eranda, daruharidra* wood fire or with *eranda* oil; the *ghrita* kept in a *kamsya* [bronze] pot for 10 days; honey taken with warm substances and in summer season, *kakamachi* cooked in a pot which is already used to cook fish or ginger; the vegetable of *upodika* cooked with *tila* [sesame seed] paste; *Balaka* meat fried with the fat of pig with coconut; *Bhasa* meat cooked on an iron rod. These incompatible substances at the time of cooking form some chemical reaction resulting in harmful element which is not useful for the human body, and cause pathology.

In the same manner the incompatibility may develop according to the quantity of two various substances, i.e. Honey and water; Honey and *ghruta*; Two different types of fats; Honey and fat; and water and fat are incompatible if taken orally in equal quantity. The oral intake of these substances in unequal quantity is safe.

The various tastes of the dietary substances are also having incompatibility. Not only tastes but *Sushruta* had also included all resultant properties after digestion of substance like *Vipaka* [last taste after digestion] and *Virya* [potency]. He categorized these substances in further four levels of incompatibility but it should be generalized as incompatibility in taste. The sour & saltish; and bitter & astringent are taste incompatible. The sweet & sour; sweet & saltish; pungent & bitter; and pungent & astringent, are incompatible in taste and potency. The sweet & bitter; sweet & astringent; sour & pungent; and saltish & pungent, are incompatible in taste and *Vipaka*. The sweet & pungent; sour & bitter; sour & astringent; saltish & bitter; and saltish & astringent, are incompatible in all aspects. Further *Sushruta* had also given targeted effects of some incompatibility. Intake of such dietary substances which are incompatible in taste and potency lead to diseased condition with weakness of sensory organs or even death.

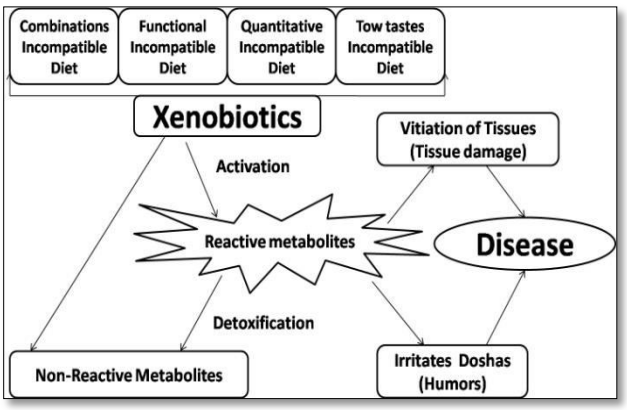
Concept of Xenobiotics in Sushruta

If the substance eaten irritates the *Doshas* [humors] and does not allow them to be eliminated by the body, it leads to vitiation

of the tissues, etc., and produces the disease.[13]

Sushruta defined Xenobiotics as the substance which is not useful in body and will irritates the bodily *doshas* [humors], not eliminated, such chemical substances leads to vitiation of the tissues and produces the disease. According to *Sushruta* elimination may take place through metabolism if such substances are in small quantity, habitual to the person, good appetite, young, has undergone oleation and has good resistance.

Figure no. 1: how Xenobiotics produce disease



CONCLUSION

The concept of Xenobiotics can be well correlated with the incompatibility of substances as mentioned by *Sushruta*. The most common root of ingestion for Xenobiotics is food. Though in natural form, certain substances may not be toxic or harmful but if in combination in various ways and after metabolism in the body may form a substance which acts as toxin and may become cause for any disease. Such combinations are still not explored in terms of pharmacological basis, pharmacodynamics and pharmacokinetics. All four categories of the Xenobiotics as described by *Sushruta* should be researched for each and every type of combination, functional, quantitative and taste incompatible substances for better understanding about their reactions in the body.

REFERENCES

1. E. Michael Thurman, Imma Ferrer, University of Almería [Spain]; Jerry A. Zweigenbaum, Agilent Technologies, “High-Resolution and Accurate Mass Analysis of Xenobiotics in Food”
2. Epstein, S. S. Environmental pathology. Am. J. Pathol. 66:352 [1972].
3. S. Fetznet “Biodegradation of Xenobiotics” Department of Microbiology, University of Oldenburg, D-26111 Oldenburg, Germany.
4. http://en.wikipedia.org/wiki/Xenobiotic
5. http://www.dadamo.com/wiki/wiki.pl/Xenobiotics
6. Donato F. Romagnolo, Stephanie C. Degner, Michael Q. Kemp, Jennifer Hockings and Ornella K. Selmin “Role of Dietary Xenobiotics-Gene Interactions in Carcinogenesis: Protective Effects of Nutritional Factors” Department of Nutritional Sciences, 1177 E 4th Street, Rm 303 Shantz Building, The University of Arizona, Tucson, Arizona 85721-0038, USA.
7. Mansuy D [2013]. "Metabolism of Xenobiotics: beneficial and adverse effects". *Biol Aujourdhui.*1 [207]: 33-37. doi:10.1051/jbio/2013003. PMID 23694723.
8. BIOTRANSFORMATION/DETOXIFICATIONREACTION SMETABOLISM OF XENOBIOTICS Biochemistry for Medics http://www.namrata.co

9. Soichi ARAI, Yasushi MORINAGA, Toshikazu YOSHIKAWA, Eiichiro ICHIISHI, Yoshinobu KISO, Masatoshi YAMAZAKI, Masami MOROTOMI, Makoto SHIMIZU, Tamotsu KUWATA & Shuichi KAMINOGAWA [2002] Recent Trends in Functional Food Science and the Industry in Japan, Bioscience, Biotechnology, and Biochemistry, 66:10, 2017-2029, DOI:10.1271/bbb.66.2017
10. Nadal I, Donat E, Ribes-Koninckx C, Calabuig M, Sanz Y. Imbalance in the composition of the duodenal microbiota of children with coeliac disease. J Med Microbiol. 2007; 56:1669-74.
11. Dabek M, McCrae SI, Stevens VJ, Duncan SH, Louis P. Distribution of betaglucosidase and beta-glucuronidase activity and of beta-glucuronidase gene gus in human colonic bacteria. FEMS Microbiol Ecol. 2008; 66: 487-95.
12. D Grace, S Abraham, A Varghese, S Sathianarayanan. *Absorption And Metabolism Of Xenobiotics: An Overview*. The Internet Journal of Nutrition and Wellness. 2008 Volume 7 Number 1.
13. G. D. Singhal, Ancient Indian Surgery Vol. 1, Chapter 20, verse no.20, 1st edition; Delhi; Chaukhamba Sanskrita Pratishthan: p.356

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