

Synergetics for antibiotics?

Recent headlines have brought to the fore scary scenarios of what may happen when ordinarily used antibiotics lose their potency at a time when increases in resistance have been noticed among infective organisms. The news items also predict near astronomical number of deaths and losses to economies that might follow in the near future due to the failure of antibiotics. I believe that even cocktails of antibiotics lose their effectiveness over time. The only suggestion that has been put forth to overcome such disasters is to intensify research for the discovery of ever newer antibiotics.

Though the matter is far from my specialization, I, as an interested person, cannot help wondering why certain aspects of synergetics that may enhance or otherwise modify the activity of antibiotics beneficially, have not been put forth as fields of research. I have heard that prescriptions based on what may be called early medical practice (Ayurveda, tribal medicine, etc.) are quite effective and have less toxicity or side-effects. There are even some cases where certain purified isolates from those prescriptions have either increased toxicity/side-effects

or loss of effectiveness in the absence of 'impurities' that may have exerted synergetic effects. Much of what I have heard may be episodic in nature, but such happenings do suggest, collectively, a way forward.

It is that one must research ever newer additives to known and tested antibiotics that may enhance the effectiveness of the latter and defeat development of resistance. An advantage could be that the additives can be changed (without changing basically the present antibiotic), if resistance shows up even after such synergetic practice. Possibilities to look for compounds of value (either synthetic or from natural sources), that are not antibiotics by themselves, may lie in the fields of polyphenols, alkaloids/purines/pyrimidines, short polypeptides, natural or 'unnatural', certain types of polysaccharides, etc. I do think there is a good opportunity here for carrying out new research in drug discovery.

Even as I wrote this I came across a report of recent work carried out in McGill University, Canada, announcing that polyphenolic compounds from maple syrup, a sweetening agent commonly

used in North America, potentiate antibiotic susceptibility of common pathogenic agents (clinical strains of *Escherichia coli*, *Proteus mirabilis* and *Pseudomonas aeruginosa*)¹. Results from this work are highly encouraging. Surely, what the authors state in the abstract of the paper: 'Overall, this study provides a proof-of-concept and starting point for investigating the molecular mechanism of the reported increase in bacterial antibiotic susceptibility in the presence of phenolic-rich maple syrup extract', opens a wide field research on synergetics involving different antibiotics, pathogenic organisms, groups of compounds of the types I have mentioned, and more.

1. Maisuria, V. B., Hosseinidoust, Z. and Tufenkji, N., *Appl. Environ. Microbiol.*, 2015, **81**(11), 3782–3792.

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The need for developing scientific temper in India

Perhaps, India is the only developing country in the world whose constitution has adopted, after the 42nd amendment in 1976, the inculcation of scientific temper as a fundamental duty of its citizens: 'to develop the scientific temper, humanism and spirit of inquiry and reforms'¹. In 1981, a statement on scientific temper was issued by a group of intellectuals led by P. N. Haksar², which evoked support as well as criticism from different quarters. In 1983, India re-emphasized the importance of scientific temper and the resolution to build self-confidence and pride in national capacity by reiterating its firm commitment to scientific temper³: 'To ensure that the message of science reaches every citizen of India, men and women, young and old, so that we advance scientific temper, emerge as a progressive and enlightened

society. In India scientific temper will be fully integrated with all spheres of national activity'. In 2011, again an attempt was made to revisit the 1981 scientific temper statement and the outcome was a revised statement⁴, now known as the 'Palampur Declaration'. The latest Science, Technology and Innovation Policy⁵ of 2013 also stresses upon 'promoting the spread of scientific temper amongst all sections of society' as the first objective.

However, the greatest exponent of scientific temper in India was our first Prime Minister, Jawaharlal Nehru^{6,7}, who wrote in 1946: 'What is needed in India is the scientific approach, the adventurous and yet critical temper of science, the search for truth and new knowledge, the refusal to accept anything without testing and trial, the capacity to change previous

conclusions in the face of new evidence, the reliance on observed fact and not on pre-conceived theory, the hard discipline of the mind – all this is necessary, not merely for the application of science but for life itself and the solution of its many problems'. The Government of India, through its National Council for Science and Technology Communication, dedicated its National Science Day on 28 February 2014, with the theme 'Fostering Scientific Temper' to spread Nehru's vision⁸.

Despite all these policy resolutions, Indian citizens remain deeply rooted in superstitions and blind faith in supernatural powers. Overall, India's achievements in the area of Science and Technology (S&T) are impressive, but this process of development, unfortunately, has not brought commensurate