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. Haksar[2], which evoked support as well as criticism from different quarters. In 1983, India reemphasized the importance of scientific temper and the resolution to build self-confidence and pride in national capacity by reiterating its firm commitment to scientific temper[3]: '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 statement[4], now known as the 'Palampur Declaration'. The latest Science, Technology and Innovation Policy[5] 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 vision[8].

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

change in the traditional outlook of the people. Ironically, the latest information technology is being used to also propagate anti-science beliefs[9]. Today, we have a large number of religious channels, but there is not a single Indian science channel. It does seem paradoxical, that even after putting in the best of our efforts to inculcate a rational outlook and scientific thinking among citizens for many years, we find ourselves where we began after independence. Rather, with the new regime in India, scientific temper has taken a back seat in planning and implementation of S&T in the country. During 2000, the University Grants Commission, New Delhi introduced Vedic astrology in universities, but this experiment failed miserably[10].

1. Basu, D. D., *Introduction to the Constitution of India*, Prentice Hall of India, New Delhi, 1993, 15th edn, p. 131.
2. op.niscair.res.in/index.php/JST/article/download/1099/35
3. psfcerd.org/blog/news/fostering-scientific-temper/
4. www.vigyanprasar.gov.in/vipnet/february-2014/Vipnet-february-2014.pdf
5. www.dst.gov.in/st-system-india/science-and-technology-policy-2013
6. Mahanti, S., *J. Sci. Temper*, 2013, **1**(1), 46–62.
7. Nehru, J. L., *Discovery of India (Centenary Edition)*, Oxford University Press, New Delhi, 1989, p. 512.
8. Keshavamurthy, H. R., *Fostering Scientific Temper is Fundamental to Innovation and Progress*, Press Information Bureau, India, 27 February 2014.
9. Tyagi, B. K., *VIPNET News*, 2014, **12**(2), 2.
10. Virk, H. S., *Curr. Sci.*, 2001, **80**(10), 1250–1251.

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CSIR in SIR 2016

The latest (2016) version of the SCImago Institutions Rankings (SIR) report[1] has been released on-line. SIR itself is a secondary evaluation exercise yielding a composite indicator that combines three different sets of indicators based on research performance (using primary bibliometric data from *SCOPUS*), innovation outputs (based on PATSTAT), and societal impact measured by their web visibility (Google and Ahrefs). Until now, as background data were also released, it was posssible with the help of indirect surrogate performance indicators[2,3] to see the time evolution of

Table 1. National and Global Rankings of CSIR and its 'daughter' institutions from 2009 to 2016

Indian rank		Global rank							
2016	Institution	2009	2010	2011	2012	2013	2014	2015	2016
1	Council of Scientific and Industrial Research	135	142	130	117	111	102	105	99
2	National Institute for Interdisciplinary Science and Technology (CSIRIN)	617	594	567	527	508	482	425	353
3	National Chemical Laboratory (CSIRIN)	497	532	528	520	505	498	460	441
4	Indian Institute of Chemical Technology (CSIRIN)	554	565	546	527	505	511	520	493
6	Central Salt and Marine Chemicals Research Institute (CSIRIN)	534	542	543	535	534	528	527	510
8	Institute of Genomics and Integrative Biology (CSIRIN)	579	588	586	567	553	544	531	514
9	National Physical Laboratory India (CSIRIN)	715	676	626	567	544	528	501	519
10	Central Food Technological Research Institute (CSIRIN)	547	549	522	513	503	505	501	531
12	Indian Institute of Integrative Medicine (CSIRIN)					548	558	557	550
13	Centre for Cellular and Molecular Biology (CSIRIN)	647	632	615	585	555	565	565	552
14	Central Drug Research Institute (CSIRIN)	657	647	625	605	575	544	537	558
17	Central Electrochemical Research Institute (CSIRIN)	638	637	621	602	612	601	588	567
19	National Environmental Engineering Research Institute (CSIRIN)	797	766	714	672	619	586		598
21	Indian Institute of Chemical Biology (CSIRIN)	670	670	655	614	573	566	566	602
23	Indian Institute of Toxicology Research (CSIRIN)	563	564	553	558	588	575	592	606
24	National Metallurgical Laboratory (CSIRIN)	704	704	688	659	632	621	621	608
26	Central Institute of Medicinal and Aromatic Plants (CSIRIN)				696		602	610	611
29	Institute of Minerals and Materials Technology (CSIRIN)			687	650	627	614	601	628
30	Central Leather Research Institute (CSIRIN)	688	695	672	654	626	603	605	633
34	National Botanical Research Institute (CSIRIN)	724	696	654	625	611	595	616	638
35	North East Institute of Science and Technology (CSIRIN)								638
38	Institute of Microbial Technology (CSIRIN)						587	617	644
39	Central Glass and Ceramic Research Institute (CSIRIN)		647	629	626	583	564	565	645
43	Central Mechanical Engineering Research Institute (CSIRIN)						639	647	647
46	National Institute of Oceanography (CSIRIN)	734	724	690	662	649	627	630	649
48	National Geophysical Research Institute (CSIRIN)	808	795	763	719	675	641	630	650
54	National Aerospace Laboratories (CSIRIN)					619	604	627	657
58	Central Electronics Engineering Research Institute (CSIRIN)					632	623	644	667