Obesity in India

Obesity is the accumulation of body fat to the level which might have a negative effect on health. A person having body weight at least 20% higher than it should be is considered obese. Body Mass Index (BMI) is a widely used diagnostic tool which provides a simple numeric measure of a person's 'fatness'. BMI of 18.5 to 25 may indicate optimal weight; a number above 25 may indicate the person is overweight; while a number above 30 suggests the person is obese and over 40, indicates morbidly obese. Overeating used to be the case just in developed nations but as a result of 'nutrition transition', the developing world is following the same trend. In India also, obesity has reached an epidemic proportion, affecting 5% of the country's population[1]. Following India's continued integration in global food markets, unhealthy, processed food has become much more accessible. Indian urban population is experiencing high rates of obesity, as their work often demands less physical exertion. Even rural areas are not immune because of increased mechanization of farming activity leading to reduced physical activity. In India, states which topped the list of rates of obesity are Punjab (30.3% males, 37.5% females), Kerala (24.3% males, 34% females) and Goa (20.8% males, 27% females)[2]. Though the percentage of obesity in India is less compared to the United States of America and other developed countries, it is significant due to the sheer size of the population. Indians are genetically susceptible to weight accumulation especially around the waist. Recently, scientists have identified a SNP (single nucleotide polymorphism) near *MC4R* gene, named rs12970134 and mostly associated with waist circumference[3]. Protein invadolysin found to be essential for healthy cell division, is present in lipid droplets – the parts of cells used to store fat[4]; however, how this protein affects metabolism and its role in obesity-related disorders is yet to be explored. Obesity may constitute a chronic stressful state, which in turn can cause significant physiological dysfunction. Such dysfunction would then predispose individuals to depressed mood and associated symptoms[5]. Treatment of obesity includes, sticking to a strict dietary prescription, physical activity and behaviour therapy along with drugs and surgery; the last two methods should be carefully weighed against their harmful effects. Obesity is a public health and policy problem because of its prevalence, costs and health effects. Reversing obesity and its health risks requires changing the habits of a lifetime. Having some insight into overeating habits will help to avoid the problem and will help reach the goal of a healthy India.

1. India facing obesity epidemic: experts. *The Hindu*, 2007, pp. 10–12.
2. Third National Family Health Survey. International Institute for Population Sciences, 2005–2006, Mumbai; http://nfhsindia.org/nfhs3_national_report.html
3. Loos, R. J. *et al.*, *Nat. Genet.*, 2008, **40**, 768–775.
4. Cobbe, N. *et al.*, *J. Cell Sci.*, 2009, **122**, 3414–3423.
5. Rihmer, Z., Purebl, G., Faludi, G. and Halmy, L., *Neuropsychopharmacol. Hung.*, 2008, **10**, 183–189.

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Drugs from the Indian seas – more expectations

Disease emergence has quadrupled over the past 50 years. Outbreaks of ebola, meningitis, SARS, bird flu and swine flu have been witnessed and we are defenceless. Diseases like HIV/AIDS, pest-transmitted diseases, cancer, Alzheimer's, etc. have made doctors desperately seek out new drugs. Moreover, insensible use of antibiotics has resulted in antimicrobial resistance and is seriously questioning the drug effectiveness, thus threatening prevalent drug prescription strategies.

Drug hunters need to look into new areas, away from terrestrial resources. Drugs from the sea are as much a potential marine resource as fish, and mineral deposits[1]. Exploration of the sea and its organisms is still at a relatively early stage in India. There are some 11,000 marine-derived natural products compared with more than 155,000 natural, terrestrial products. Only 5% of the marine environment has been described and 500,000–5,000,000 species (mostly microorganisms) remain undiscovered, representing a huge potential source of new drug leads. Marine organisms have evolved biochemical and physiological mechanisms that include the production of bioactive compounds for purposes such as reproduction, communication, and protection against predation, infection and competition[2]. Thus oceans represent an untapped source of new medicines[3] and will be the new frontiers for drug discovery in this century.

The marine microorganisms, seaweeds, soft corals, fungus, sponges, bryozoans, tunicates, annelids, holothurians, molluscs, echinoderms have all been reported to be a source of bioactive molecules (acetogenins, polyketides, terpenes, alkaloids, peptides and many compounds of mixed biosynthesis). To cite a few, sponge-derived compounds like Zidovudine (AZT) can fight the AIDS virus, and cytosine arabinoside (Ara-C) is used in the treatment of leukaemias and lymphomas[4]. Bioactive molecules from temperate marine diatom, *Skeletonema* is now used against a non-small-cell bronchopulmonary carcinoma line (NSCLC-N6)[5]. While extracts of seaweeds *Ulva fasciata* and *Hypnea musciformis* exhibit antiviral activity, that of green mussel, *Perna viridis* exhibit anti-HIV and anti-influenza activity[4].

International agencies realized the untapped drug potential of Indian Ocean wealth way back in late 1960s. Such efforts were launched in India only in the last decade with prestigious institutions (National Centre for Ocean Information

Services, CMFRI, CDRI, NIO) funding research on marine bioprospecting. Indian drug and pharmaceutical industries have increased their R&D spending by 400% in the past 4 years[6]; however, they still spend only one-tenth of their revenues on R&D against 20% by western companies.

An obvious corollary of the high cost of drug research is that companies will invest only in R&D activities that ensure high returns if a successful product emerges[7]. New drug discovery and development is still in its infancy in India, and at present no Indian-based company has the financial muscle to compete with the multinationals[7]. Any new drug development needs an investment of about US$ 500 million per product and minimum development period of 8–12 years, with a final success rate of less than 0.01%.

Based on the potentially large health benefits to society, the governments should encourage and support the search for drugs from sea and increase R&D investment on marine biotechnology and marine biomedical field. It is time that our agencies and institutions recognize the magnitude of the problem and the all-too-obvious limitations of our laboratories[7]. Indian university curricula need to include chapters on bioprospecting. Creating an autonomous body such as 'Indian National Centre for Marine Natural Products' manning a nationwide network of units can have a revolutionary effect on the discovery of new therapeutic molecules in India for human sustenance.

Considering the survival benefits to mankind, does not deep sea exploration deserve as much attention as the Indian lunar surface exploration?

1. Grant, P. T. and Mackie, M., *Nature*, 1977, **267**, 786–788.
2. Halvorson, H. O., *New Engl. J. Higher Ed. Econ. Dev.*, 1998, **13**, 28–42.
3. Pomponi, S. A., *J. Biotechnol.*, 1999, **70**, 5–13.
4. Venugopal, V., *Marine Products for Health Care – Functional and Bioactive Nutraceutical Compounds from the Ocean*, CRC Press, Boca Raton, FL, 2009, p. 528.
5. Bergé, J. P., Bourgougnon, N., Carbonnelle, D., Le Bert, V., Tomasoni, C., Durand, P. and Roussakis, C., *Anticancer Res.*, 1997, **17**, 2115–2120.
6. Mashelkar, R. A., *Science*, 2005, **307**, 1415–1417.
7. Balaram, P., *Curr. Sci.*, 2000, **78**, 937–938.

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Online herbaria or national flora: what is needed first?

Datar and Ghate[1] aptly describe the need for online herbaria in India. In addition to housing plant collections, many herbaria have initiated computerized data information system to record and access the information on plant specimens, as well as to access information from other herbaria worldwide[2]. The initiative in India by Agharkar Herbarium (AHMA) deserves appreciation. Sasyabharthi, Sampada, Herbaceous Plants of Baroda, etc. are other efforts in this field and their status and limitations have already been reviewed[3,4].

In this context, the Botanical Survey of India (BSI) has come up with a thematic proposal for an online digital herbarium of the entire country[3]. But before working on the online herbarium, we must first complete our baseline data of floristic diversity of India in the form of a complete national flora.

J. D. Hooker and his associates produced *Flora of British India* (covering flora of India, Pakistan, Bangladesh, Myanmar, Sri Lanka, Nepal, Malayan Peninsula, Bhutan, Tibet, etc.), describing 14,312 species of flowering plants in a period of 25 years (1872–1897)[5]. Since its publication, many new species, genera and even few families have been added to the flora of India, but this book is yet to be revised. After independence, our country has made appreciable progress in all fields of science. Presently it is encouraging that on one side we are able to send *Chandrayaan* to Moon and succeed in proving presence of water there, but on the other side it is equally embarrassing that we are not able to produce a national flora indicating the presence of certain flowering plants in our own country. Even countries as big and diverse as Russia, China, Australia, etc. have completed their national floras and much of the information is available on the web.

Serious efforts for producing *Flora of India* in 32 volumes were started by BSI[6] in 1986 and few volumes (introductory volumes, vols 1, 2, 3, 4, 5, 12, 13) were published during 1993–2000 with good quality information. But the task is still unfinished and no new volume has appeared during the last 8 years. The synthesis of information from enormous herbarium collections available with BSI (3 million) and other herbaria (1.2 million)[3] is delayed, as it seems, due to diversion from the principal aim of preparing a modern up-to-date account of the flora of India. On a national scale we do not even have a checklist of flowering plants; what exists is a checklist of monocots[7] only, accounting for 4081 species which is less than one quarter of the floristic wealth of India. Regarding the number of flowering plants, different figures are quoted such as 15,000 species[8], 16,809 species[5], 17,000 species[9,10], 17,500 species[11], 18,000 species[4], 20,247 species[12], etc.

Another embarrassment to plant taxonomists is lack of complete information about our threatened flowering plant species. BSI came up with valuable datasets on 622 species of threatened plants of India in three volumes of *Red Data Book of Indian Plants*[13] but this subject, similar to *Flora of India*, also lost its priority and subsequent volumes (vols IV and V) are awaited since 1990. Meanwhile, another publication[14] from BSI itself came up with a new list of 1215 species of threatened flowering plants of India as mentioned in *IUCN Red Data Book*. It is just a list and needs to be worked upon to provide detailed information about these