

Ayurveda: where are we?

This correspondence is in support of the earlier one by Srivastava¹. Despite the fact that Ayurveda is one of the old systems of medicine and the belief that herbal preparations have no side effects (unlike many conventional treatments), concern is now growing in the international community about its efficacy and safety². Therefore, a threat to the wide acceptance of this traditional Indian system of medicine is expected. Obviously, there is need for vigorous research on Ayurveda and/or on herbal medicine. Although a good deal of research is going on, not much scientific and medical documentation is presently available in this field, particularly on the clinical aspect. In the recent past when a PUBMED search from 1950 and EMBASE search from 1974 were made using keywords 'Ayurvedic drugs' and limited to clinical trials, reports with title and abstract were found to be mea-

gre, clearly indicating an urgency of serious and systematic medical research on herbal preparations. Srivastava¹ suggests one aspect, namely that most of the ingredients have to be fully identified, so that more effective medicines can be produced. Safety is also another important issue. In animal models we have found that some of our traditional herbal extracts might prove to be toxic in higher doses^{3,4}. Therefore, a strict quality control measure has to be followed. Let us not forget that we must have logic and scientific evidence for the continued use of herbal medicines. In fact, in order to create a better understanding and faith among the consumers and the researchers, everyone concerned with complementary medicine must understand that Ayurveda will not have a promising future unless standard cost effective drugs are produced with high efficacy and little or no ad-

verse effect. Certainly, a systematic, collaborative and scientific approach is the need of the hour.

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Anti-infective agents: Spectrum and selectivity

The discovery and development of anti-infective agents traces its beginnings to the work on penicillins (A. Fleming, Britain) and sulfonamides (G. Domagk, Germany), while earlier discoveries have been in the area of medicinal plants and herbal extracts, e.g. tulsi and turmeric (India), baobab (Africa), *Artemisia annual*/sweet wormwood extract (China).

The last four decades have seen intensive research for discovering new anti-infective agents with activity against a broad spectrum of pathogenic bacteria, also called broad-spectrum anti-bacterial agents. These meet the medical need of curing infections caused by several bacterial pathogens, which differ from each other in minor and sometimes significant ways.

These significant though minor differences are sometimes a hurdle for the development of effective broad-spectrum anti-bacterial agents. Also, the similarities

between mammalian mitochondria and bacteria are sometimes a hurdle for the development of effective broad-spectrum anti-bacterial agents. When this is the case, the drug discovery activities for such projects usually end, in favour of other more promising projects. Some patents may be filed, and a series of papers may be published in leading scientific journals.

In the case of anti-bacterial agents with a narrow spectrum of activity against a small set of pathogenic bacteria, the boundary conditions for drug discovery are quite different. Examples are leprosy, meningitis and tuberculosis. In each case, only a few species of pathogenic bacteria are the causative agents, with minor differences between them.

This has several implications. It is less difficult to discover potent anti-bacterial agents with a narrow spectrum of activity. There is more scope to exploit the minor differences between the drug-targets

of a small set of pathogenic bacterial species and their orthologs/homologs in mammals. Also, anti-bacterial compounds that did not make it as broad-spectrum anti-bacterial agents, may be developed into narrow spectrum anti-bacterial agents.

In view of what has been published on anti-bacterial compounds that did not become broad-spectrum anti-bacterial agents, knowledge is available.

In addition to the established approaches for drug discovery, namely, structure-aided design, reaction mechanism-based design, combinatorial chemistry and high throughput screening, the area highlighted here will hopefully receive more support than it has in the past.

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