

pollinators have caused their large-scale demise⁴. This has threatened the reproductive success of a wide array of plant species over the globe. As per the latest survey, over one thousand species of bees are on the verge of extinction. If this continues, there is every likelihood that this is going to markedly reduce not only the melittofaunal diversity, but also the coloured floral diversity of the biosphere. Therefore, conservation of pollinators would mean conservation of angiosperm diversity of the earth. This is not the only reason for the conservation of the pollinators. Their loss also affects the yield of several cross-pollinated crop

plants⁵. In the absence of managed pollination, at several places the world over, seed growers have to rely on wild pollinators for the pollination of their crops. Therefore, there is an urgent need to conserve the pollinators through the conservation of their habitats and ensured safety against pollutants and hazardous chemicals.

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2. Faegri, K. and van der Pijl, L., *The Principles of Pollination Ecology*, Pergamon Press, Oxford, 1979, p. 244.

3. Sihag, R. C., *Pollination Biology: Basic and Applied Principles*, Rajendra Scientific Publishers, Hisar, 1997, p. 215.
4. Kevan, P. G. and Laberge, W. E., Proceedings of the IV International Symposium on Pollination, Maryland, 1979, pp. 489-508.
5. Kevan, P. G., *J. Agric. Econ.*, 1977, 25, 61-64.

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Healing plants – Do they heal?

With herbal medicines gaining popularity, the profusion of articles and comments about them^{1,2} seldom address the crux of the matter – Do herbal medicines work? In our country, the use of medicinal plants is well entrenched and is a part of our culture and heritage. There are extensive works on the description of these plants, their supposed medicinal qualities and detailed pharmacopoeias of herbal remedies. All this still does not detract from the fundamental question that authors of this subject rarely ask: How do we know that they work?

Modern medicine has its origins in traditional medical knowledge, from which it evolved to such an extent that they are now divorced from and often in conflict with each other. This is because modern scientific medicine is underpinned by a sound base in the relatively new fields (historically speaking) of anatomy and physiology, and the rigorous pursuit of truth using logical deduction and experimental proof. Traditional systems of medicine, where herbal treatments are used, have failed to do either, perhaps because they will wither and die if exposed to the harsh light of truth. For purposes of this discussion, all systems of medicine, whether traditional or relatively modern, that fall outside scientific medicine, can be taken as constituting a group that does not follow scientific principles or are actually opposed to it. Thus, the criticism of herbal medicine pertaining to its lack of rational basis

applies to its fellow travellers equally. That some of the remedies that they use contain pharmacologically active substances does not diminish their irrationality.

For a remedy to be deemed effective, it has to be compared to a placebo to see whether it is more effective than the placebo treatment. In practice, these clinical studies are underpinned by careful statistical design and analysis, epitomized by the randomized double blind placebo-controlled study. Patients are randomly allocated to either treatment or placebo groups, treated with the drug under investigation or placebo, respectively, and the outcome compared. Neither the investigator nor the patient knows who is on the effective drug or placebo. Randomization avoids bias in patient selection and ensures that the two groups are comparable, and blinding prevents the manipulation of outcome and foils the many prejudices that may sway the result. Without such methodological rigour, even treatments, which we assume to be beneficial based on good physiological or biochemical reasons may turn out to be ineffective or harmful, a consequence of the complexity of biological systems and the myriad interaction between the drug, labyrinthine biochemical pathways and organ systems that we cannot currently predict. The double blind placebo-controlled study is a sort of baptism by fire, and a new drug or any other form of treatment that survives it is deemed

effective. How many herbal medicines have been subject to such studies? Indeed, how many forms of treatment with herbal medicines have a sound base in modern biology? Let us, therefore, talk not of the lack of side effect of these drugs but the lack of effect. If it is without any effect, it will not have side effects either! Indeed, even the lack of side effects cannot be taken for granted without a placebo-controlled study.

The fact that herbal medicines are rooted in history, bolstered by mythology and nostalgia, are cheap, popular and widely available are immaterial if their efficacy is not known. Of course, most diseases (especially minor infections) are self limiting and any form of treatment, including placebos will appear effective. In this way, the use of herbal medicines can be justified. Indeed, the same can be said of scientific medicine, where most minor ailments are treated with drugs to control symptoms and by non-specific placebos. However, the efficacy of many forms of treatment (for acute life threatening and chronic debilitating or life threatening conditions) are well established by clinical trials, though many are still based on logical deduction without sufficient evidence of efficacy established by clinical trials. This weakness is well recognized but these treatments are at least based on scientific knowledge of biological systems, which cannot be said of the traditional systems of medicine. Hence, herbal treatments,

like any other therapy, should be subject to double blind placebo-controlled studies to detect both effect and side effect. Until we have such information, all arguments regarding its efficacy, side effect, low cost, etc. are irrelevant.

An ardent nationalist may promote these remedies, whether they are good or bad, because they are Indian. He will be doing a disservice to the nation by championing treatments which may be ineffective or harmful or both, wasting our resources on an illusion and denying efficacious and possibly cheaper therapies. 'Eye of newt and toe of frog, Wool of bat and tongue of dog, Adder's fork and blind-worm's sting, Lizards leg and owlet's wing, For a charm of powerful trouble, Like a hell-broth boil and bubble' – part of the formula for a potion prescribed to the troubled Macbeth, but it is no longer popular among the British

despite its roots in (literary) tradition. The ingredients are devilishly difficult to get hold of in any quantity, the method of preparation imprecise, and most of all, there are no double blind placebo-controlled studies showing its effectiveness (say as an anti-anxiety elixir). Neither should we hang on to culturally endorsed remedies, at least to treat real diseases. One of the reasons driving the current interest in herbal medicines may be its recent popularity in the West, along with all things that are 'Eastern' such as yoga, acupuncture and mysticism, and magnetotherapy, numerology, tarot reading, etc. We, of course, have a penchant for Western approval in every sphere of life. The affluent West can afford these charming peccadilloes when the foundation of their society, including the healing sciences, rests on the cornerstone of rigorous logic. With little

funds for such foibles, we have to be more prudent. We should use any form of treatment that works – if we can show to our satisfaction that it does indeed work. Western approval is not necessary. A true patriot will only promote those treatments (or any other activity) that is logically sound and empirically useful, regardless of its place of origin. For we must remember that nature cannot be fooled and *sathyameva jayathae*.

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2. Chattopadhyay, M. K., *Curr. Sci.*, 1999, **76**, 1415.

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Hypothyroidism

This is regarding the article entitled 'Study of prevalence of hypothyroidism in women of reproductive age in Meghalaya, North-Eastern India' (*Curr. Sci.*, 1998, **75**, 1390–1393). I have a few queries regarding the same.

(1) What is the population from which the sample was drawn? We can then comment on the prevalence of hypothyroidism. Was it from a hospital, or specialty clinic, or was it from the general population. If it was from the general population, how were these women selected? What sampling method was used? If they were from a hospital or clinic, why did the women come there? Were they healthy or did they have any particular illness for which they consulted a doctor? (2) The range of serum T_4 in non-pregnant women at the upper end (216.6 ng/ml) crossed the upper limit of their normals (120 ng/ml). In non-pregnant women, a truly elevated serum T_4 level suggests thyrotoxicosis. Were the women (or woman?) with high T_4 clinically toxic? Details of the population attain importance to answer questions such as these. (3) It is well known that pregnancy results in increased total

serum T_4 levels due to estrogen-induced elevation of thyroid binding globulin levels. How was the diagnosis of hypothyroidism made in this group? What was the TSH level in the lone woman diagnosed as hypothyroid? (4) Thyroid deficiency may be very common in the north-east. But there is no objective evidence in this presentation to say that it is so.

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Response:

We thank G. R. Sridhar for reading our paper on the prevalence of hypothyroidism in women of reproductive age in Meghalaya. We wish to state that (1) the samples were randomly selected from a general population of about 3 lakhs and the individuals were visibly healthy, (2) no apparent symptoms of thyrotoxicosis

were observed in the women with high total T_4 levels (free T_4 levels were not monitored), and (3) the level of total T_4 (29.44 ng/ml) was considered as an indicator of hypothyroidism in the pregnant women where TSH level was found to be 0.3 μ IU/ml. It is important to mention that in areas of less severe iodine deficiency, endemic goitre is associated with normal TSH concentrations (Ingbar, S. H., in *William's Textbook of Endocrinology* (eds Wilson, J. D. and Foster, D. W.), W.B. Saunders Company, London, 7th edition, 1985, pp. 682–815). Our data indicate prevalence of hypothyroidism in women of Meghalaya beyond any doubt. However, as mentioned in the concluding paragraph of the paper, the prevalence of hypothyroidism in the general population of the State with reference to age, sex, food habits, ethnic origin, economic status, etc. remains to be analysed.

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