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How an Ayurvedic Practitioner Can Control Industrial Pollution Effectively



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ABSTRACT

Pollution of the environment is a serious issue for human population. The situation is worsening on a daily basis. This must be focused seriously since it can adversely affect the natural components, such as water and air. Environmental pollution is divided into five categories: air, water, soil, noise, and light pollution. It has a negative impact not only on human health, but also on the environment, which ultimately leads to the extinction of life on Earth. In Ayurveda significant place has been given for environmental health. In *charaka samhita*, the important environmental threats that can possibly happen has been described in the chapter *Janapadhotwamsa* (Pandemic). In *Sushruta Samhita Kushtanidanadhyaya*, the method of illness transmission is well described. They are called *Aupasargikarogas* (Communicable diseases). In Ayurveda, our great acharyas have provided several remedies and techniques to cleanse the polluted environment. Several research have shown the effectiveness of ayurveda in detoxifying both the body and the environment. However, further study is needed to discover Ayurveda's hidden treasures and to spread the scope of Ayurveda in the management of environmental toxicity.



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INTRODUCTION

Environmental pollution has risen in recent decades as a result of rapid economic growth. Manufacturing and industrial sectors, which are the backbone of a country's economy, are mostly responsible for this crisis. According to statistics, industry and manufacturing units are responsible for around 50% of pollution. This has a profound influence on both biotic and abiotic aspects of the environment. Furthermore, it causes a variety of interrelated social issues and threatens people's safety. Industrial pollution impacts a range of environmental elements, including energy patterns, radiation levels, and the chemical and physical components of the environment. It also causes air pollution, water pollution, and land pollution, all of which endanger the natural ecosystem. It is essential to enhance public awareness of environmental decline and its consequences¹. *Ayurveda*, eternal life science, has been proven to be the most effective in the management of health. *Janapadodhwamsa*, which literally means destruction of individuals or communities, is one of the unique concepts addressed in Ayurvedic treatises. *Acharya Charaka* referred to it as *Janapadodhwamsa*, *Acharya Sushruta* referred to it as *Maraka*, and *Acharya Bhela* referred to it as *Janamaara*. *Vayu* (air), *Jala* (water), *Desha* (land), and *Kaala* (season) are four components described as common and vital for all living things, and any *vikrutha* that impacts these four variables leads in *Janapadodhwamsa*². The *Janapadodhwamsa* defines all epidemic and pandemic notions. We may conclude that the term "epidemic" is not recent term in *Ayurveda*. There is a detailed description of the concept, prevention, causes and treatment and epidemic preparedness.

AIR POLLUTION

Life would be unsustainable without the essential component of air. It is a naturally occurring material that is readily available. It is an essential component of nature that allows life to exist on Earth. Pollutants emitted into the atmosphere damage both human health and the health of the entire planet. The World Health Organisation (WHO) estimates that air pollution causes deaths of almost seven million people globally each year. Numerous air pollutants pose substantial health risks and can even be fatal at low quantities. Nearly 200 of them are legally regulated, with mercury, lead, dioxins, and benzene being among the most common concentrations. Nearly 200 of them are subject to legal regulation; some of the more prevalent ones include mercury, lead, dioxins, and benzene.

Role of Industry in Air Pollution: Among the gaseous contaminants are carbon monoxide (CO), hydrogen sulphide (H₂S), ozone (O₃), nitrogen dioxides (NO₂), and sulphur dioxide (SO₂). These pollutants are generated by industries such as cement manufacture, power plants, manufacturing, smelters, and refineries³. These are the main environmental aggressors, and they can harm vision as well as cause a variety of respiratory disorders in humans. Due to urbanisation, industrialization, and the growth in energy consumption, the burning of fossil fuels and waste materials exacerbates this serious issue of air pollution¹.

Health impacts: Excessive amounts of air pollution may result in a variety of harmful health consequences. Short-term and long-term exposure to air pollution has been related to detrimental health effects. Short-term air pollution exposure is linked to chronic obstructive pulmonary disease (COPD), coughing, shortness of breath, wheezing, asthma, respiratory infections, and high hospitalisation rates (a measure of morbidity). Long-term effects of air pollution include chronic asthma, pulmonary insufficiency, cardiovascular diseases, and cardiovascular death. Finding a natural, efficient solution to this problem is therefore essential⁴.

AYURVEDIC METHODS TO CONTROL AIR POLLUTION

Dhupana karma (fumigation)

Dhoopana Karma is a traditional treatment mentioned in numerous Ayurvedic literature as a means of keeping the world healthy and free of illness. According to Ayurvedic literature, Dhoopana is suggested for Rakshoghna Karma, which refers to the eradication of harmful germs. As a result, it plays an essential role in the prevention and treatment of a wide range of infectious diseases⁵.

Homa-havana and *Yajna* are mentioned in Vedic literature, as well as *Agnihotra's* sterilisation of the air, sterilization of house and place around by *Dhoopana*. *Kashyapa Samhita* mentions *Raksoghana Dhupana* and *Dhupana Gana* as remedies for ailments induced by *Bhuta* (microbes) and protection against infections⁶. Dravyas, or medicines, used for *Dhupana Karma* include *Guggulu* (*Commiphora mukula*), *Nimba* (*Azadiracta indica*), *Vacha* (*Acorus Calamus*), *Kustha* (*Saussurea lappa*), *Haritaki* (*Terminalia chebula*), *Sarshapa* (*Brassica campestris*), and *Yava* (*Hordeum vulgare*) with *Ghrita*. *Rakshoghna Dravya*, such as *Sarshapa* (*Brassica campestris*), *Nimba* (*Azadiracta indica*), and *Lavana* with *Ghrita*

fumigation is to be performed on them twice daily for 10 days are mentioned in the *Sushruta Samhita*. Rakshogna karma” described in Ayurvedic literatures have correlations to the aseptic and disinfectant procedures of modern science⁵. Drugs that have a synergistic effect and help in the propagation of the primary antibacterial drug's activity are frequently used in formulations. Ayurvedic fumigation is a type of drug delivery through inhalation that has several advantages. It is characterised by ease of administration, enhanced bioavailability, and the ability to pass the blood-brain barrier.

Vaad chikitsa (sound therapy)

Ayurveda is a spiritual science, having divine roots. The doshas like *Vata*, *Pitta* and *Kapha* can be controlled effectively by sound therapy. As per *Acharya Sushruta*, numerous symptoms are produced if one inhales polluted air. To treat these symptoms, one of the effective remedies is application of various pastes on variety of instruments, which will then create sound. One such remedy is *Pitta* of a cow with the *Kapila Varna* colour should be combined with equal parts of the following contents: *Taara* (Silver), *Sutaara* (Mercury), *Suvarna* (Gold), *Saariva* (*Hemidesmus indicus*), and *Kuruvinda* (A kind of Precious Stone). Apply this paste to any instruments that produce sound. As from the sound of instruments *Visha* will be destroyed⁷. Sound therapy is a well-established evidence-based therapy in the field of medicine. It is beneficial on many levels: mentally, emotionally, physically, spiritually, intellectually, and socially. Its benefits mainly include decreasing blood pressure, improving cognition, and reducing muscular tension.

Nasya

In Ayurveda types of Panchakarma are described that is *Vamana*, *Virechana*, *Basti*, *Nasya* and *Raktamokshana*. *Nasya* means instillation of medicine through nostrils. Due to inhalation of polluted air of today's environment so many respiratory diseases like congestion, allergies, chronic cough, rhinitis and various breathing problems occurs. In chronic stage it develops COPD, asthma and bronchitis etc. In *Ayurveda* prevention of these problems are made through *Nasya* therapy. This therapy cleanses, purifies and strengthens the nasal passages. When we administrated ghee through the nostrils, it may prevent inhalation of those unwanted particle which enters through nasal passage with polluted air. *Nasya* also boosts our immune system and helps to avoid various ailments such as hair loss, premature greying of hair, chronic headache, coryza, eye problems, and so on.

Ayurveda recommends using therapeutic oils such as *anutaila* and *shadbindutaila*. This hinder the entrance of pathogens into the respiratory system. Pure sesame oil has been shown to be effective in the treatment of dry nasal mucosa. A biofilm can be formed by applying nasal oil, which acts as a barrier to viral particle entry⁸.

Yoga & Pranayama

It is essential to include yoga and pranayama into your everyday routine. Yoga is an ancient practise aiming at bringing balance and health to an individual's physical, mental, emotional, and spiritual elements. Pranayama is the important step in the Yoga practise. Yoga is recommended to be practised every day, even if just for 10 minutes, because it helps to enhance respiratory functions by strengthening the lungs and cleansing the nasal passages. The pranayama practise is essential for increasing lung capacity. *Pranayama* is a set of breathing methods that comprise, *Puraka* (inhalation), *Kumbhaka* (holding your breath), and *Rechaka* (exhalation). Breathing practises such as *kapalbhati*, a cleaning kriya, followed by *anuloma viloma*, a balancing and rejuvenation *pranayama*, assist to cleanse the body and enhance lung functions⁹. Regular *Pranayama* practise has been shown to increase lung volumes and capabilities, aiding in the prevention and management of several respiratory disorders.

Agnihotra

Agnihotra is a traditional ceremony conducted to maintain balance between living beings and environment. *Agnihotra* is the most basic form of 'Yajnya' done at sunset/sunrise, in which cow dung is burned in a copper pot with cow ghee and brown rice as oblations, while mantras of the sun and fire are chanted¹⁰. Experiment studies reveal that in households where *Agnihotra* is routinely performed, the frequency of physical ailments, sickness, and disease is reduced because it produces a clean, nutritious, and healing atmosphere. It regenerates brain cells, rejuvenates the skin, purifies the blood, and prevents the growth of pathogenic organisms. *Agnihotra* is essentially a healing treatment. The strategy is "heal the atmosphere, and the atmosphere will heal you." This process purifies the environment by using the component electrons of the compounds fumigated in the Yagya. *Agnihotra* fumes have therapeutic properties and help to decrease air pollution. An *Agnihotra* fume exhibits antibacterial characteristics by killing or inhibiting microbe development, resulting in a decrease in microbial burden in the surrounding environment.¹⁰

Some of the effective/proven remedies in controlling air pollution:

Lakshaharidradhi yoga

Ayurvedic literature mentions several remedies or yogas as means to cleanse the air. One of these, *Lakshaharidraadi Yoga*, is mentioned in the *Sushruta Samhita's Kalpa Sthana* as having the potential to cleanse the air. Drugs like *Laksha* (*Laccifer lacca*), *Haridra* (*Curcuma longa* L), *Ativisha* (*Aconitum heterophyllum*), *Abhaya* (*Terminalia chebula*), *Abdha* (*Cyperus rotundus*), *Harenuka* (*Vitex negundo* L.), *Ela* (*Elettaria cardamomum*), *Vakra* (*Valeriana wallichii*), *Kushta* (*Saussurea lapa*), *Priyangu* (*Callicarpa macrophylla*) are included in *Lakshaharidraadi yoga*. The majority of the medications in this yoga are *Tikta*, *Katu Rasa*, *Ushna Veerya*, and *Katu Vipaka*. Drugs like *Haridra*, *Ativisha*, and *Vakra* are having anti poisonous effect. The drugs like *Haridra*, *Ativisha*, *Kushta*, *Tagara*, are having a potential antimicrobial activity, The drugs like *Haridra*, *Ela* and *Tagara* are having volatile aromatic oil which helps to remove the bad odour and gives freshness to air¹¹. Additionally, it works well at boosting people's immunity and neutralising the effects of contaminated air on a person.

Usage of herbal mask

Face masks emerge as a strategy for reducing particle exposure. It helps in minimising our exposure to contaminants and particulate materials dispersed in the air. The results indicate that any face mask offers some measure of protection. Surgical and cloth masks obtained efficiencies ranging from 25 to 60%. However, the level of protection provided by the herbal mask has gained appeal over these masks. When compared to those who wore a cloth mask, those who utilised *Nephrolepis exaltata* herbal mask had a five-fold rise in IgA levels. The reduction in FVC (forced vital capacity) was statistically significant, whereas the drop in FEV1 (forced expiratory volume) and PEF (peak expiratory flow) was not significant. Use of *Nephrolepis exaltata* herbal mask significantly improved the pulmonary function¹².

WATER POLLUTION

Water, being a vital environmental ingredient for all kinds of life, has a significant role in the socioeconomic development of the human population. Water pollution is defined as the release of pollutants into beneath the surface groundwater or into lakes, streams, rivers and seas to the point that the contaminants interfere with beneficial water usage or the normal functioning of ecosystems.

The role of industry in water pollution; All industries discharge waste (chemicals or sediments) untreated or with inadequate treatment onto open land or water channels. These effluents contain exceedingly toxic organic chemicals, inorganic salts, heavy metals, and mineral acids. Water used as cleaning chemicals is released quickly throughout industrial zones and inhabited cities. These effluents contaminate water when they enter bodies of water such as lakes, rivers, and seas, rendering the water unhealthy and producing a variety of environmental problems. Reduced dissolved oxygen levels induced by these effluents have an influence on the aquatic environment and life.

Health impacts: Toxins in industrial waste are a leading cause of immunological suppression, reproductive failure, and acute poisoning. Infectious disorders such as cholera and typhoid fever, as well as gastroenteritis, diarrhoea, vomiting, skin and renal problems, are spreading due to dirty water. The direct harm to plants and animal nutrition has an impact on human health¹³.

AYURVEDIC METHODS TO CONTROL WATER POLLUTION

Jalaprasadana^{14,15}

Jala is one of the Pancha Mahabhoota. Purification of *Jala* is important in Ayurveda, so that our *Acharyas* have described numerous techniques of purification. *Sushruta* mentions a number of medicines for *Jalaprasadana*, including *Kataka* (*Strychnos potatorum*), *Gomedaka* (*Cinnamomum tamala*), *BisGranthi* (*Nelumbo nucifera*), *Shaiwal Moola* (*Ceratophyllum demersum*), filtering with cloth, adding *Mukta* (Pearl), and *Sphatika* (alum). It aids in the removal of water turbidity. It also improves the potability of water.

Methods to remove the unpleasant smell of drinking water

1. By using following flowers

Utpala (*Nelumbo nucifera*)

Naga (*Mesua ferrea*)

Champaka (*Michelia champaca*)

Patala (Stereospermum suaveolens)

2.Storage of water in tamra patra

Keeping water in a copper or silver vessel is one of the oldest methods for purifying it¹³. Copper is said to have a scraping effect (Lekhana), and heals, and nourishes the body when consumed in small doses.

3.Exposing of water in direct sunlight

Exposing water to sunlight directly aids in purifying and renders the water toxin-free.

4.Dhavashvakarnadiyoga

Dhava (Anogeissus latifolia), *Ashvakarna* (Dipterocarpus turbinatus), *Asana* (Pterocarpus marsupium), *Paribhadra* (Erythrina variegata), *Patla* (Stereospermum suaveolens), *Mukshaka* (*Schrebera swietenoides*), *Aragvadha* (Cassia fistula), *Somvalka* (*Acacia leucophloea*) are burnt and this ash is then mixed with water. *Matra – 1 anjali* (160 gm) of ash purifies 1 ghata of water¹⁶.

5. Hamshodaka

This autumnal water has been designated as Hamsodaka by Charaka. It has got two connotations, where the first one Hamsa sands for the sun and the moon and the second one Udaka for the water, so the water purified by the rays of sun and moon is known as Hamsodaka. It has been given name Hamsodaka also because this is the type of purified water which indicates swan will consume only pure water. Bhavamisra mentions the qualities such as *Rasayana* (which rejuvenates), *Balya* (which builds strength), *Medhya* (which builds intelligence), and controlling the *Tridoshas*. The water which is exposed to the heat of sun during the day time and to the cooling rays of the moon during night, it also purified by the time and is detoxicated by *Agasthya nakshatra* and thus called Hamsodaka, which is spotlessly clean and is as beneficial as nectar for the purpose of bathing, drinking and swimming¹⁷.

LAND POLLUTION

Land pollution is the deterioration of the earth's land surfaces. Furthermore, it happens mostly as a result of the indirect and direct consequences of human activity. It is a worldwide issue that must be handled immediately.

Role of industry in land pollution; Land and soil contamination is mostly caused by industrial pollution, which is increasing at a rate of 2% each year. its causes include industrial activities and the processing of heavy metals such as zinc, chromium, lead, and copper. Because there are no efficient methods for treating these metal wastes, they are freely deposited on land and in bodies of water. This negligent waste disposal poses a severe hazard to soil contamination. The disposal of hazardous items has a detrimental influence on the soil. Furthermore, soil pollution has an impact on subsurface water storage systems. These effluents change the PH of the soil, causing it to become acidic or alkaline¹⁸.

Health impacts: Exposure to such soils can cause a variety of short-term health problems such as headaches, coughing, chest pain, nausea, and skin/eye irritation. Prolonged exposure to contaminated soil can lead to the depression of the central nervous system and damage to vital organs (such as the liver)¹⁹.

AYURVEDIC METHODS TO CONTROL SOIL POLLUTION

SPRINKLING ON THE POISONED SURFACE

The poisoned surface should be cleansed by sprinkling it with a decoction of drugs like *Vidanga* (*Embelia ribes*), *Patha* (*Cissampelos pareira* L), or *Katabhi* (*Albizia procera*), or by using a solution of drugs like *Ananta* (*Hemidesmus indicus*), *Eladi gana* along with wine (*Sura*), or with (an adequate quantity of) black clay dissolved in the water²⁰.

DISCUSSION

Industrial pollution is being increasing tremendously and its impact on health is unavoidable. Though many remedial measures are being taken, some serious measures, should be implemented to completely eradicate this problem. In Ayurveda significant place has been given for environmental health. In *charaka samhita*, the important environmental threats that can possibly happen has been described in the chapter *Janapadhotwamsa* (Pandemic). In *Sushruta Samhita Kushtanidanadhyaya*, the method of illness transmission is well described. They are called Aupasargikarogas (Communicable diseases).

Toxicity caused by the environmental factors could be prevented to a great extent by following the diet, and regimen prescribed in Ayurveda like *dinacharya*(daily regimen),*ritucharya* (seasonal regimen), *panchakarma* (the five purificatory procedures) and *rasayana* (rejuvenative therapy. These preventive as well as curative methods has been proven through recent studies.

A man uses all the available resources around, without considering the harmful effects caused to the environment, in order to satisfy his greed. These can be correlated to *pranjaparadha*. To prevent these mishaps, one has to avoid of emotional outbursts such as *kama* (desire), *krodha* (anger), *lobha* (greediness) and also follow proper code of conduct (*sadvrutta* and *achara rasayana*).

Dhoopana (Ayurvedic fumigation), can prevent air pollution and is also a method of medicine administration through inhalation. The inhaled fumigated air which has antibacterial property can cross the blood brain barrier, thereby providing immunity. *Nasya* also does the same action of boosting the immunity, by forming a biofilm in the nasal mucosa which acts as a preventive barrier for the entry of viral particles, thereby hindering its harmful effects⁵. It also purifies and strengthens the nasal passages. One can also do the daily practise of yoga and *Pranayama*, to increase lung volumes and capacities, aiding in the prevention and management of several respiratory disorders. It can open blocked airways caused by bronchitis or emphysema, which are linked to COPD (chronic inflammatory lung disease), and improve the function of air circulation. Simple yoga techniques are known to help even in cases of advanced COPD⁹.

Studies are also proven the benefits of herbal mask, which can be used to improve occupational health, *Nephrolepis exaltata* herbal mask can absorb chemical pollutants such as xylene, trichloroethylene, and carbon monoxide from the air. The properties of *Nephrolepis exaltata* are suspected to cause improvement in lung function as per the study. So this method of using herbal mask can be implemented as a new technique of protection from air pollution.

In case of water pollution several methods can be adopted such as exposing water to sunlight which reduces the abundance of harmful particles in water. Storing water in a copper vessel is an age-old natural water purifying process. Studies have shown that copper ions completely kill bacteria. *E. coli* inoculated onto copper were completely killed. The studies concluded that the copper ions completely kill bacteria by membrane damage as in case of *E-coli*²¹.

CONCLUSION

Pollution of the environment is a serious issue for the human population. The situation is worsening daily. This must be focused seriously since it can adversely affect the natural components, such as water and air. Environmental pollution is divided into five categories: air, water, soil, noise, and light pollution. It has a negative impact not only on human health, but also on the environment, which ultimately leads to the extinction of life on Earth. Urbanization and industrialization can be considered as two main causes because of industrial pollution, hazardous chemicals, vehicular emissions, and natural resource depletion. In Ayurveda, our great acharyas have provided several remedies and techniques to cleanse the polluted environment. Several research have shown the effectiveness of ayurveda in detoxifying both the body and the environment. However, further study is needed to discover Ayurveda's hidden treasures and to spread the scope of Ayurveda in the management of environmental toxicity . We can conclude that the term "epidemic" is not new in Ayurveda. It includes a detailed explanation of the concept, as well as prevention, causes and treatment.

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