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Prospects of Ayurveda through Cell Line

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ABSTRACT

Ayurveda is a science of life with a holistic approach to health and personalized medicine. It is a system of traditional medicine developed during antiquity and the medicinal period and as such as comparable to modern system of medicine. Ayurveda gives us a model to look at each individual as a unique make up of *Tridosha* and to thereby design treatment protocols. Unfortunately, due to lack of scientific validation in various concepts like *Tridosha*, *Prakruti*, *Mahabhuta*, *Guna* and its affect on body. Hence evidence-based research as highly needed for global recognition and acceptance of Ayurveda, which need further advancements in vitro study. The present review highlights to improve the fundamental principles, drugs, pharmaceuticals and clinical research in Ayurveda through cell line study. In vitro studies permit a species-specific, simpler, convenient and more detailed analysis that can be done with the whole organism. This attempt will certainly encourage to researchers to work on cell line for the development and promotion of Ayurveda.

Key words: *Ayurveda, cell line, vitro study.*

INTRODUCTION

Ayurveda is a holistic system of medicine with historical roots in India subcontinent. Ayurveda sees a strong connection between mind and body, a huge amount of information is available regarding this relationship. It is the pure science based on strict logical explanation called *Darshana.* Its aim to provide guidance regarding food and lifestyles so that healthy people can stay healthy and folks with healthy challenges can improve their health.

Dosha, Dhatu and *Mala* are the basic of Ayurvedic Science. Each *Dosha* is responsible for regulating an essential aspect of organism function connected to a recognized definition of life. *Vata* regulates input or output of homeostatsis. *Pitta* turnover negative entropy production, *Kapha* storage inheritable structure.[1] Like that, *Guna* is also basic property in *Dravyas*. *Dosha*, *Dhatu* and *Mala* are exhibited through *Gunas*. In *Chikitsa* aspect *Samanya VisheshA Siddhanta*, *Samanya Guna* will increases *Dhatu* and *VisheshA Guna* will decreases *Dhatu.*[2] Everything in Ayurveda is a validated through observation, direct examination and knowledge derived from the ancients text.[3] But it requires translate concepts and practical application into the idiom of modern biochemistry, medicine, system analysis of organism function, correlation of *Dosha* and genomic variation and correlation of *Guna* and cellular function. Hence if Ayurveda has to provide the much needed support of the biochemistry science of cell line study. It requires more research in the areas of fundamental principles and diagnostics tools in place of drugs. Research is the prime need of contemporary Ayurveda. Much of its uses Ayurveda and industrialization of Ayurvedic drugs sector that needs the standardization and quality assurance of in use drugs beside developing new drugs. The system approach shows how *Tridosha* applies to every living organism from the first cells.[4] There is a strong need to explain fundamental

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principles of Ayurveda in a modern context through cell line study for future aspect. Cell culture is highly desirable as it's provides system for direct access and evaluation of tissues. It is a valuable tool to study the problems of clinical relevance especially those related to diseases, screening and studies of cells toxicity mechanisms. It provides the possibility for easy studies of cellular mechanisms and in the pathological conditions. It has an interesting application in the evaluation of therapeutic agents that potentially may treat the dysfunction.[5] Through this article, the authors intend to communicate the need of cell line study in Ayurveda science.

OBJECTIVE OF THE STUDY

To explain the need of cell line vitro study in Ayurveda to explore scientific innovation.

MATERIALS AND METHODS

Classical texts of Ayurveda viz. Charaka Samhita, Sushruta Samhita, Ashtanga Sangraha and Ashtanga Hrudaya were taken for study. Literature available regarding cell line was also collected from biochemistry science and standard journals. These references from both streams of knowledge were compared and analyzed critically.

DISCUSSION

Cell culture

Cell culturing is the process of growing cells artificially. Cell culture has become an indispensible technology in various branches of life sciences. Animal cell culture basically involves in vitro maintenance and propagation of animal cells in a suitable nutrient media. Mouse cell culture is the most commonly used in the laboratory.[6] The tissue culture term is commonly used to include both organ culture and cell culture.[7]

Types of cell culture

1. **Primary cell culture:** This is the maintenance of growth of cells dissociated from the parental tissue using mechanical or enzymatic methods, in culture medium using suitable glass or plastic containers. Primary cell culture is of two types - Adherent cells and Suspension cells.
2. **Secondary cell culture:** When a primary culture is sub-cultured it becomes known as secondary culture. Subculture or passage the cells refer to transfer of cells from one culture vessel to another culture vessels.[7]

Cell line

A cell line or cell strain may be finite or continuous depending upon whether it has limited culture life span or it is immortal in culture. There are two types of cell line,

1. **Finite cell line -** The cell line with limited culture life spans are referred to as finite cell line. The cells normally divide 20 to 100 times before extinction. The human cells generally divide 50 - 100 times, while murine cells divide 30 - 50 times before dying. Its growth rate is slower.
2. **Continuous cell line -** A few cells in culture may acquire a different morphology and get altered. Such cells are capable of growing faster resulting in an independent culture. The progeny derived from these cultured cells has unlimited life. They are designated as continuous cell lines. Its growth rate is faster.[8]

Nomenclature of cell line

It is a common practice to give codes or designation to cell line for their identification. For example, 3T3-L1 cell line the code is the '3T3' designation refers to the abbreviation of "3-day transfer, inoculums 3 x 10^5 cells." This cell line was originally established from the primary mouse embryonic fibroblast cells that were cultured by the designated protocol, so-called '3T3 protocol'. The primary mouse embryonic fibroblast cells were transferred (the "T") every 3 days (the first "3") and inoculated at the rigid density of 3 x 10^5 cells per 20-cm^2 dish (the second "3") continuously. The spontaneously immortalized cells with stable growth rate were established after 20-30 generations in culture and then named '3T3' cells.[9]

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Cell culture medium

A culture medium or growth medium is a liquid or gel designed to support the growth of micro-organisms, cell or small plants. Cell culture media generally comprise an appropriate source of energy and compounds which regulate cell cycle. A typical culture medium is composed of a complement of amino acids, vitamins, inorganic salts, glucose and serum as a source of growth factors. In addition to nutrients, the medium also helps maintain pH and osmolarity.[10]

Maintenance of cell culture

For maintenance of cell lines in culture the examination of cell morphology and periodic changes of medium is very important. The cell in culture must be examined regularly to check heath status of the cells, the absence of contamination and any other serious complications like toxins in medium, inadequate nutrients.[10]

Basic cell culture technique

In the laboratory, cells are generally maintained in a suitable culture medium either solid or liquid but in either case one providing an environment suitable for their growth and multiplication. Culture of cells is normally supplied as pure cultures, containing only a single strain. This is in contrast to natural environment where a diversity of micro-organisms usually presents. Cultures are usually supplied in conical flasks, universal bottles or petri dishes, cotton wool plug, screw caps or covers respectively serving to keep the cultures free of contamination from airborne bacteria or fungal spores.[6] In order to maintain pure culture, all glass ware must be sterilized before use and aseptic techniques should be followed.

Application of cell culture

1. To investigate the normal physiology or biochemistry of cells, for instance studies of cell metabolism.[6]
2. To test the effect of various chemical compounds or drugs on specific cell types (normal or cancerous cells)[6]
3. To study the sequential or parallel combinations of various cell types to generate artificial tissues. (e.g. artificial skin).[12]
4. To synthesize valuable biological from large scale cell cultures.[12]
5. The major advantage is the consistency and reproducibility of results that can be obtained from using a batch of clonal cells.[13]

Advantages of cell line study

1. Cell culture studies not allow direct trial on human.
2. Control of physiochemical environment pH, temperature, dissolved gases, osmolarity.[14]
3. Regulation of physiological conditions, nutrient concentration, cell to cell interactions, hormonal control.[14]
4. The cultured cell line becomes homogenous after one or two subcultures. This is in contrast to the heterogeneous cell of tissue samples. The homogenous cells are highly useful for a wide range of purposes.[15]
5. It is easy to characterize cells for cytological and immunological studies.[14]
6. Cultured cells can be stored in liquid nitrogen for several years. [16]
7. Due to direct access and contact to the cells, biological studies can be carried out more conveniently.[16]
8. Utility of tissue culture will drastically reduce the use of animals for various experiments.

Limitations

1. Need of expertise and technical skill for the development and regular use of tissue culture.
2. Cost factor is a major limitation.[14]
3. It is estimated that the cost of production of cells is about 10 times higher than direct use of animal tissues.[15]
4. Control of environment factors is not easy.[14]

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5. Tissue culture techniques are associated with the differentiation i.e. loss of the characters of tissue cell from which they were originally isolated. This happen due to adaptation and selection process while culturing.[16]
6. Homeostasis mechanism in vivo regulation are lacking in vitro cultures.[15]
7. The propagation of cells in vitro study occurs on a two dimensional substrate, due to this, the cell to cell interactive characters are lost.[17]

Today the cost of health care is constantly rising and affecting people's ability to afford health coverage. The drug should be the first meaning of treatment beginning with the natural healing method like Ayurveda. Ayurveda is still covering because of lack of scientific evidence in many cases. The development of guidelines for biochemistry science in Ayurveda requires huge professional work both by academics and practioners who must have the necessary knowledge and motivation for this task. Although the process of research is time taking but it is the only way to overcome the difficulties in the promotion of Ayurveda worldwide. The tools accepted by Ayurveda for examination - the direct observation (*Pratyaksha*), the inference (*Anumana*) and the literature (*Aptopadesha*). These methods of investigation have been planned to develop the backbone of Ayurvedic system in the form of basic principles. It is also a bitter truth that modern researches have not been very rewarding for Ayurveda itself as most of these researches is being used Ayurveda to extend modern bioscience.[18] Modern biochemistry science gives knowledge of cells, tissues and their nutrients, organisms and molecular science. Thus both systems have to be complement to each other in the benefit of wisdom. In the present scenario, Ayurveda needs further advancement in the development and promotion of Ayurveda.[19]

Fundamental research needs to be done in the field of Ayurvedic physiology, pathology, pharmacology and pharmaceuticals. But as see disadvantages of cell culture study, there is a lot of problems and limitation coming in the field of Ayurveda. Cost factor is the major issue to affordable everybody in these studies. There is a limitation of expertise, young Ayurvedic scholars although enthusiasts are not clear about their views on the future of Ayurveda. There is a lack of knowledge of modern technologies required to conduct advancements. There are the most chances of contamination of cells in vitro study, so that expertise and well equipment are needed. The homeostatic components are lacking in vitro study due to outside environment culturing so that result is not perfect or uncertain. There is a lack of co-operation and biomedical science knowledge, cell line study, molecular science which is after unduly skeptical and carries prejudice. But see as advantages of cell culture study, it is very useful in investigate normal physiology or biochemical of cells. These are useful in various pathological conditions, virus detection and vaccine development. The government should prepare a financial development budget about the issue of cost factor of cell line for the progress and development of Ayurveda. India has to develop some type of policies in the health care system for the further development of Ayurveda. There is a need of research on Ayurveda to refresh and upgrade the tremendous knowledge. This kind of research will certainly upgrade the fundamental knowledge of Ayurveda which will be definitely benefitted.

CONCLUSION

The epistemology of Ayurveda is based on the relation between microcosm and macrocosm involving five basic elements (*Mahabhuta*), three dynamic principles similar to humour (*Dosha*), seven types of tissues (*Dhatus*) and many other unique concepts. Ayurveda principles are largely holistic with more reductionist in its approach, whereas that of the modern biochemistry is based more on experimental, analytical and reductive reasoning. The relationship between the Ayurveda and biochemistry science is similar to the relationship between the whole and the parts, whereas the sum of the parts need not be equal to the whole. The Ayurvedic sector should urgently recognize and address the need for scientific evidence, systematic documentation, appropriate methodology and rigorous experimentation in

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accordance with good expertise to move towards evidence-based Ayurveda. This review and analysis is carried out with a caveat that the methods of cell culture study and evidence of cell line approach of biomedical science is need of Ayurveda.

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