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AN INTEGRATIVE REVIEW OF POLLUTED WATER REMEDIATION IN AYURVEDA AND MODERN ASPECTS

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ABSTRACT

Water is an essential component for sustaining life and maintaining health. Rapid industrialization, urbanization and agricultural activities have led to increased water pollution, posing significant risks to human health and the environment. Ancient Ayurvedic texts provide detailed descriptions of water quality, contaminated water (Dushta Jala), its health effects, and various purification methods. Modern science has developed advanced water treatment technologies to ensure safe drinking water. This review aims to explore and compare Ayurvedic and modern approaches to the treatment of polluted water. The study highlights traditional purification methods such as boiling, filtration, exposure to sunlight and the use of herbal substances, alongside contemporary physical, chemical and biological treatment techniques. Integrating Ayurvedic wisdom with modern technologies may offer sustainable and cost-effective solutions for water purification.

KEYWORDS: Water pollution, *Ayurveda, Dushta Jala, Jalashodhana*, Water purification, Modern water treatment.

INTRODUCTION

Water is one of the *Panchamahabhutas* and is indispensable for life. *Ayurveda* considers pure water essential for maintaining health and preventing disease. Classical Ayurvedic texts such as Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya describe the characteristics of water and methods for purifying contaminated water.

In the modern era, water pollution has become a major public health concern due to contamination by microorganisms, industrial effluents, pesticides, heavy metals and domestic waste. According to global health agencies, unsafe drinking water contributes significantly to water-borne diseases. Therefore, understanding traditional and modern purification methods is important for ensuring safe water supplies.

AIM

To review Ayurvedic and modern approaches for the treatment and purification of polluted water.

OBJECTIVES

1. To study the Ayurvedic concept of polluted water (Dushta Jala).
2. To review traditional water purification methods described in Ayurveda.
3. To examine modern water treatment technologies.
4. To compare Ayurvedic and modern approaches for water purification.

METHODOLOGY

This review is based on information collected from classical Ayurvedic texts, published research articles, review papers, environmental science textbooks and scientific databases related to water pollution and treatment technologies.

Concept of Polluted Water in Ayurveda

Ayurveda describes contaminated water as Dushita Jala. Water may become impure due to decaying organic matter, Animal and human waste, Poisonous substances, Stagnation, Excessive turbidity. The properties of dushits jala mentioned by Acharya Sushrutta are

दुष्टं जलंल पिच्छिलमुग्रगन्धि फेनान्वितं राजिभिरावृतं च|
मण्डूकमत्स्यं म्रियते विहङ्गामत्ताश्च सानूपचरा भ्रमन्ति ||
मज्जन्ति ये चात्र नराश्वनागास्ते छर्दिमोहज्वरदाहशोफान्|
ऋ)ग(च्छन्ति तेषामपहृत्य दोषान्दुष्टंजलंशोधयितुं यतेत|| (lq-d-3/7-8)

According to Ayurveda consumption of impure water may lead to many diseases like Atisara (diarrhea), Chardi (vomiting), Jwara (fever), Kushtha (skin diseases), Krimi Roga (parasitic infestations), Agnimandya (digestive disorders) etc.

Characteristics of Pure Water

- Clear appearance
- Pleasant taste
- Absence of odor
- Light and digestible
- Free from visible contaminants

Ayurvedic Methods of Water Purification (Jalashodhana)

1. **Ushnikarana (Boiling)-**Boiling destroys disease-causing microorganisms and improves digestion. Ayurveda recommends boiled water; Ushnodaka for maintaining health and treating various disorders.
2. **Filtration-**Water was traditionally filtered through clean cloth, sand, gravel, charcoal. Filtration removes suspended particles and impurities.
3. **Surya Tapana (Sunlight Exposure)-** Exposure of water to sunlight was believed to purify water naturally. Modern studies also support the germicidal effect of ultraviolet radiation from sunlight.
4. **Use of Medicinal Herbs-** *Acharya Sushrutta* mentioned various herbs to purify water.

धवाश्वकर्णासन पारिभद्रान्पाटलान्सिद्धक मोक्षकौ च|
दग्ध्वा सराजद्रुमसोमवल्कांस्तद्भस्म शीतंवितरेत्सरःसु||
भस्माञ्जलिं चापि घटे निधाय विशोधयेदीप्सितमेवमम्भः|(lq-d-3/7-8)

In *kalpa sthana* of Sushrut Samhita ashes of some plants like *dhav, ashwakarna, asan, paribhadra, paatala, sidhak, mokshak, Aragvadha and somavalka are specified* for purification of water. These herbs possess antimicrobial and coagulating properties that aid water purification.

5. In *sutra sthana* of Sushruta Samhita seven objects are mentioned for purification of water like *katak, gomedamani, kamalnaal, shaivalmool, vastra, mukta prakshepa and sphatika prakshepa*

6. **Storage in Copper Vessels**-Water stored in copper vessels acquires antimicrobial properties due to the oligodynamic action of copper ions.
7. **Sedimentation**- Allowing water to remain undisturbed helps heavier impurities settle at the bottom, improving clarity.

Modern Aspects of Water Treatment

Modern water treatment involves multiple stages to ensure water safety.

1. Preliminary Treatment

- Screening
- Removal of large debris
- Grit removal

2. Coagulation and Flocculation

Chemicals such as alum are added to aggregate suspended particles into larger flocs.

3. Sedimentation

Flocs settle under gravity and are removed from water.

4. Filtration- Methods include

- Rapid sand filtration
- Slow sand filtration
- Membrane filtration

5. Disinfection- Common methods:

- Chlorination
- Ozonation
- Ultraviolet irradiation

6. Advanced Treatment Technologies

- Reverse Osmosis (RO)-Removes dissolved salts, heavy metals, and microorganisms.
- Activated Carbon Filtration- Removes odors, organic pollutants, and chlorine residues.
- Nanotechnology- Nanomaterials effectively remove contaminants at microscopic levels.
- Biological Treatment- Microorganisms degrade organic pollutants and improve water quality.

Comparative Analysis of Ayurvedic and Modern Approaches

Aspect	Ayurveda	Modern Science
Principle	Natural purification	Scientific treatment processes
Methods	Boiling, herbs, sunlight, copper vessels	Filtration, chlorination, RO, UV
Cost	Low	Moderate to high
Sustainability	Eco-friendly	Depends on technology
Effectiveness	Suitable for household use	Suitable for large-scale treatment

DISCUSSION

Ayurvedic water purification methods reflect a deep understanding of environmental health and preventive medicine. Techniques such as boiling, sunlight exposure, herbal purification, and copper storage have been supported by modern scientific investigations. However, these methods may not completely remove industrial pollutants, heavy metals, or chemical contaminants. Modern water treatment technologies provide comprehensive purification and are capable of treating large volumes of water. Nevertheless, they often require substantial infrastructure, energy, and maintenance. Integrating Ayurvedic practices with modern technologies may improve sustainability and accessibility, especially in rural and resource-limited settings**.**

CONCLUSION

Both Ayurveda and modern science recognize the importance of safe drinking water for health. Ayurvedic methods provide economical, eco-friendly, and culturally acceptable approaches to water purification, while modern technologies offer highly efficient treatment of diverse contaminants. A combined approach utilizing traditional wisdom and scientific advancements can contribute significantly to sustainable water management and public health protection.

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