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Thought Leadership Article

Reflections on current Ayurveda research

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ABSTRACT

The current development in modern biology partnered with technology, better understanding of genes, environment is beginning to allow predicting the state of the human body. Research in Modern science is in transitional state from reverse pharmacology to system approach. It's time for Ayurveda to undertake research deep in its own foundational theories and in its interface with modern science. The present environment, lifestyle and nutrition have drastically different from ancient times. There is a need to modernize Ayurveda and make it relevant and contextual in terms of personalized medicine where allopathic medicine is heading. Innovations based on advancements, new treatment regimen, therapeutic approaches are the current needs from Ayurveda to make an impact on global clinical practice. In India, the Ayurveda research needs commitment in leadership and good funding resources for its best run, and for true healthcare.

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Recently, during a discussion meeting in Bangalore a rather thought provoking question came up – where are the modern day Susruta, Charak or Patanjali (s)? In fact, there has not been one that anyone in the room could come up with. While, there is a growing interest in research on Ayurveda, the fact that no one could come up quickly with names, indicates the status of the field.

We are where we are. One can attribute a lot of reasons for the current state of research and development in Ayurveda – best argued over chai or beer. The recent developments in modern biology have been driven greatly by developments in technology. Today, we can sequence genomes, analyze metabolites, and the developments in physics and chemistry allows us to non-invasively query anatomy and physiology. Our understanding of the connection between genes and biochemistry provides us with interesting tools that can lead to predicting the state of the human body. We better understand the relationship between environment and ourselves and the consequence of our actions on the environment. Most importantly, our environment, lifestyle and nutrition have all significantly changed from the days of the ancient texts.

I am not saying that there isn't any research happening in the area of Ayurveda. My impression is that research in Ayurveda is fragmented and often not deep in its own foundational theories or in its interface with modern science [1]. Ayurveda physicians often take a stand that modern science is reductionist and hence cannot be applied to Ayurveda. This essentially shuts off the ability to use the scientific and technological tools available for practice as well as for research. Life scientists often use Ayurveda formulations as the starting point primarily for reverse pharmacology and try to isolate the single molecule and to determine their molecular mechanisms and mode of action. The idea of systems approaches is just beginning to come into modern life science research and the ability to take a systems approach when looking at complex formulations is hence a real possibility – but hardly attempted [2].

An interesting aspect of modern science is the push to understand processes from the first principles of physics and chemistry, thereby allowing one to make mathematical models and generate hypotheses that can then be tested experimentally. Interestingly, most things in modern medical practice also are not explained from the first principles of physics and chemistry and hence the idea of evidence-based medicine is a fallacy. Most drugs in the market are not necessarily based on understanding of the molecular mechanism, but on positive statistical correlations on a large population. Such statistical validation is often confused with scientific evidence. Mathematical models using complex non-linear dynamic systems approaches are beginning to be applied in Ayurveda [3]. The question is, do Ayurveda physicians and researchers have the willingness to adopt these types of models, make predictive hypothesis and test them? These types of models, if developed well, incorporating current lifestyle, nutritional and environmental factors will allow for modernization of Ayurveda practice.

There are however, interesting opportunities. Ayurveda is not a single molecule based therapeutic intervention. It does not believe that the best way to cure an infection that is gone rouge is to kill all the bacteria – the fundamental philosophy is to restore

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homeostasis. In the current scenario when antimicrobial resistance is on the rise and the risk of zoonotic diseases is high (as we encroach more into natures domain) and bioterrorism is a big threat, a better approach is the Ayurveda approach of improving ability of humans to defend themselves – a case that has been argued well already [4]. The future of modern medicine is immunomodulation and regenerative medicine and modulation of the microbiome using approaches of personalized medicine – all of which are territories very familiar to Ayurveda. The challenge is to modernize Ayurveda and make it relevant and contextual.

Papers published in the Journal of Ayurveda and Integrative Medicine in many ways can act as a good representative of the current approach to research in this area. This is not an appreciation of the journal, but a subjective comment on the current orientation of authors in Ayurvedic journals. Most published work still looks at cause effect relationships and tries to relate current Ayurveda practices to 20th century modern medical practices. Often, they are studies on efficacy and/or activity, chemical studies on formulations and plants, identification of active ingredients etc. There are no papers on new science based advancements to Ayurveda, no new treatment regimens that are not described in the ancient texts. These suggest an attitude that all that is needed to be known is already known and there is nothing new to find. The startling absence of new innovative therapeutic approaches and new science is of great concern and unless this changes, the state of Ayurveda research will continue to be superficial. In the absence of new innovations, the impact that Ayurveda will have in global clinical practice also will remain marginal.

Let me stop by throwing ideas on what needs to be done to change the scenario. Obviously, the critical missing link is the presence of the *Vaidya* Scientist, discussed eloquently by Ashok Vaidya [5]. There also seems to be a lack of leadership and commitment from successive governments into investing in Ayurveda research – the total annual funding available for Ayurveda research, education and services for the whole country is less than that of many average sized biology departments in a major science nation like the United States. Unless, the budget for Ayurveda research reaches a critical amount – five thousand to ten thousand crore rupees a year, it will not attract the best talent. Perhaps even departments like DST and DBT should allocate funding for Ayurveda-biology. Most of the Ayurveda research is now done in traditional medical institutions that do not have the best scientific infrastructure – improving their infrastructure to state of the art is an urgent investment that is needed. In a short run, collaboration with the best science institutions should be the strategy. Today, scientific institutions in India that have the best scientific minds, infrastructure and have a peripheral interest in Ayurveda research. To invest a significant part of their time and minds into Ayurveda research, demands a similar funding for research programs. At present, very small grants are given by the Ayurveda Biology Task Force (about fifteen to thirty lakh rupees a year). More importantly, the poorly thought out-thrust on translational research is a death knell to Ayurveda research (as well to many other areas). Return to investment in deep science requires significant amount of sustained funding over a threshold level. While funding is a problem, leadership also in crisis. Most science ministries, including Department of Health Research have professionals as their head instead of career administrators. The need for domain expertise is acknowledged and respected. The government's commitment to AYUSH practice and growth driven by further research and development needs two significant changes, one in appointing visionary professional leadership and the second in allocating appropriate resources, at least equivalent to the size of the DBT only for the research mission.

A significant cultural change is an urgent need. Good research in this area requires the ability of physicians, scientists (in life sciences and other areas), engineers and data scientists to work together. This requires new ideas of how institutions are managed and individuals are motivated. The idea that all credit goes to one of the authors in a finding (paper or in other forms of intellectual property) is a serious detriment to collaborative work. Given the impossibility of having all of the necessary expertise in one person, especially in a complex science like Ayurveda biology/medicine, one needs better metrics to credit all the investigators equally. The holistic ideas of Ayurveda, when combined with research on conservation and the ability to live in harmony with the environment can create a paradigm shift in medicine moving from disease management to true health care.

In summary, Ayurveda research in India is still at its infancy. No one disagrees on the importance of its systemic perspective, but the current practitioners need to have a cultural change and as a nation, there needs to be commitment in leadership and resources to it. If these changes happen, the foundations of Ayurveda will definitely provide a platform for India to assume a leadership role in the future of health care. We are at risk of missing the opportunity and I hope there will be some swift action for the betterment of mankind.

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Conflict of interest

None.

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