



## Review Article

**A REVIEW ON REHEATED COOKING OIL AS AN ASPECT OF SANSKAR VIRUDDHA****Shirke Ashwini A<sup>1\*</sup>, Dalvi Prachi<sup>2</sup>, Upalanchiwar Sachin<sup>3</sup>**<sup>1</sup>P.G. Scholar, <sup>2</sup>Associate Professor, <sup>3</sup>Assistant Professor, Dept. of Swasthavritta, R.A.Podar Medical College, Mumbai, Maharashtra, India.**KEYWORDS:**Dietetic incompatibility, Fried food, Reheating of cooking oil, *Samskar viruddha*, *Viruddhahara*.**ABSTRACT**

*Ayurveda* is a science of life. *Ayurveda* focuses more to remain healthy and prevent diseases. To become healthy, diet plays a very important role. All the *Ayurvedic* classics have paid special attention on the concept of wholesome and unwholesome diet. The food, which maintains the balanced *Dhatus* in normalcy and restores the equilibrium, should be taken as wholesome. Unwholesome diet i.e. *Viruddha Ahara* is a special concept described in *Ayurvedic* literature. Different types of *Viruddha's* have been mentioned according to place, time, digestion power, dosage, habit, *doshas*, mode of preparation and so on. *Samskar Viruddha* is that where food is converted into harmful substances during the course of preparation emerging ill effects on health. In current scenario examples of *Samskar Viruddha Ahara* are being changed due to changing life style, urbanization and fascination of western culture. Though there is noticeable change in food habits and preparatory methods between early time and in present era, the principle (*Ayurvedic siddhant*) behind this remained the same. Today's lifestyle is very fast, full of hurry. As a result consumption of ready-made food is in much demand. And if it is deep-fried then its demand becomes even higher. Edible vegetable oil is the major ingredient in these fried food products. Reusing this deep fried oil repeatedly for frying purposes leads to many health hazards. The efforts have been made here to elaborate health effects of reusing cooking oil for frying process as an account of *Samskar Viruddha*.

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**INTRODUCTION**

*Ayurveda* has given emphasis a lot on 'Ahara' describing it as one of the three *Upastambhas* of life.<sup>[1]</sup> Number of food incompatibilities has been mentioned in *Ayurvedic* literature. Today's life is very fast moving and with this, dietary habits also becoming fast i.e. fast food. Demand of fried food is increasing now a day. Cooking oil is often heated repeatedly for frying purpose. This article focuses mainly on fried food stuff prepared in reheated cooking oil with reference to *Samskar Viruddha* and its health effects.

**MATERIALS AND METHOD**

All available authentic books viz. *Samhitas* and their respective commentaries have been referred for the specific materials. Different related websites on internet, magazines, articles etc. have been used as literary materials.

**CONCEPTUAL VIEW**

*Ayurveda* says that food is your medicine. <sup>[2]</sup> Diseases occur as the result of poor diet. The difference of health/happiness and ill health /Unhappiness is based on the difference between wholesome food and unwholesome food. *Viruddhahara* is precisely defined as food articles which cause the *Utklesha* (aggravation or

excitation) of *Doshas* but do not expel them out of the body.<sup>[3]</sup> It possesses the qualities which are contradictory to body tissues (*Dhatus*) and similar to that of the *Doshas*. The word *Viruddha* leads to two factors i.e. on combining two, three or more things, the stronger one shades or overpowers the weaker ingredients. It has been stated that in a combination of so many opposite qualities, the majority of the power packed qualities overpower the weaker qualities. Such food combinations can prove harmful, which may be imparting its untoward effects on immune system, cellular metabolism, growth hormone etc.

These unwholesome food substances have been classified in a number of ways according to different criteria such as place, time, digestion power, dosage, habit, *Doshas*, mode of preparation, potency, bowel, state of health, order (sequence), proscriptions and prescriptions, cooking, combination, palatability, richness of quality etc. probably according to their mode of action. One of the *Viruddha* explained in *Ayurvedic* text is *Samskar Viruddha*.<sup>[4]</sup>

**SAMSKAR VIRUDDHA**

The incompatibility of preparation (*Samskar Viruddha*) is that where food is converted into poison during the course of preparation.<sup>[5]</sup> This includes the consumption of dietary articles prepared in a particular way which produces harmful effects on the body. <sup>[6]</sup> Various examples of *Samskar Viruddha Ahara* have been motioned in *Ayurvedic* literature for example meat of black partridge (*Tittiri*), peacock (*Patradhya*), iguana lizard (*Godha*), gray partridge (*Kapinjala*) that have been cooked with the wood of castor plant (*Eranda*) and processed with the castor oil itself. *Pippali* processed with the oil in which fish has been earlier fried is incompatible.<sup>[7]</sup> The meat of a kind of yellow bird (*Haridra*) pierced with wood of *Haridra* and cooked with the wood of *Haridra* (*Daruharidra*) itself is *Samskar Viruddha*.<sup>[8]</sup> In day-to-day life examples of *Samskar Viruddha Ahara* are changing. Deep fried food which is prepared in reheated cooking oil possesses certain amount of potentially toxic products which may cause negative health impact. Deep fried food prepared in reheated cooking oil is one of the examples of *Samskar Viruddha Ahara* in today's perspective.

**Deep fried food**

In this fast-paced society, frying remains as one of the popular and tastier methods in food preparation. In developing countries consumption of ready-made food is in much demand. And if it is deep-fried then its demand becomes even higher. Frying improves the sensory quality of food by formation of compounds rich in aroma, attractive colour, crust and texture, all highly appreciated by the consumers. Various food products such as potato and other chips, pakodas, namkeens, patties, French fries, doughnuts, rolls etc. are prepared at large scale by this frying process. Edible vegetable oil is the major ingredient in these fried food products. Therefore, the cost of the oil becomes the most important factor to be considered in terms of economy. As a result, vegetable oil is often heated repeatedly to ensure cost effectiveness. The oil is reused repeatedly and it is discarded and replaced with fresh oil, only when it becomes foamy, highly viscous, emits bad odour and become dark coloured and many a times it is never replaced at all, instead fresh oil is added to already heated, thick and highly viscous oil <sup>[6]</sup>

**Reheating of cooking oil**

Reusing this deep fried oil repeatedly for frying purposes is responsible for many health hazards in human population. Increased viscosity and darkening in colour are some of the physical changes which can alter the fatty acid composition of the cooking oil on repeated frying. Oxidation, hydrolysis and thermal polymerization are the chemical reactions occurring as a result of repeated heating of cooking oil for low and cheap food production.

**Changes during the reheating of oil**

The problem begins when the same oil is used again and again by repeated heating. During deep-frying

of food at temperatures between 170° - 200°C, the oil used undergo following changes:

**1. Hydrolysis** – Moisture from the food being fried vaporizes and hydrolyses triglycerides (TGs) in the frying oil to glycerol, free fatty acids (FFAs), monoglycerides (MGs) and diglycerides (DGs).

**2. Oxidation** – Triglyceride molecules in the frying oil undergo primary oxidation to unstable lipid species called hydro peroxides which cleave to form secondary oxidation products which comprise non-volatile and volatile compounds. Some of these secondary products polymerize (tertiary oxidation), increasing the oil viscosity, cause browning on the surface, and darken the oil. <sup>[7]</sup>

**3. Thermal Polymerization**– High temperatures of the frying operation produce high molecular cyclic fatty acid (FA) monomers, and TG dimers and oligomers. <sup>[8]</sup> Fried food may absorb many oxidative products such as hydro peroxide and aldehydes, which are produced during this process thus affecting the quality of oil. <sup>[9]</sup>

**RESULTS AND DISCUSSION**

The quality of oil deteriorates with increased length of frying time due to the accelerated formation of oxidized and polymerized lipid species in the frying medium. If the physicochemical properties of cooking oil deteriorate, the oil must be discarded because it can prove to be harmful for human consumption. It has also been reported in a study that small amount of acrolein, a toxic substance to experimental animals, may be found in repeatedly heated cooking oil. Its toxic effect in humans has yet to be determined.<sup>[10]</sup> Cooking oil may also contain contaminants such as Polycyclic Aromatic Hydrocarbons (PAHs).

**Effect on Human Health****PAHs**

The EPA (Environmental Protection Agency) has classified seven PAH compounds as probable human carcinogens: benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. <sup>[11]</sup> The International Agency for Research on Cancer (IARC) has determined the following: benz[a]anthracene and benzo[a]pyrene are probably carcinogenic to humans. <sup>[12]</sup>

**Aldehydes**

The toxic aldehydes are a result of degradation of the fatty acids in oil, and although some are volatile, others remain after frying. As they are very reactive compounds they can react with proteins, hormones and enzymes in the organism and impede its correct functioning.<sup>[13]</sup> Aldehyde inhalation can alter breathing patterns by narrowing airway openings. It can also damage cells lining the airways, prompting white blood cells to enter the lungs. <sup>[14]</sup>

**Aflatoxin**

Furthermore, certain types of plant oil such as peanut oil may be contaminated by naturally occurring

aflatoxin, which are considered to be human carcinogens. Aflatoxicoses in humans was reported in many countries like India, China, Thailand, and several African countries. In African and Asian countries, where environmental conditions favor the aflatoxin contamination, threat to human health from aflatoxins is quiet high. Studies on aflatoxin exposure and incidence of liver cancer by Groopmann and Wild (1994 -2001) in places like China and West Africa showed that the situation was alarming.<sup>[15]</sup>

Increased oil consumption is not considered to be good for human health. Even though a certain amount of potentially toxic products are produced during frying (such as polar compounds or polymers), fried foods are generally considered safe. It is only when frying oil is used repeatedly that it becomes toxic for human consumption.<sup>[16]</sup> Repeated heating of the oil accelerates oxidative degradation of lipids, forming hazardous reactive oxygen species and depleting the natural antioxidant contents of the cooking oil. Long-term ingestion of food prepared using reheated oil could severely compromise one's antioxidant defense network, leading to pathologies such as hypertension, diabetes and vascular inflammation <sup>[17-19]</sup> Lipid oxidation causes a high risk for the development of coronary heart diseases. Reusing oil can create "free radicals" which can cause ailments in the long run. These free radicals can be carcinogenic i.e. can cause cancer and also atherosclerosis which can lead to increase in bad cholesterol levels, blocking the arteries. <sup>[20]</sup> Frequent intake of combination of incompatible food leads in to toxins. Then in the alimentary tract this toxins provoke all *Doshas* and which get mixed with digestive juice and then *Rasa dhatu* and so on it spread from one *Dhatu* to next *Dhatu*. Thus this *Doshas* spread from *Koshtha* to *Shakha*. While travelling through all over the body wherever there is *Sthaanavaigunya* it gets lodged and shows the symptoms of the diseases.<sup>[21]</sup> Food articles made in reheated cooking oil are having less nutritive value and harmful effects on body as well, hence all the *Dhatu*s are not properly nourished.

### Solution

We have seen that edible oil becomes highly viscous and presence of harmful products increases when oil is heated repeatedly. This oil now becomes dangerous for human consumption. Therefore oil should not be heated again and again and the formation of harmful products can be minimized by discarding it (for making soap at small scale) or using it with certain antioxidants. Study conducted by Garima Goswami et al. states that, the use of natural antioxidants in cooking oil as adsorbents can make the oil safe by retarding the formation of oil deterioration products. Addition of different antioxidants like sugarcane bagasse, rosemary extract, turmeric extract etc during frying have been found to reduce the harmful effect of the deterioration products. <sup>[22]</sup>

The person who takes *Viruddha Aahara* should be subjected to either of *Shodhana* therapy or *Shamana*

therapy with drugs which are qualitatively opposite to such *Viruddha Aahara*. Early refinement of the body with such (qualitatively opposite) drugs is also recommended. Purgation, Emesis, Antidotes and prophylaxis- these four cure the diseases caused or to be caused by the intake of unwholesome drugs and diets. According to *Acharya Susruta*, incompatible foods consumed by a person who indulge in physical exercise i.e. *Vyayama* get digested without any trouble. Physical exercises are always beneficial for persons who consume fatty foods.<sup>[23]</sup>

### CONCLUSION

Fried food articles prepared in reheated cooking oil is nothing but the example of *Samskar Viruddha Ahara*, in which some harmful products gets formed. Demand of these fried food articles is increasing day by day. Re-using cooking oil is a somewhat common practice; it can pose some serious health hazards. The most common danger when recycling cooking oil is that it becomes rancid or spoiled. In addition to having strange flavors and odors, rancid oil may contain possibly carcinogenic free radicals. Using fresh oil every time for frying is the healthiest option. Regular physical exertion in proper way is helpful to digest *Viruddha Ahara*. But ultimately avoidance of intake of incompatible food plays key role in the prevention of diseases.

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