India's leading female scientist, Indira Nath, talked to *Nature Medicine* about the changes she has seen in her work environment during her long career. In what might seem surprising for a developing country, she reveals that India's biomedical research community is both respected by government and also respects its female members.

Indira Nath

It was 45° Celsius in New Delhi the day I talked with Indira Nath by telephone. Too hot to work. Nearly too hot to think. Unbearable temperatures were the least of the problems that Nath faced when she returned to her native India to pursue a career in research in the early 1970s. Meager resources—both material and financial—and incalculable layers of bureaucracy plagued scientific investigation. But two things that Nath had in abundance were leprosy patients and the determination to make a homespun contribution to leprosy research on an international level.

As a young medical student, Nath, like many of her peers, wanted exposure to the practice of medicine abroad. But unlike her colleagues, she did not want to be part of the brain drain. So she and her husband set themselves a rule to return to India after three years absence. "Those who went for longer found it more difficult to return, they couldn't readjust to India," she remembers. "Still, it was quite an exciting time to come back because you felt you could really play a role in building up research." In the 1970s, after working as a House Officer in various UK hospitals, she returned to the All India Institute of Medical Sciences (AIIMS) in Delhi.

Dissatisfied with pathology, Nath became interested in the immunology of leprosy after a yearlong Nuffield Fellowship spent at London's National Institute of Medical Research. Immunology was in its infancy—it was the time of T- and B-cell discovery.

Then, as now, India had the largest number of leprosy patients in the world—4.5 million people showed signs of disease. Yet the reagents for studying the immunology of human leprosy were limited as studies had hitherto been based largely on mouse models. To add insult to injury, obtaining these materials was extremely difficult for Nath. "Customs clearance was impossible for reagents. You had to have approval from two ministries: one to certify that what you were buying wasn't manufactured in India—that could take a few months—then another to give final clearance."

The situation has since improved. When Rajiv Gandhi became Prime Minister, he gathered together 100 scientists to ask what he could do for them during his tenure. "We told him about the amount of permission needed for customs clearance and he fixed that within less than a year."

Applying for foreign research money was, and still is, even harder. "Grant applications had first to be sent for local scientific peer review and receive government clearance by political and economic bodies *et cetera*. It used to take years. By the time it reached the international agencies it might not even be relevant."

Fighting the brain drain

And there was one further drawback to leprosy research. By the 1980s, the World Health Organization (WHO) was beginning to announce that leprosy could be eradicated. The effect was a drop in the availability of research funding and the subsequent transfer of many leprosy researchers to other diseases. "I am upset that international research was reduced just as we were getting somewhere. We knew we couldn't eradicate leprosy because its incubation is so long and we don't know enough about its transmission," says Nath. At the time, investigators in southern India had monitored a leper colony and found that the numbers of new cases never dropped, despite intervention and treatment with dapsone.

"Eradication is a strong word," says Nath, "But this kind of word was required to push governments into action. Now WHO has changed the terminology to 'elimination' and they're ready to accept a prevalence of 1:10,000." India currently has a population prevalence rate of 5.7 per 10,000.

On the positive side, the WHO introduced multidrug therapy (MDT) for leprosy (rifampicine, clofazimine and dapsone). Prime Minister Indira Gandhi set eradication as her goal and the necessary infrastructure fell into place. But although India was the first country to accept MDT at the government level, there is no end in sight. "We've had 17 years with MDT, plus substantial non-governmental organization support and in spite of this our incidence of leprosy remains the same. The same thing is happening in Brazil, the next largest country for leprosy," says Nath.

Nevertheless, she is encouraged that in her lifetime at least the clinical picture of the disease has changed. Earlier detection and better treatment means that the awful disfigurements that were commonplace are now rare.

By the mid-1980s, Nath wanted to introduce more of a molecular slant to her work, a desire that luckily coincided with the government's drive to increase its biotechnology capabilities. "They decided to increase biotech manpower by setting up a new academic institution. The job was offered to me on a platter," she says. And in 1986, she became the first Head of the Department of Biotechnology at AIIMS. One project currently running in her laboratory is the infection of macrophages with *Mycobacterium leprae* to examine gene activation.

Being a woman, it seems, is not a drawback within the Indian research community. The former Director of AIIMS was female. "Although women in rural areas are still oppressed, once you reach a certain social level, there's no problem. We don't have a difference in salaries, we don't have any gender-related problems." In fact, it seems that being a woman scientist is more of an issue elsewhere, evidenced by the fact that Nath was one of five women chosen to receive the UNESCO/L'Oreal award this March to honor women scientists on International Women's Day.

Next year, Nath finishes her five-year assignment as a professor with the Indian National Science Academy, which has been funding her work. Over the years she has been drawn into serving on several committees, and this experience has given her a sense of two areas that need attention—the drop in the number of physicians entering scientific research and the need to entice women to return to medical science after childbirth. Thus, her project for the coming years will be to stem the country's internal brain drain as she once did her bit for its external losses.

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