

In this issue

Science academies of India

The year 1994 marks the diamond jubilee of the founding of two of India's important science academies, the Indian Academy of Sciences, Bangalore and the Indian National Science Academy, New Delhi (formerly the National Institute of Sciences). *Current Science* takes this occasion to publish in this issue a special section containing some historical material on the starting of these two academies. The National Academy of Sciences at Allahabad also celebrated its diamond jubilee a couple of years ago. We also include material about the Allahabad Academy for completeness. One of the articles reproduced is from the May 1933 issue of *Current Science*. While advocating the need for a scientific Academy in the country it was stated 'The achievements of Indian science are national assets and an Academy, which treasures and displays them collectively, is assured of providing the necessary guidance and inspiration for the younger generation to put forth greater exertions in order to enrich and widen the usefulness of this great estate'. As everyone knows, the article resulted in not one Academy for the country but three. Naturally problems arose and there was an attempt at unifying the three academies when India was about to attain independence. Ramaseshan in his article traces the attempt at unification and how it fell through (see page 633).

G. M.

Quinacrine for female sterilization

The older generation has heard of and used quinacrine, the antimalarial drug. In fact it was swallowed in tablet form daily by tens of thousands of soldiers during the Second World War as a preventive against malaria. No long term ill effects were ever reported. But quinacrine was brought to our attention by an article in *The Economist* (March 23 issue 1994) which referred to a paper by Do Trong Hieu and his colleagues entitled '31781 cases on non-surgical female sterilization with quinacrine pellets in Vietnam' (*Lancet*, 1993, 342, 213). This paper gives the results of the meticulously conducted field trials in 24 provinces of Vietnam over nearly a four-year period (1989–1992). The issue also contained strong criticism and stronger support of the use of quinacrine for this purpose. The authors have given a very balanced reply. There was also a commentary by one who had spent a lot of time in Vietnam (since 1987) with various United Nations agencies (page 708). We invited Hieu to write an article for *Current Science* as we felt that these researches would be of great interest to India (where too some studies on quinacrine had been done). We also requested him to comment on the various problems connected with this method and his view of the future of this method for developing countries.

Hieu and Tan (page 706) in their article include the opinions which were discussed during the WHO consultation meeting on the development of new techniques for female sterilization held in Geneva (24–27 July 1994). We give below a short write-up mostly culled from recent accounts in the literature (scientific and popular) on this subject.

Jaime Zipper of the University of Santiago, Chile, famed for his invention of the 'Copper T', the intra uterine device (IUDS) made another remarkable discovery. If 252 mg of quinacrine (hydrochloride) is placed directly in the womb scar tissues develop which block the fallopian tubes and is therefore a possible method for female sterilization. The Chilean group carried out field trials and found the method very effective; and no long term ill effects were discovered or reported. Further clinical studies on sterilizing effects of quinacrine went on in many parts of the world which have much population pressure. Then came this detailed study from Vietnam which reported that this method was quite a success. An important result was that quinacrine had to be administered twice for it to be 97% effective. The method can be performed by non-physicians on an out patient basis who have had a brief training or by personnel capable of inserting intra uterine devices. In this study there were 818 pregnancies, i.e. 2.63% in women who received two doses and 5.15% in those who received one dose.

There were no deaths (some deaths were reported from India and Bangladesh and none from Chile). There were eight serious complications (0.03%).

At present the most widely practiced form of birth control is irreversible female sterilization (IFS). Approximate figures according to the 1987 UN report states IFS 29%, IUDS 20%, oral contraceptives 14%, condoms 9%, male sterilization 8%, injectables 2%, natural methods 13% and others 5%. IFS requires anesthesia, a highly trained doctor, and a hospital. In surgical sterilization, the reported deaths are 1 in 1000 (nil in quinacrine) and 5 to 20 per 1000 suffer serious complications (0.3/1000 in quinacrine). Another important factor in developing countries is the maternal deaths due to pregnancies. In the Vietnam field trials calculation made according to statistics, 242 women would have died had they not been sterilized.

One of the major issues to worry about in the quinacrine method is that it may not completely seal the fallopian tubes. If this happens it may increase the number of cases in which the foetus grows outside the womb (ectopic pregnancy)—a serious complication. This too has been analysed in the Vietnam studies. The ectopic pregnancy was 0.89 per 1000 woman years. This number is close to the number found in IUCDS users. Further the ectopic pregnancy risk is much higher in 'non-contracepting' women.

The major issue that divides those who work on contraception is the WHO definition of what an effective contraceptive is. WHO is against the use of any female contraceptive less than 95% effective *after one treatment*. Quinacrine after one treatment, falls short of this criterion (94–95%) but when administered twice (the number recommended by the Vietnam group) it gets to above the required norm (97.5%). WHO whose motto is 'Health for All' rightly refuses to differentiate between developing and richer countries. WHO has strong objections to a contraceptive being 'safe enough' for the Third World but has not come up to the safety standards that richer countries demand. It is not clear whether this organization is of the view that quinacrine belongs to the 'safe enough' category or not. But recognized experts on contraception and those

who have studied quinacrine with some thoroughness (like Kessel of Oregon University) are strongly of the view that the quinacrine method cannot be classified under the category of just 'safe enough' but is *safe in all senses of the term*. They also feel that women must have many options available for the control of fertility; and that quinacrine could make mass sterilization practical. One, of course, must remind oneself that it could be used for forced sterilization too—ease of use can become ease of abuse.

Another reputed expert, Potts of University of California after interviewing Vietnamese women who had been quinacrine-sterilized says that they prefer the quinacrine method to IUDS in spite of their knowing that it is not 100% safe; that the demand for sterilization was so much that incentives (like money payments etc.) were not at all necessary; indeed many were willing to pay for quinacrine sterilization! Another point made by him is that surgical sterilization is often offered to a woman immediately after a delivery of a child; it is not really the time for rational choice, particularly after the trauma the woman has undergone; and many have regretted their choice later on. The quinacrine method has the advantage that it separates delivery from sterilization.

Many alternatives have been tried. Tetracycline (so much in the news now in India) is safe but has a high failure rate; chemicals which are much better than quinacrine have proved dangerous. WHO not satisfied with the safety of the drug has persuaded Vietnam to stop its trials. Further animal trials, the follow up on women already sterilized, etc have been suggested.

According to experts, quinacrine seems to offer the best balance between safety and efficiency. Between 50,000 and 100,000 women in various developing countries have been treated with quinacrine with practically no harmful effects—short term or long term. Detailed

experiments show that cancer risk is also minimal. Contraceptive techniques developed by rich countries (and often sold by multinationals) are often tested in poor countries and these are extremely expensive. One wonders whether poorer countries should wait for the tests rich countries insist upon, but are not willing to pay for, or should they continue with their search for inexpensive but effective ways of birth control.

S. R.

Shaping up with hedgehogs

Biologists come in many shapes and hues but their social status, for the average amongst them, is determined by the organism on which they work. Thus, a biologist studying the human genome may get away dressing like Sushmita Sen while her colleague, the world's authority on the wriggling behaviour of the earthworm, is suspended for sending invitations to her cousin's wedding on official stationery. The reason for the higher regard given to those who work on 'higher' organisms is our Homo-centric view of the biosphere. But then, what else can one expect of *Homo sapiens*? Nevertheless, there is some justice in this world. Many of the classical problems of developmental biology in animals with a spinal cord have been demonstrated by elegant experiments that involve grafting or removal of slices of tissue. However, the mechanisms that actually operate, as opposed to the mechanisms that could operate, have usually come from relatively recent experiments on flies and worms and (cheer up botanists) even plants. Much of what we know about the relationships between gene activity, cellular regulatory events and organismal development has emerged from studies on popular 'model' systems such as the fruit fly *Drosophila melanogaster*, the worm *Ceanorhabditis elegans* and lately the flowering plants *Antirrhinum majus* and

Arabidopsis thaliana. The studies on these systems were productive because of the possibility of applying molecular approaches to organisms in which a genetic base of interesting mutants were available. These approaches allowed the isolation (cloning) and sequencing of the genes responsible for many important developmental processes. Independently, biologists, over the past hundred or so years, had developed elegant model systems which demonstrated the effect of interfering developmental processes. While little genetic studies were possible in these systems, they led to the proposing of models on how limbs are patterned or how the embryo knows front from rear. Advances in recombinant DNA technology have put these studies on firmer mechanistic grounds because of the isolation of genes in higher animals that are similar in DNA sequence to those studied in insects and worms, for example. What is remarkable is that sometimes, fairly often in fact, genes with similar DNA sequences seem to have similar functions during development. B. P. Gupta and K. VijayaRaghavan (page 714) review one such example, the *hedgehog* gene. How is that similar genes in different organisms play similar roles during development? The answer lies in looking at the protein the gene makes, studying its cellular role and, very importantly, understanding the mechanisms of evolution, which like politics, is the art of the possible. And like many successful politicians evolution is a shameless opportunist. If a molecule is a good signalling agent for the developing egg, why not use it again when there is pressure for effective signalling in the spinal cord? In telling us about aspects of pattern formation, the review on *hedgehog* and its vertebrate homologues tells us about the continuing need to work on model organisms as well as the continuing need for catholic biologists. And I am not referring to their religious beliefs.