

Traditional knowledge systems and new science policy thrust

The extent of original medical research in India remains sub-optimal despite competence and facilities. One of the factors could be ignorance about, and a general lack of rational appreciation of India's traditional knowledge systems (TKS), which could otherwise be a good source of new ideas, and thus innovation. The existing silos do not allow sufficient cross-disciplinary dialogue between the mainstream biomedical community and those in the TKS to promote active and unbiased research in TKS. The new Science, Technology and Innovation Policy (STIP) proposed by the Department of Science and Technology (DST 2020), Government of India has the potential to accelerate the confluence of ancient and contemporary wisdoms, if appropriately articulated, inter-digitated and executed.

Science and Technology remains a key driver for economic growth and human development. The STIP aims to identify and address strengths and weaknesses of the Indian STI ecosystem to catalyse socio-economic development of the country and also make the Indian STI ecosystem globally competitive. STIP proposes establishment of a National STI Observatory as a central repository for all kinds of data related to and generated from the STI ecosystem. Strategy of Open Science Framework will be important to provide access to scientific data. Making all data generated from publicly-funded research available to the public is a welcome step. The idea of 'one nation, one subscription' would give legally appropriate access to global research articles. The policy intends to strengthen innovative ecosystem and entrepreneurship. Establishment of Science Media Centres at national and regional levels, to connect scientists with media, is also a good step. The STIP is expected to be guided by a broad vision including technological self-reliance, human resource development, increased investments and global recognition. In order to fulfil aspirations of a new, future-ready India with ensured and active participation, shared responsibility and equitable ownership of all stakeholders, it is necessary to transform the national STI landscape. It should fortify India's indigenous capacity while nurturing meaningful global interconnectedness.

In this context, there is a need for greater emphasis on promoting active research in TKS, so that the intertwined facts and myths are separated. This is expected to

lead to development of indigenous technologies and encourage grassroots innovation.

The STIP envisions an institutional architecture to integrate TKS and grassroots innovation into education, research and innovation system by encouraging collaborations with scientists. Obviously, there is a need to rationally verify and strengthen the validated traditional knowledge base. The capacity to look at various disciplines with humility, curiosity and passion is the key to such integration. It is important to recognize the dynamic nature of knowledge rather than keep it compartmentalized as traditional and modern. This perspective is important for health research in a country like India, which has a long history of living with traditional health-care systems such as Ayurveda, Yoga, Unani, Siddha, Sowa Rigpa and several local health traditions (broadly grouped as AYUSH systems).

The mainstream health research in India is managed by the Department for Health Research (DHR) mainly through the Indian Council of Medical Research (ICMR). The five research councils under the Ministry of AYUSH (MoA) function independently. In addition, several other departments and councils of science and technology also support health and biomedical research. Importantly, the DHR mandate needs to cut across boundaries of modern and AYUSH systems, giving due regard to respective epistemological nuances. In this context, it is necessary to emphasize that health education and research needs to be considered in a holistic manner. The National Health Policy 2017 and National Education Policy 2020 both promote this vision. The proposed National Research Foundation will hopefully be aligned to promoting trans-disciplinary research on TKS.

There is often a criticism that AYUSH professionals are not involved in high quality research. The need for more rigorous scientific research on Ayurveda and other TKS has been repeatedly highlighted (Patwardhan, B., *J. Ayurveda Integr. Med.*, 2010, **1**(3), 169; Lakhotia, S. C., In *Integration Perspectives: Ayurveda, Phytopharmaceuticals and Natural Products* (ed. Bhat, N.), Continental Prakashan, Pune, 2020, II/7, pp. 87–102; Lakhotia, S. C., *Proc. Indian Natl. Sci. Acad.*, 2016, **82**(1), 1–3; Patwardhan, B. and Vaidya, A. D., *Curr. Sci.*, 2009, **97**(8), 1117–1121). Although, the data in Clinical Trials Registry of

India indicate that AYUSH-related research has substantially increased (Bhapkar, V. *et al.*, *J. Ayurveda Integr. Med.*, 2020; doi: 10.1016/j.jaim.2020.10.012. Epub ahead of print. PMID: 33262559; PMCID: PMC7690275), the overall original research contribution in global context remains still small.

The Indian scientific and medical community so far has not seriously looked at TKS as sources of new ideas and innovation. Those engaged in research involving TKS are not sufficiently trained in modern science methodology and often lack funding, resources and infrastructure for research. On the other hand, barring a few examples, mainstream Indian scientists have not sufficiently appreciated and explored knowledge from AYUSH systems.

Scientific research on AYUSH should be a primary and fiduciary responsibility of the scientific community. It should not be perceived as the sole responsibility of vaidyas, hakims and siddhas. It is imperative that universities and national institutions engage in unbiased research on AYUSH systems. It is important that a competitive process, akin to that followed for the modern medicine graduates, be followed for AYUSH scholars as well to provide them opportunities to join the cadre of scientists in national laboratories and universities. For instance, presence of open-minded Ayurvedic scholars in a molecular biology laboratory would be greatly advantageous to both the disciplines and facilitate progress of good science.

Many innovations may emerge if systematic research on TKS can be undertaken by mainstream researchers and physicians. For instance, Ayurvedic biology remains an exceptional and exemplary effort and an unbiased approach to understand science underlying basic principles of TKS (Lakhotia, S. C., In *Integration Perspectives: Ayurveda, Phytopharmaceuticals and Natural Products* (ed. Bhat, N.), Continental Prakashan, Pune, 2020, II/7, pp. 87–102; Lakhotia, S. C., *Proc. Indian Natl. Sci. Acad.*, 2016, **82**(1), 1–3; Patwardhan, B. and Vaidya, A. D., *Curr. Sci.*, 2009, **97**(8), 1117–1121). The ‘Science Initiatives in Ayurveda’ (ASIIA) based on a decadal vision towards Ayurvedic biology (Valiathan, M. S. *Proc. Indian Natl. Sci. Acad.*, 2016, **82**(1), 13–19) has triggered curiosity driven constructive dialogue between biologists, chemists and material scientists. This has indeed resulted in high quality research. The ASIIA initiative has led to establishment of Ayurvedic Biology group under the DST to support basic science research. Efforts to develop research capacity, train human resource and undertake innovative research have been successful at Savitribai Phule Pune University, Manipal University; Banaras Hindu University; TransDisciplinary University; Institute of Genomics and Integrative Biology, IIT Kanpur, etc. Innovative ideas such as Traditional Knowledge Digital Library (TKDL), AyuSoft, Ayugenomics, reverse pharmacology, Ayurvedic Biology, Vaidya scientists, have inspired and helped young scientists and some AYUSH practitioners to participate in high quality research. The

lessons learned in pursuing the quest for evidence-based Ayurveda would be valuable for future activities (Patwardhan, B., *Curr. Sci.*, 2012, **10**, 1406–1417).

Science and Technology of Yoga and Meditation (SATYAM) is another example of timely initiative by the DST to strengthen interface among Medicine, Physiology, Psychology, Neuroscience and Philosophy. Initiatives like SATYAM may trigger innovation and open newer avenues of original transdisciplinary research in emerging areas such as mind-body medicine, cognitive sciences and consciousness.

The pandemic challenge posed by COVID-19 has triggered good collaborative programmes. The Ministry of AYUSH, Ministry of Health and Family Welfare, Ministry of Science & Technology, Council for Scientific and Industrial Research, Department of Biotechnology have all been working together on various research projects to combat the menace of COVID-19. The National Clinical Management Protocol for COVID-19, integrating modern and AYUSH systems, is an important step in this direction. Such inter-ministry and inter-institutional collaborations should be further strengthened beyond COVID-19. This would strengthen integrative medicine research by embracing advances in modern science and learning from wisdom in the TKS.

The global community is already recognizing the value in holistic concepts underlying Ayurveda (Wallace, R. K., *Medicina*, 2020, **56**(12), 661) and Yoga (Park, C. L. *et al.*, *Stress and Health*, 2020). The integration of Ayurveda, Yoga and biomedical science has promise to improve the affordability, quality and precision of healthcare (Patwardhan, B., *J. Ayurveda Integr. Med.*, 2010, **1**(3), 169; Patwardhan, B., Mutalik, G. and Tillu, G., *Integrative Approaches for Health: Biomedical Research, Ayurveda and Yoga*, Academic Press, 2015). *For this to happen, the TKS community needs to come out of its self-pride in past-glory syndrome and at the same time, the scientific community should shed bias and participate in open-minded research* (Lakhotia, S. C., *Proc. Indian Natl. Sci. Acad.*, 2016, **82**(1), 1–3; Patwardhan, B., *Curr. Sci.*, 2012, **10**, 1406–1417). There is a strong need to develop mutual respect and confidence in strengths of each discipline. We hope that the STIP 2020 provides necessary impetus to motivate and support Indian researchers to seriously consider TKS as sources of ideas for innovation and thus strengthen the culture of high-quality original research.

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