CONCEPT OF MICROBIOLOGY IN AYURVEDA

Chahal Kaur Ravneet[1],SarochVikas[2], Johar Smita [3]

1.P.G Scholar, 2.Asst. Professor, 3.Principal P.G. School of Ayurveda and Research,

Desh Bhagat University Mandi Gobindgarh, Punjab.

Corresponding Email: ravneetayurveda@gmail.com

ABSTRACT

The science of Microbiology is not new to Ayurveda. Rig Veda (1/91/) highlights the concept of microbes as invisible organisms having specific unique characteristics. The literature of Vedic Microbiology paved the way to the existence of microbial world with the invention of a simple microscope in 1677 by Antoni Van Leewenhoeck. Classical Ayurvedic formulations are not only a supplement of diet but also an alternative in the treatment of bacterial infections. The paper attempts to review the implementation microbiological sciences in Ayurvedic research and development.

Keywords: *Microbiology, Ayurveda, Bacterial infections*

INTRODUTCION

The Ayurvedic system of medicine has described various formulations in the treatment of diseases, which play an important role in modern health care and curing various ailments and diseases. Evidences demonstrate that combinations of medicinal plants may increases the antimicrobial spectrum and potency. Ayurvedic herbal formulations commonly used in treatment of various microbial diseases such as *Pashanbhed churna, Arjuna churna, Bilba churna, Amla churna, Gokharu churna, Panchasakar churna, Trikatu churna, Avipattikar churna, Chandanadi churna* etc.

By the use of microbiological studies an Ayurvedic physician can select accurate diagnosis or drug for a particular disease. Moreover plant based antimicrobial culminates a vast untapped source for medicine. Phytoconstituents for instance flavonoids and polypeptides are used extensively in Ayurveda. Ayurvedic antimicrobials represent the most economic and safest choice for combating infectious diseases. Microbiology, no doubt an independent branch of

science has its deep root in Ayurveda as well. Systematic review of classical texts elucidates this fact clearly.

Present Status of Knowledge

1. Concept of Microbiology in Ayurveda [1,2]

The term ***kṛmi*** includes parasites, bugs, and worms and probably microorganisms also Meulenbeld prefers to consider the kṛmis as worms, though he admits difficulties in interpreting the term kṛmi. There is no evidence available to suggest that the ancient Ayurvedic physicians had access to magnifying glass, not to speak of microscopes. In these circumstances, it is difficult to judge whether invisible kṛmis in the blood are microbes. Aṣṭāṅga Hṛdaya, elucidates that the pathogens of the blood are indeed totally invisible to the human eye and are therefore microscopic. This is a very clear statement of the existence of microscopic life and a strong evidence to suppose that ancient Ayurvedic physicians were aware of microscopic life albeit they could not study it in sufficient detail.

2. Classical Microbial Standardization process for Ayurvedic medicines [1,2]

Apakarsana, Prakrtivighāta and Nidāna-parivarjana are the principles of treatment mentioned in context to combat the parasitic infections. The anti-microbial activity incorporates Vishagna, Vranashodhana, Vranaropana activities. The ultimate aim is to arrest and encounter the infection. For these to encounter the Visa caused due to specific micro-organism is to be identified and accordingly the stipulated drug from Krimighna and or Vishagna are to be administered or considering the manifestation produced due to microorganism like kleda, jvara, Kandu, Daha etc. respective Krimighna, Kandughna, Kusthaghna, Jvarahara, Svāsahara, Kāsahara, Sothahara, Sītapraśamana are to be used. Some groups of drugs are also used to arrest the infections caused by specific type of microorganisms characterized by different types of discharges, burning sensations, pain, redness etc.

3. Microbial Standardization for Ayurvedic medicines

Preparation of Extract [3, 4, 5]

The aqueous extract should be prepared by adding 20 g of herbal preparations in 200 mL distilled water, boiled on low heat for 2 h, filtered through cloth and filtrate was evaporated to dry on sand bath. After 24 h of shaking, the extract is to be filtrated, evaporated in vacuum and dried by rotary evaporator at 60°C. Dried extracts can be stored in labeled sterile screw capped bottles at 4°C and later used in vitro study.

Sample preparation [6, 7, 8]

Inoculate diluted specimens of the substance being examined with separate viable cultures of Escherichia coli, Salmonella species, Pseudomonas aeruginosa and Staphylococcus aureus. This is done by adding 1 ml of not less than 10-3 dilutions of a 24-hr broth culture of the microorganisms to the first dilution (in buffer solution pH 7.2, fluid soybean-casein digest medium or fluid lactose medium) of the test material.

Media preparation [9, 10, 11]

Culture media may be prepared as given below or dehydrated culture media may be used provided that, when reconstituted as directed by the manufacturer, they have similar ingredients and / or yield media comparable to those obtained from the formulae given below. Where agar is specified in a formula, use agar that has a moisture content of not more than 15%. Where water is called for in a formula, use purified water. Unless otherwise indicated, the media should be sterilized by heating in an autoclave at 115º for 30 minutes (for bacteria).

Total aerobic microbial count [12, 13, 14]

Membrane Filtration: Membrane filters 50 mm in diameter, having a nominal pore size not greater than 0.45 µm the effectiveness of which in retaining bacteria has been established for the type of preparation being examined. The filtration apparatus is sterilized and assembled as described under tests for sterility. [15, 16]

Plate Count: Using Petri dishes 9 to 10 cm in diameter, a mixture of 1 ml of the pretreated preparation and about 15 ml of liquefied casein soybean digest agar at not

more than 45º is added. Two such Petri dishes are prepared using the same dilution and incubated at 30º to 35º for 5 days, unless a more reliable count is obtained in a shorter time. The number of colonies found is counted. The result is calculated using plates with the greatest number of colonies but taking 300 colonies per plate as the maximum consistent with good evaluation.

Tests for specified micro-organisms [17]

Escherichia coli: Prescribed quantity is placed in a sterile screw-capped container, 50 ml of nutrient broth is added, shaken, and allowed to stand for 1 hour (4 hours for gelatin) and shaken again. The cap is loosened and incubated at 37º for 18 to 24 hours.

Salmonella: Prescribed quantity of the pretreated preparation being examined containing 1 g or 1 ml of the product to 100 ml of nutrient broth in a sterile screw capped jar, shaken, allowed to stand for 4 hours and shaken again. The cap is loosened and incubated at 35º to 37º for 24 hours.

Pseudomonas aeruginosa: Pretreated preparation being examined as described above and inoculates 100 ml of fluid soybean-casein digest medium with a quantity of the solution, suspension or emulsion thus obtained containing 1 g or 1 ml of the preparation being examined. Mixed and incubated at 35º to 37º for 24 to 48 hours. Medium of growth is examined.

Results and Discussions

Enteric or diarrhoeal infections are major public health problems in developing countries and contribute to the death of 3.3 to 6.0 million children annually. Enteric bacteria comprised of Salmonella sp., Shigella sp., Proteus sp., Klebsiella sp., E. coli, Pseudomonas sp. Vibrio cholerae, and S. aureus; are major etiological organisms of sporadic and epidemic diarrhea. Recently, it has been demonstrated that many human pathogenic bacteria have developed resistance against several synthetic drugs.

Integrating industrial microbiological techniques, the potency of antimicrobial Ayurvedic compounds can be increased substantially. The efficacy of a particular formulation largely depends on its shelf life. Dry heat sterilization process for raw materials and finished goods is an effective technology that can be employed to restore the potency of the compound and discard unwanted residues.

The codified texts of Ayurveda were composed in the few centuries preceding and succeeding the common era. Ayurveda made several advancements in theory and practice of medicine that have not yet been recognized as milestones in the history of medical ideas.

A careful study of the early writings on Ayurveda reveals that these ancient physicians were aware of not only pathogenic organisms but also nonpathogenic organisms that naturally inhabited the human body.

Table 1: Antimicrobial Ayurvedic Formulations [8, 9]

Herbal preparations	**Therapeutic use**	**Solvent Extracts**	**Ingredient**
Pashanbhed churna	Diuretic, Diarrhea, Cough, Fever	Aqueous Ethanol , Methanol and Acetone	Bergenia ligulata
Arjuna churna	Skin disease, Dysentery, Syphilis, Fever, Cough	Aqueous Ethanol , Methanol and Acetone	Terminalia arjuna
Bilba churna	Constipation, Typhoid, Intestinal disorder, Diarrhea, Dysentery	Aqueous Ethanol , Methanol and Acetone	Aegle marmelos
Amla churna	Dental carries, Anemia, Cold, Fever, Constipation, Digestive	Aqueous Ethanol , Methanol and Acetone	Emblilica officinale
Trikatu churna	Digestive, Tonic, Stimulant	Aqueous Ethanol , Methanol and Acetone	Piper longum, Piper nigrum, Zingiber officinale
Chandanadi churna	Urinary infection, Antiseptic, Gonorrhea, Cystitis, Genitor urinary affections	Aqueous Ethanol , Methanol and Acetone	Santalum album, Acacia arabica, Syzigium cumini, etc.
Pushyanug churna	Alterative, Stringent, Diuretic, tonic, leucorrhoea	Aqueous Ethanol , Methanol and Acetone	Cyperus rotund, Cissampelos pareira, Syzygium cumini, etc

Table 2: Classification of Major Microbial Contaminants in Herbal medicine [10]

General Classification	**Group**	**Sub Group**	**Specific Examples**	**Possible Sources**
Biological contaminants	Microorganisms	Bacteria	Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella sp. Shigella sp. Escherichia coli	Soil, post-harvest processing, transportation and storage
		Fungi	Yeast, Moulds	Post-harvest processing, transportation and storage

Conclusions

The production of disease by microorganism is a dynamic process between an infective organism and the various defenses of the human immune system. By the indulgence in the physical contact, expired air, ingested food material with other in the same plate, sharing bed & chair, wearing used clothes, garlands and paste; Kustha, Jvara, Sosa, and other infectious diseases spread individuals to individuals. The crude and sterile extract of selected plants, named Udumbara, Aragvadha and Eranda are effective to inhibit the zone of colonization of microorganism E.coli and Klebsiella. The effect of the administration of the crude extract of the plant is more than the effect of the administration of sterile one in context to antimicrobial activity. Emerging resistance to antibiotics demands alternative medicinal treatment that minimizes side effects to the maximum possible extent.

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