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 polychlorinated 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
dermis before they reach the bloodstream. 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. Xenobiotics are normally eliminated from the body after metabolism to compounds that are excreted through the bile, kidney, lung or dermis.

**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.

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 *shavvit* 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 yoghurt 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.\cite{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”
3. S. Fetznet “Biodegradation of Xenobiotics” Department of Microbiology, University of Oldenburg, D-26111 Oldenburg, Germany.
8. BIOTRANSFORMATION/DETOXIFICATIONREACTION SMETABOLISM OF XENOBIOTICS Biochemistry for Medics http://www.namrata.co


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