

## Concept of *Ama* w.s.r. to Free Radicals as a Causative Factor of Diseases

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### Abstract

Majority of the endogenous disease begins with the formation of *ama* in the body. It has tremendous capacity to vitiate the *doshas* and disturbing the homeostasis (*Dhatu-samya*). *Ama* is the resultant of improper digestion or partially digestion of the food particle due to hypofunction of *jatharagni* and also due to accumulation of *mala* in the body. It may be considered as partially or incompletely metabolised *dhatu* in case of *dhatvagnimandya*. *Ama* is not a single entity but is a generalized term, which can be applied to many malformed substances in the body. This *ama* is responsible for the production of various diseases. In modern parameters, *ama* is supposed to be deadly free radical. Free radical is an atom/molecule that contains one or more unpaired electron, which requires neutralization by free radical scavengers. Thus it exists in an incomplete metabolic state which is also the state of *ama* described as *avipakvam* (incompletely digested/metabolised). The present article attempts to understand the concept of *ama* as well as free radicals as a causative factor if diseases. Free radical theory is one of the biggest clues which help us in understanding the phenomena involved at the molecular level of *ama*. The above speculation leads to the conclusion that the earlier *Ayurvedic* concept of *ama* can be explained to the modern man by justifying it with the help of biochemical parameter called free radicals.

**Keywords** *Ama*, Free Radical



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## INTRODUCTION

*Ama* in *Ayurveda* are considered as very important morbid factor responsible for causation of a variety of diseases and playing key role in genesis of most of the diseases. As per *Ayurveda*, disease state is due to disturbances or deviation in the equilibrium of *dosa-dhatu-mala*. The proper knowledge for correcting them cannot be obtained without understanding the in-depth of pathology. *Ama* is an important factor in pathology of any disease. This concept resembles with contemporary concept of free radical theory.

## AIMS AND OBJECTIVES

- To evaluate the concept of *Ama* as per *Ayurveda*.
- To evaluate the concept of free radical theory.
- To understand the role of *Ama* in pathology of disease in *Ayurveda* as well as contemporary science.

## MATERIALS

*Ayurvedic* textual materials were referred, mainly *Charaka samhita*, *Sushruta samhita*, *Astanga hridaya* and available commentaries of these *samhitas*, for the study. Some modern books of biochemistry,

journals etc. have also been looked over. From these books references have been collected.

## DISCUSSION

### *Ama- the Concept:*

According to *Ayurveda* “*Ama*” is responsible for most of the diseases we suffer from. The synonym of disease i.e., *amaya* is said to be a condition produced by *Ama*<sup>1</sup>. According to *Acharya Vagbhata* due to the diminution of *agni* the first *dhatu* namely *rasa* is not formed properly and the *anna rasa* (food essence) undergoes fermentation and putrefication being retained in the *amashaya* (stomach) this state of *rasa* is *Ama*. So the improperly digested *rasa* is *Ama*. *Ama* (as per the different classics) can be understood as-

- Incomplete digested food.
- Unprocessed food.
- Food which is undergoing the process of digestion.
- Partially digested.
- Matter which requires further *parinama*<sup>2</sup>.

### *Effects of Ama:*

According to *Acharya Vagbhata* *Ama* produces-

- *Srotarodh* (obstruction of channels).

- *Balabhramsa* (loss of strength)
- *Gaurava* (heaviness)
- *Anila mudhata*
- *Alasya*
- *Apakti* (indigestion)
- *Nisthiva* (excessive salivation)
- *Mala sanga* (obstruction of stools, urine etc)
- *Aruchi* (anorexia)
- *Klama* (lethargy).

#### ***Etiological Factors:***

*Charaka* has very elaborated view regarding etiology and pathogenesis of *Ama*. He says that not only food taken in excess quantity cause production of *Ama* but heavy, cold, dry, impure etc. diets may also cause *ama*. He also indicates mental factors causing *Ama* like anger, greed, jealousy, grief, fear etc. Intake of wholesome food in proper quantity do not get properly digested when individual is afflicted with these mental conditions<sup>3</sup>. Again the impairment of *agni* may be brought about by abstinence from food, indigestion, never-eating, irregular diet habits, indulgence in incompatible food items, the consumption of cold substances, mal-effects of *virechana* (purgation), *vamana* (emesis), *snehana* (oleation), wasting of tissue due to diseases, unfavourable changes in place, climate,

season and suppression of natural urges cause impairment of *agni* which fails to digest even the most easily digestible light food. Thus, the undigested food attains *shuktatva* (fermentation) leading to the onset of toxic state<sup>4</sup>. The *dosas* & *dusyas* (the *dhatu*s and *malas*) which get mixed with this *ama* are designated as *Sama* (mixed with *ama*)<sup>5</sup>. So also the diseases arising from them<sup>6</sup>.

#### ***Role of Ama:***

This “*Ama*” is of sedentary nature so it tries to sediment wherever it gets a chance. This sedimentation of the waste in the body occlude the micronutritive channels of the body resulting in different diseases like, in a patient of kidney stone there is always a history of the disturbed digestive system in the beginning. Therefore, deposition of “*Ama*” in the urinary system and its further solidification might be the reason for the kidney stones.

Likewise when “*Ama*” gets deposited in the joints it is termed as Rheumatoid Arthritis. It is the inflammatory response of the joints in response to the presence of “*Ama*” there. One specific thing about this deposition of “*Ama*” in joints is that it is not permanently deposited in a particular joint. With movement it might change its location and

accordingly there will be sifting pain in different joints.

In the same way the presence of “*Ama*” can disturb any part and system of the body.

From above all references it can be understood that the concept and formation of *Ama* depends upon the key factor i.e. *agni*. Slight hypo functioning of this biological *agni* lead to the formation of many metabolic toxins, leads to the ill effects of cells, tissues, organs, channels etc. This linearity of activities can be observed in the contemporary concept of free radical theory.

### **CONCEPT OF FREE RADICAL THEORY:**

A free radical can be defined as any molecular species capable of independent existence that contains an unpaired electron in an atomic orbital. The presence of an unpaired electron results in certain common properties that are shared by most radicals. Many radicals are unstable and highly reactive. They can either donate an electron to or accept an electron from other molecules therefore behaving as oxidants or reductants<sup>7</sup>. The most important oxygen containing free radicals in many disease states are hydroxyl radicals, superoxide anion radical, hydrogen peroxide, oxygen singlet, hypochlorite, nitric oxide radical and

peroxynitrite radical. These are highly reactive species, capable in the nucleus, and in the membranes of cells of damaging biologically relevant molecules such as DNA, proteins, carbohydrates and lipids<sup>8</sup>. Free radicals attack important macro molecules leading to cell damage and homeostatic disruption. Targets of free radicals include all kinds of molecules in the body. Among them, lipids, nucleic acids and proteins are the major targets.

### ***Production of Free Radicals in the Human Body:***

Free radicals and other ROS are derived either from normal essential metabolic processes in the human body or from external sources.

Some internally generated sources of free radicals are<sup>9</sup>-

- Mitochondria
- Xanthine oxidase
- Peroxisomes
- Inflammation
- Phagocytosis
- Arachidonate pathways
- Exercise
- Ischemia/Reperfusion injury

Some externally generated sources of free radicals are-

- Cigarette smoke

- Environmental pollutants
- Radiation
- Certain drugs, pesticides
- Industrial solvents
- Ozone

### **FREE RADICAL AS A CAUSATIVE FACTOR OF DISEASE:**

The theory of free radicals which has been proven in recent years considers these free radicals (unstable reactive radicals) as the main cause of many diseases and degenerative changes produced in the human body<sup>10</sup>. These free radicals may damage any cellular content and also destroy the genetic machinery of the cell. They produce destruction of the cellular membrane which results in loss in the organization of cellular enzymes, a disturbance in the distribution of nutrients and dysfunction of cellular metabolism. The sequence of events eventually leads to various disease processes<sup>11</sup>. In accordance with the present scientific knowledge, the excessive production of free radicals in the organism, and the imbalance between the concentrations of these and the anti oxidant defenses, may be related to processes such as aging and several diseases, among which main are cancer, ischemic processes, senile dementia, diabetes, pulmonary and

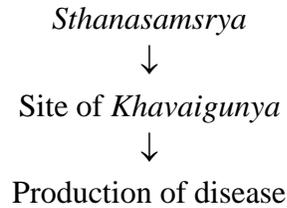
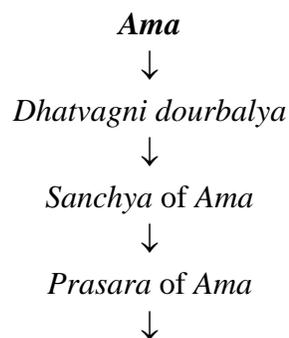
pancreatic diseases, lupus erythematosus, cirrhosis, intestinal inflammatory diseases, multiple sclerosis, arthritis, arteriosclerosis, cardiovascular diseases, diseases of the central nervous system and the brain.

### ***Similarities between Ama and Free Radical in production of Disease:***

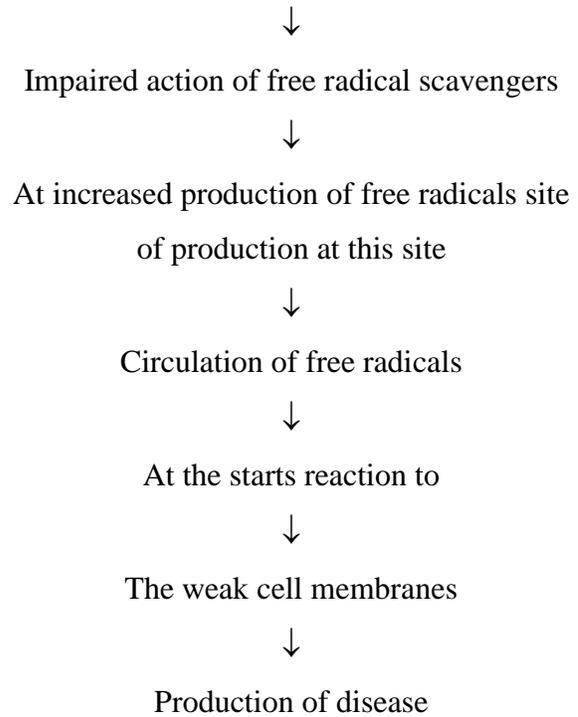
According to *Susruta*, a disease is produced in six steps viz. *sancaya*, *prakopa*, *prasara*, *sthanasamsraya*, *vyakti* and *bhedavastha*<sup>12</sup>. In case of diseases produced by *Ama*, *sancaya* of *Ama* is first step. It happens due to impairment of *Agni* at that place. Similar is the case with free radicals. At certain site due to impairment in action of free radical scavengers, increased production of free radicals takes place. When this *sancaya* or accumulation is in small amount it does not cause any harmful effects, but if treatment is not given, this *sancaya* exceeds the threshold and starts producing minimal symptoms, this is the state of *prakopa*. After this state, *Ama* goes into circulation; same is the case with free radicals. Now this *Ama* requires a site for creating disease in form of *khavaigunya*<sup>13</sup>, which should be considered as weakness in any body tissue where *Ama* may be *sthanasamsraya*, or may adhere with this tissue or cells. In case of free radicals also, they look for a site, which is weak and

can easily take part in electron exchange with them. Therefore depending upon this site of *khavaigunya* different diseases are produced in different manner from same root cause, i.e. *Ama* or free radicals. This is the stage of *sthanasamsraya*. Now symptoms of disease become clear. All pathologies described in modern science are from this stage. In modern science, stages earlier to this are rarely considered. After this stage, pathology at gross level becomes visible. If even at this stage the disease is not treated it leads to complications, which are described in *Ayurvedic* classics as *upadravas*.

From above discussion, it becomes clear that the method of production of disease at its basic level is described in similar manner in modern as well as in *Ayurvedic* literature. The above mentioned process of pathogenesis can be presented in a flow chart as follows:



### Free radical



## CONCLUSION

Summing up above explanation it can be concluded that main factors concerned in the formation of *Ama* is *mandagni* (hypofunction of digestive faculty of body). Dietetic indiscretion and emotional stresses contribute to the formation of *Ama*. These may impair the effective functioning of the neuro-humoral mechanism responsible for proper secretion of digestive juices. Here it

is noteworthy that whenever there will be improper metabolism due to impaired functioning of *agni* then only *Ama* will be formed. In modern parlance, *Ama* may be referred to the intermediary by-products of metabolism which have tendency to block the micro channels of different system of the body. The cause for production of *ama*, way of its formation, characteristics and nature of affecting *dosa-dhatu-malas* which matches with contemporary concept of free radical theory, one may say that the concept of *Ama* which supplies the pathological basis of *Ayurveda* is perhaps the original source of the free radical theory. Free radical can be a future parameter to measure the depth of pathology.

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