

## Root Cause of Diseases – Ama Concept W.S.R to Free Radical Theory

### Review Article

Jaideep Sapra<sup>1\*</sup>

1. Associate Professor (Reader), Department of Kayachikitsa,  
Shaheed Kartar Singh Sarabha Ayurvedic Medical College, Sarabha, Ludhiana, Punjab.  
Email- [jaisapra5@gmail.com](mailto:jaisapra5@gmail.com)

### Abstract

Ayurveda speaks the main cause of diseases is rooted in the impairment of the body's main fire, called *Agni*, the fire of digestion. Ayurveda views the health of the body as the functioning of a biological fire-governing metabolism. If this essential part is functioning effectively, the whole body will be nourished, full of life and vibrancy. Altered digestive functioning can lead to the production of *Ama*, a toxic material that initiates and promotes disease processes throughout the body. In the same way, free radicals are also found to be the root cause of many diseases. The majority of free radicals that damage biological systems are oxygen-free radicals, and these are more generally known as “Reactive oxygen Species” (ROS). These are the main byproducts formed in the cells of aerobic organisms, and can initiate autocatalytic reactions so that molecules to which they react are themselves converted into free radicals to propagate the chain of damage. Here we shall discuss about properties of both *Ama* and Free Radicals. The present article attempts to correlate the concept of Free radical with the concept of *Ama*.

**Keywords:** *Agni*, *Ama*, Free radicals, ROS

### Introduction

#### Concept of *Ama*

According to Ayurveda proper diet and its digestion are main pillars of life. An improper diet or error in digestive process results in production of *Ama*, a toxic material that initiates and promotes disease processes. Whatever we ingest in our body through the mouth, in any form it does not get assimilated in the body in same form.

\*Corresponding Author:

#### Jaideep Sapra

Associate Professor,  
Department of Kayachikitsa,  
Shaheed Kartar Singh Sarabha Ayurvedic  
Medical College,  
Sarabha, Ludhiana, Punjab  
Email- [jaisapra5@gmail.com](mailto:jaisapra5@gmail.com)

The ingested food material undergoes a series of physical and chemical transformation before it is rendered acceptable by the body tissues. The transformation takes place by the action of a particular *Agni* on the ingested food material of particular substance. The transformation process entirely, depends upon the strength of this *Agni*. Stronger the *Agni*, quicker is the transformation and better transformation too. If this *Agni* is weak the transformation will be incomplete. Concept of *Ama* (1) has been stressed in Ayurveda with its vast application. *Ama* (as per the different classics) can be understood as:-

Incompletely digested food,  
Un-processed food,  
Food which is undergoing the process  
of digestion,

Partially digested, Matter which requires further *Parinama*.

When this entity is retained in the body, it gradually produce impairment in the micro and macro channels of the body. It creates the condition of *Srotovaigunya* that can lay the foundation of disease processes or can be converted into any form of disease (2). This is the why Ayurveda has given much importance to the concept of *Ama*. As per the contemporary physiology a variety of transforming substances are present in the body like various enzymes, hormones, catalysts etc. When these are unable to function properly then different metabolites are formed which are not acquired by the body, further these go on accumulating in different systems affecting their normal functions. As per Ayurveda these can be considered as *Ama*.

### Concept of Free Radicals

Oxygen, which is an indispensable element for life, can under certain situations cause severe deleterious effects in the human body. Most of the potentially harmful effects of the oxygen are due to the formation and activity of number of chemical compounds, known as Reactive oxygen species (ROS), which have tendency to donate oxygen to other substances resulting in formation of oxygen radicals and several non-radical oxidizing agents such as HOCl (Hypochlorous acid), hydrogen peroxide, ozone, etc. Many such reactive species are free radicals and have a surplus of one or more free floating electrons rather than having matched pairs and are therefore, unstable and highly reactive. This unstable configuration creates energy which is released through reactions with adjacent molecules, such as proteins, lipids, carbohydrates, and nucleic acids. These are the main byproducts formed in the cells of aerobic organisms, and can initiate autocatalytic reactions so that molecules to which they react are

themselves converted into free radicals to propagate the chain of damage.

A wide variety of oxygen free radicals and other reactive species can be formed in the human body and food system. *Ama* is not a single entity but is a generalized term which can be applicable for many malformed substances in the body and responsible for the production of various diseases. In the same way free radicals are also found to be the root cause of many diseases in contemporary science (3, 4,5)

### Discussion

#### Similarities in ama-free radical

##### Cause of formation:

##### *Manas hetu*

Consumption of food in state of mental stress due to *Kama, Krodha, Lobha, Moha, Irshaya, Shoka, Bhaya, Lajja, Chinta, Mano Udvega, Manoglani* (6) etc are important factors responsible for indigestion of food and production of *Ama* in the body.

Mental stress is known to trigger or enhance the production of Free Radical.

##### *Mithya ahara*

Improper dietary habits cause *Agnimandata* leading to the production of *Ama* (7)

The types of food we eat can alter the degree of oxidative stress in the body. For example, 'advanced glycation end products' (AGE's) that are formed during the frying/ crisping of foods increase oxidative stress in the body so can lead to production of Free Radicals.

Also Exogenous factors like preservatives used in certain food products of today's instant and ready to eat food, pollutants, tobacco, smoke, drugs, xenobiotics, or radiation etc. lead to the formation of Free-radical .

##### *Visha/Toxins* (8)

*Ama* may be formed in the body as a result of *vishaja dravyas* or combination

of *vishaj dravyas* like *Gara visha*, *visha* from *Viruddha ahara* etc.

Similarly certain toxic substances like heavy metal produce free radicals. Auto-oxidation, consequent inactivation of small molecules such as reduced thiols, flavins and electron transfer etc. are few such processes that trigger free radicals inside the body.

### Mode of Production

#### **Ama:**

*Ama* is produced due to inequilibrium of *Agni* at various levels.

#### **Free radical:**

Free radicals are said to be produced in the body in abundance when equilibrium between its generation and body's primary defense is disturbed which includes the activity of certain enzymes like superoxide dismutase, catalase and glutathione peroxidase.

### Classification

#### **Ama**

The human body contains about  $10^{13}$  cells. Each cell of the body has its own *Agni* depending upon which many different types of *Ama* can be produced.

#### **Free radical**

Total number or types of free radicals are unknown. Depending upon the site and method of production many different forms of free radicals are produced.

#### **Avipakvatva (9): Ama as an intermediate metabolite**

##### **Ama:**

As per one of the definition, *Ama*, is a food state which is undergoing the process of digestion hence it can be considered that *Ama* exist in an incomplete or intermediate metabolic state. If this state remains in the body as such it can cause various diseases which has to be treated/neutralized after *deepan* and *pachan*.

#### **Free radical:**

Certain enzymes produce radicals as intermediary substances, which are supposed to go into further metabolism, but they somehow jump out of the normal metabolic cycle and work as harmful entities.

#### **State of their existence:**

Both *Ama* and Free Radical when produced, remains in Free State and hence termed *asamyuktam*.

#### **Similarities in Guna of Ama and Free Radical**

##### ***Daurgandhaya* (10)**

##### **Ama:**

*Ama* being impartially processed metabolite has a quality *Durgandha*.

##### **Free radical:**

Free radical causes the damage to cell membrane and leads to putrefaction as well as foul smell formation.

##### ***Bahupicchil* (11)**

##### **Ama:**

*Ama* sticks to normal healthy body tissues very quickly due to its *picchil* quality.

##### **Free radical:**

To seek stability in their structure Free radicals try to quickly stick to the healthy molecules thereby attacking the body and thus setting a chain reaction of destruction.

##### ***Sadan sarvagatra* (12)**

##### **Ama:**

*Ama* affects the whole body tissues.

##### **Free radical:**

Free radicals can also damage the cells of body.

#### **Similarities in Treatment**

##### **Free Radical:**

Antioxidant is the answer to prevent body from the deleterious effects of Free Radicals. An antioxidant is a molecule that inhibits the oxidation of other molecules.

Oxidation is a chemical reaction involving the loss of electrons or an increase in oxidation state. Oxidation reactions can produce free radicals. In turn, these radicals can start chain reactions. When the chain reaction occurs in a cell, it can cause damage or death to the cell. Antioxidants terminate these chain reactions by removing free radical intermediates, and inhibit other oxidation reactions. They do this by being oxidized themselves, so antioxidants are often reducing agents such as thiols, ascorbic acid, or polyphenols. plants and animals maintain complex systems of multiple types of antioxidants, such as glutathione, vitamin C, vitamin A, and vitamin E as well as enzymes such as catalase, superoxide dismutase and various peroxidases. Insufficient levels of antioxidants, or inhibition of the antioxidant enzymes, cause oxidative stress and may damage or kill cells. Oxidative stress is damage to cell structure and cell function by overly reactive oxygen-containing molecules and chronic excessive inflammation. Oxidative stress seems to play a significant role in many human diseases, including cancers (13).

#### **Ama:**

Line of Treatment of *Ama* includes - *Langhan*, *Deepan*, *Paachan* and *Sodhan* according to the *Dosas* (14). In order to find out a correlation on the basis of treatment between *Ama* and *Free Radicals* some *Deepan* drugs as included by Acharya Charak in *Deepaniya Mahakashaya* - *Sunthi*, *Chitrak*, *Pippali*, *Ama* pachan properties of *Mustak*, as per *Yaajapurishiya Adhayaya* and *Mishreya*, which has been coded by Acharya Sarngdhara in definition of *Deepan dravyas* are considered here. All of these drugs are proven to be rich in antioxidants. Action of above mentioned drugs as per Ayurvedic Classics and their antioxidants composition are as mentioned below:

***Sunthi, Zingiber officinale Roscoe-Zingiberaceae*** has been included by Acharya Charak in *Dipaniya Mahakasaya* (15). It contains a number of antioxidants such as beta-carotene, ascorbic acid, terpenoids, alkaloids, and polyphenols such as flavonoids, flavones glycosides, rutin, etc. Easily cultivable, *Zingiber officinale* with its wide range of antioxidants is a major source of natural or phytochemical antioxidants. Various studies on the antioxidant properties of ginger species had been confined only to the rhizomes, which have been reported to have tyrosinase inhibiting properties (16).

***Mishreya, Foeniculum vulgare Mill.-Apiaceae*** Acharya Sarangdhara says *Mishreya* possesses *Dipan* properties (17). It is a biennial medicinal plant belonging to the family *Apiaceae* (*Umbelliferae*) is a rich source of vitamin C. A one cup serving of fennel bulb provides 10.5 mg of vitamin C, or 17% of the daily value. Vitamin C boosts the immune system, and also functions as an antioxidant by protecting blood vessel walls from oxidation that contributes to cardiovascular disease. Fennel provides Phytochemical, including Anethole, Rutin and Quercetin, which function as antioxidants. They protect and repair damage resulting from excessive levels of free radicals (18). Anand *et al* reported that fennel seed possesses anticancer activity owing to its antioxidant properties (19).

***Chitrak, Plumbago zeylanica Linn.-Plumbaginaceae*** as per Acharya Charak plant possess *dipanaya*, *pachaniya* properties and is able to cure *Gudshotha*, *Arsha* and *shula* (20). Various studies have shown that the root of the plant and its constituents are credited with potential therapeutic properties including anti-atherogenic, cardiogenic, hepatoprotective and neuroprotective properties. Its active ingredient plumbagin have significant antioxidant abilities by free radical scavenging and superoxide radical

scavenging assays. The plant roots extract revealed significant antioxidant activity as compared to standard flavonoid (quercetin) (21). In another study, *Plumbago zeylanica*, was tested for its possible in vivo protective effect against cyclophosphamide-induced genotoxicity and oxidative stress in Swiss albino mice (22).

**Mustak, *Cyperus rotundus* Linn.- Cyperaceae** is known to exhibit Samgrahi, deepaniya, pachniya properties (23). The Extract of *Cyperus rotundus* has analgesic, anti-inflammatory, antioxidant and immunomodulatory effects due to presence of flavonoid, tannin and polyphenol contents. (24).

**Pippali, *Piper Longum* Linn.- Piperaceae** has been included by Acharya Charak in *Dipaniya Mahakasaya*. The phytochemical tests in various studies indicated the presence of alkaloids, glycosides, tannins, and flavonoids in the crude ethanolic extract. Several of such compounds are known to possess potent antioxidant activity (25).

In the light of above mentioned action of *Deepan* and *Paachan* drugs and their antioxidant activity, it can be said on the basis of line of treatment also both *Ama* and Free radicals can again be correlated with each other.

### Conclusion

Summing up above explanation it can be concluded that though *Agni*, the metabolic fire at various levels digests the food thoroughly and nourishes the body systems, but hypofunction or impaired function of these *Agnis* at various levels is the main factor concerned in the formation of *Ama* i.e. improper metabolism produces *Ama*. Further accumulation of byproduct of metabolism as well as metabolic waste that are not properly eliminated or utilized in the body can be considered as *Ama*. Here it is noteworthy that whenever there will be improper metabolism due to impaired

functioning of *Agni* then only *Ama* will be formed. Free radicals which are also formed as intermediary byproduct of metabolism, have the tendency to damage various cells of the body. From the entire discussion regarding the various similarities between *Ama* and free radicals in terms of the general definition, properties, types, site of production, mechanism of producing diseases and the line of treatment, we can say that the concept of *Ama* in Ayurveda can be correlated with the theory of Free radical in Modern science.

### References

1. Viadya Yadunandan Upadhyaya editor Ashtanghridayam sootrsthana ch.13/25, 8<sup>th</sup> edition page 111 Chaukhamba Prakashan, Varanasi.
2. Viadya Yadunandan Upadhyaya editor Ashtanghridayam sootrsthana ch.13/27, 8<sup>th</sup> edition page 111 Chaukhamba Prakashan, Varanasi
3. Understanding the correlation of Ama concept and Free radical theory with a clinical interpretation review article by Mohanty Bishnupriya et al. Journal of Biological and scientific opinion volume 1 (3) 2013
4. Kumar Baldev, Dave Hetal, Kumari Madhuri. Pathological correlation between Ama and free radicals with special reference to Madhumeha. The Journal of Research and Education in Indian medicine 2008; xiv- 2:61-64 ..
5. Correlation of concept of Ama and Free radical theory- review article. Rohit Ranjan1, Sanjay Srivastava2 Int. J. Ayur. Pharma Research, 2014; 2 (2): 9-13.
6. Brahmanand Tripathi editor Charak Samhita Viman Sthana ch.2/9 Reprint edition 2015, Chaukhamba Prakashan, Varanasi, page 671.
7. Brahmanand Tripathi editor Charak Samhita Viman Sthana ch.2/8 Reprint edition 2015, Chaukhamba Prakashan, Varanasi. page 671

8. Viadya Yadunandan Upadhyaya editor Ashtanghrdyam sootrsthana ch.8/13, 8<sup>th</sup> edition, Chaukhamba Prakashan, Varanasi, page 89
9. Madhavakara, Editor Yaduanadana Upadhaya, Madhava Nidan, Reprint, Vol. 1 Chap. 25/1-15 Varanasi; Chaukhambha Sanskrit Sansthan; 2006 P. 508-509
10. Ibid
11. Ibid
12. Ibid
13. Wikipedia free encyclopedia –Free Radical Theory
14. Viadya Yadunandan Upadhyaya editor Ashtanghrdyam sootrsthana ch.13/25, 8<sup>th</sup> edition page 89 Chaukhamba Prakashan, Varanasi
15. Brahmanand Tripathi editor Charak Samhita Sootra Sthana ch.4/6 Reprint edition 2015, Chaukhamba Prakashan, Varanasi page 78
16. Chemical composition and antioxidant properties of ginger root (Zingiber officinale) Shirin Adel P. R. and Jamuna Prakash -Journal of Medicinal Plants Research Vol. 4 (24), pp. 2674-2679, 18 .December, 2010 Available online at <http://www.academicjournals.org/JMP> R DOI: 10.5897/JMPR09.464 ISSN 1996-0875©2010 Academic Journals.
17. Brahmanand Tripathi editor Sarangdhara Samhita Madhyam khanda ch. 4/1 Third edition Chaukhamba Prakashan, Varanasi page 46
18. Boloji.com properties of Herbal Fennel, Saunf -Dr. Vipul Sharma
19. Anand, P.; Kunnumakara, A.; Sundaram, C.; Harikumar, K.; Tharakan, S.; Lai, O.; Sung, B.; Aggarwal, B. Cancer is a preventable disease that requires major lifestyle changes. Pharmaceut Res. 2008, 25, 2097-2116
20. Brahmanand Tripathi editor Charak Samhita Sootra Sthana ch.25/40 Reprint edition 2015, Chaukhamba Prakashan, Varanasi page 454.
21. Plumbago zeylinica linn. (chitrak) - review as rasayan (rejuvenator / antiaging) Sanjana data and Mishra RN-Review Paper International Journal of Research in Pharmaceutical and Biomedical Sciences, ISSN: 2229-37 Jan –March 2012
22. SivakumarV, Niranjali Devraj S. Protective effect of Plumbago Zeylanica against cyclophosphamide-induced genotoxicity and oxidative stress in Swiss albino mice.
23. Brahmanand Tripathi editor Charak Samhita Sootra Sthana ch.25/40 Reprint edition 2015, Chaukhamba Prakashan, Varanasi page 454
24. Pharmacological, antioxidant, genotoxic studies and modulation of rat splenocyte functions by *Cyperus rotundus* extracts Kilani-Jaziri Soumaya, Mhalla Dhekra, Châbane Fadwa, Ghedira Zied, Limem Ilef, Ghedira Kamel and Chekir-Ghedira Leila. B.M.C Complementary and alternative medicine journal Jan, 2013 available at <http://www.biomedcentral.com/1472-6882/13/28>.
25. Phytochemical Evaluation and Antioxidant activity of Piper cubeba and Piper nigrum, Gayatri Nahak and R.K. Sahu, Journal of Applied Pharmaceutical Science available at [www.japsonline.com](http://www.japsonline.com) ISSN: 2231-3354 Received on: 08-10-2011 Revised on: 12:10:2011 Accepted on: 15-10-2011.

\*\*\*\*\*