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P.D. Agarwal Memorial Oration

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by

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Dr. Banerjee, Dr. Sengupta, Dr. Agarwal and friends. You do me a great honour in asking me to deliver the 2nd Memorial Oration in honour of P.D. Agarwal, a man whose contributions to India are memorable. He was one of India's most notable builders and developers, opening trade and commerce throughout the country. More than this, he was a man whose humanity and concern for India were extraordinary and these have been recounted to me in countless stories from friends, business associates and employees at all levels. He is no less the patriarch of a remarkable family whose energy, vision, love of country, social concern and compassion may be likened to a number of other great families in my own country, such as the Roosevelts, the Kennedys and others. It was my loss not to have personally known this marvelous man but I have had the privilege of knowing well his youngest son and having more recently become acquainted with other family members. Genes alone do not determine the character of a person or his career but the strength of my belief that genetics does play a role is reaffirmed by this extraordinary family which he and his wife have given to India.

It has been my privilege during the past week to work with staff and the Board of yet another pioneering venture which has been made possible by the Agarwal family - the Indian Institute of Health Management Research. Its basic goal is to foster major and timely changes in the management of health and medical care systems throughout India. This occurs at a time when it is becoming increasingly apparent that we are at the beginning of a revolution in the development and application of new methods of disease prevention and health promotion, a revolution which

promises to be worldwide. It is an initiative which will serve to improve the health and quality of life of every man, woman and child throughout this vast country and through other countries as well. Conceptually, the Institute is unique in character and visionary in its understanding of basic needs. How much more traditional it would have been to provide support for a hospital or a special surgical unit but such would have served at most to improve the lives of thousands. The Institute's horizons, however, extend to the health and well-being of hundreds of millions. It bears the Agarwal hallmarks of compassion and foresight of a quality and character which will make a mark on history.

My remarks today will deal with smallpox eradication and certain of the lessons learned from that great campaign. Although coordinated by WHO, there were, in fact, no more than 100 WHO staff working in the field at any one time. It was a campaign in which nearly 200,000 health workers from countries throughout the world worked together to achieve a great victory. What was achieved and the lessons from this accomplishment bear relevance to the work of the new Institute.

The campaign to eliminate smallpox from the world began in earnest in 1967. At that time, there were some 10 to 15 million cases of smallpox occurring in the world each year, of whom two to three million died and hundreds of thousands who became blind because of the disease. More than one-third of all cases of blindness here in India were at that time due to smallpox. In 1967, the World Health Assembly endorsed this initiative and suggested a ten-year goal to complete the task. The ten-year timetable bore a close resemblance at that time to the ten-year time frame allotted for landing a man on the moon. However, there were a number of reasons to doubt the feasibility of smallpox eradication. Most important was the fact that never in history had a disease been eradicated. Moreover, there were vast areas of Africa, Asia and South America which could barely be penetrated - the enormous Amazon basin of Brazil and the mountainous areas of the Himalayas are two examples. Complicating operations would be war and civil strife, then present in many countries, and the fact that smallpox was prevalent in countries whose population numbered more than one billion persons. To imagine

that all countries could work cooperatively and fully effectively in any common cause seemed unlikely to many. In brief, there was cause for doubt and pessimism.

We began the programme with a strategy which endeavored to assure the availability of good quality vaccine in all countries and vaccination campaigns designed to reach 80% of the people. There was a second important element in the strategy which was very different from smallpox programmes before this time. We reasoned that since the goal of the programme was zero cases of smallpox, progress should be measured primarily in terms of our success in decreasing the numbers of cases. Until this time, progress in programmes had been measured in terms of the numbers of vaccinations performed with little regard as to the number of smallpox cases which had occurred. That this may not be especially helpful is illustrated by the experience of a country just to the west of here which reported vaccinating as many as one-half to two-thirds of their population every year but, despite this, large numbers of smallpox cases continued to occur. Thus, from the beginning, we focused on the reporting of cases and their investigation by surveillance teams. The teams established reporting networks, searched for additional cases, isolated patients, vaccinated household contacts and others in the village and thereby stopped the spread of disease. Although this system was simple in principle, it took time and considerable effort to assure that reports were dispatched weekly from every health establishment throughout a country; likewise, it took time to develop trained teams to do this. Gradually, reporting improved, accomplished by teams of only two to three persons who regularly visited health centers, hospitals, practitioners and village leaders to assure that cases were reported.

It was notable that the two largest contributors to the programme were the United States and the Soviet Union, who worked closely together and with complete amity. They contributed substantial quantities of vaccine, as did other countries. Often, we would have in a single national programme, professionals of four or five different

nationalities using vaccines from yet other countries but no one cared. All worked together in a common cause.

Year by year progress was made in the programme. In fact, during the first four to five years, progress was more rapid than we had anticipated in a number of regions. By 1973, it had become apparent that our biggest problem was the Indian Subcontinent. The simple case reporting and containment system that we had used so successfully in Africa were not accomplishing the task. Here in India and in Bangladesh and Pakistan, population densities are very much greater and the transportation network more developed. There are enormous numbers of people who daily travel great distances by bus and train. There were many who had come to the city who became ill with fever and who returned to their home villages and there developed the rash of smallpox. The disease spread to others and large outbreaks occurred. Surveillance teams were finding the cases but not until epidemics had begun. Many were deeply pessimistic in 1973-74, only 12 years ago, and many assured us that there was something unique about the Indian Subcontinent which would ultimately preclude eradication. Just as the Ganges area has been called the home of cholera, many believed that it was likewise the home of smallpox and that for undefined reasons, one could never eliminate smallpox from South Asia.

In June 1973, in a meeting with officials of the government of India, we pondered the possibility of mobilizing health workers throughout the country to visit every village in India during a one-week period to find outbreaks. Once discovered, they could then be quickly contained. It appeared that there were enough health workers but could they be organized, could they be supervised well enough to do the job? Initially, such a programme began in the four states of West Bengal, Uttar Pradesh, Madhya Pradesh and Bihar and eventually extended to other parts of India. Within 12 months, the system was working well enough so that it was possible to intensify the search and to visit every house in India. Independent assessment teams were created to check the work. They visited a 5%-10% sample of houses to determine if they had been searched. If they had not, the search was repeated. It was surprising

to everyone to discover that it was indeed possible to organize a programme in which 120,000 health workers visited more than 90% of the houses during a seven to ten day period. Few could believe the accomplishment. The staff persevered despite staggering problems - some of the worst floods in Bihar's history, railway strikes, airline strikes, famine in Southern Bihar, and many other problems.

In May 1975, the last case of smallpox occurred in India, less than two years after this programme began. Smallpox, which had been present in India for at least 5,000 years, was suddenly eliminated. And on Indian Independence Day that year, the independence of India from smallpox was celebrated. In October 1975, the last case in Asia occurred in Bangladesh. This month, in fact, we celebrate the tenth anniversary of the last case of smallpox in all of Asia. In October 1977, the last case occurred in Africa and this was the last case of smallpox in the world.

How could we be certain that this was the last case? Beginning in 1974, a reward began to be offered to anyone who reported a case of smallpox. As the number of cases diminished, the reward was progressively increased. In certain countries, almost everyone with chickenpox or even a pimple on the nose was brought in to be examined. Tens of thousands of persons with rash were examined and thousands of specimens were taken but after October 1977, none were smallpox. WHO then selected special commissions, largely comprised of critical scientists who were skeptical of the achievement. They visited each country and traveled widely, examining records and looking for cases. They were instructed that they could go wherever they wished and could talk to whomever they wanted to satisfy themselves that smallpox had been eliminated. In all, 23 different commissions visited 60 countries throughout the world, including India. In each case, they returned from the field, some rather surprised, to report that they were indeed satisfied that smallpox had been eradicated.

Finally, an International Global Commission was created to review the situation throughout the world. In May 1980, they reported to the World

Health Assembly that they were satisfied that smallpox had been eradicated throughout the world and that month, the World Health Assembly declared this officially and advised that vaccination could be stopped in every country and vaccination certificates for travelers were no longer required. Indeed, smallpox vaccination has now been stopped. Rumors of cases persist, however, all of which are rigorously checked. India alone has been checking some 100 to 150 rumors every year. Most of these originate with reporters who can't distinguish chickenpox from smallpox or who find an epidemic of a rash disease and a couple of deaths, usually due to measles, and assume it must be smallpox and report the occurrence.

The smallpox virus now remains in only two laboratories, in glass vials under heavy security, one is the Centers for Disease Control in Atlanta, Georgia, and the second, the Institute for Viral Preparations in Moscow. These two laboratories, over the years, have done the most extensive research work on smallpox and this they are continuing. However, we expect a commission next year to recommend the destruction of these viruses as well.

What important observations were made during this programme? It was found in all countries that each had far larger resources of trained manpower and a health staff with greater ability than it had ever imagined. Given additional but modest resources and better organization, miracles could be performed. Indeed, few countries spent much more than they had for smallpox control. From this experience, it appeared that there was a great deal more which could be done to improve health even when resources were scarce.

This is illustrated by the fact that the cost each year of smallpox eradication worldwide was just nine crore of rupees. If we had decided to build hospitals to care for those with smallpox, we would have required about 1,000 hospitals of approximately 500 beds each. The total amount expended for the programme would not have purchased even one hospital. This illustrates how powerful the tool of prevention can be.

There were other lessons that we learned which are now influencing health policy in other areas. The first was the need to define more exactly the goals of a programme. Our objective was not to vaccinate hundreds of millions of persons but to reach a nil incidence of smallpox. In fact, it really didn't matter how many people were being vaccinated; the important thing was whether we were getting rid of the disease. Only now are we beginning to measure the actual effects of various programmes on the health of people. We must do more.

A second lesson we learned was that it was important that the tools which we used were fully satisfactory. In 1967, when the programme began, we established international centers to test the vaccines that were in use. We thought we would find that most met accepted standards but, in fact, we discovered that less than 10% of the vaccines in use were satisfactory even at the time of manufacture. A number of specimens revealed that the vials contained nothing but inactivated virus. In one instance, the laboratory report stated that the supposed vaccine contained only dirt and animal hair but no vaccine virus. Yet these vaccines were being widely used by health services throughout the world. Surprisingly, health officials had paid little attention to vaccine quality. Gradually, the endemic countries themselves began to produce their own vaccine and indeed, by 1973, 80% of all vaccine in use was produced in the endemic countries. India was among the best of the vaccine producers and itself contributed vaccine to Bangladesh and Sri Lanka. Another improvement in vaccination came through the development of a new vaccination device. When the programme began in India, the rotary lancet was being employed which was difficult to sterilize and produced a very nasty vaccination reaction. Other countries used needles, pins and lancets. Wyeth Laboratories in the USA developed a marvelous device called the bifurcated needle, a small needle with two prongs. It could be dipped into the vaccine solution and when withdrawn, just the needed amount of vaccine was held between the two prongs. Fifteen rapid strokes of the needle on the arm served to vaccinate. It was simple to use; one could teach a vaccinator to use it within 10 minutes with excellent results. It cost only sixty rupees per thousand needles and they could be sterilized repeatedly and reused.

A third important element in the programme was organization. It was critical to have a chain of command and to assure that each worker knew exactly what he was supposed to do. I have been impressed by how often health workers are simply told, for example, to give health education or improve sanitation in the villages. What does this mean? What does he do? Unless one can imagine standing on a path leading into a village and can explain to the health worker exactly what he is supposed to do, one doesn't have a programme. Organization, training and supervision are terribly important. For WHO staff, we made a rule that every staff member had to spend at least one-third of his time in the field. There were no exceptions even for the director of the programme. In consequence, I personally saw many, many villages throughout the world and this was for me, most instructive. It was helpful to talk to the people and to the health workers - to ask them what is going well and what is not - to ask what can we do to make the programme better. The wisdom of so many of those people was surprising. They had many good ideas and many of those we implemented. As the programme drew to a close, I concluded that I could identify only one really innovative idea which originated in Geneva, but many which came from the field and, indeed, many which came from staff at the lowest administrative levels. To test and to evaluate the programme at field level was critical to supervision and, indeed, many of those at Central Government level, likewise, traveled extensively, as well as those at state and district levels. It was apparent from these contacts that the workers felt that their work was appreciated and they worked even more diligently. An added element of quality control was independent teams who evaluated the work of searchers and containment teams. To evaluate the search, they would go to a sample of the villages to determine if search had been performed. If not, they returned to the health center and organized a repeat search.

Where did the programme lead? Many countries, impressed with the productivity of their efforts, asked whether there might not be other vaccines which could be administered and so in 1974, an Expanded Programme of Immunization was proposed at the World Health Assembly, a programme whose goal was to administer the triple vaccine (diphtheria,



whooping cough and tetanus), measles vaccine, polio vaccine and BCG (tuberculosis) vaccine. With such effective vaccines available, one inevitably had to ask why, in so many areas of the world, one should tolerate so many deaths caused by totally preventable diseases. Why not provide inexpensive prevention and avoid longer-term expensive therapy and the emotional trauma of death and disability. The EPI programme, as it is called, began in 1975, when less than 5% of children had received any vaccine against these diseases. Today, the number is approaching 50%, a truly remarkable change. Last Friday, in the United Nations General Assembly, there was a decision taken on the part of all countries to achieve a level of 90% vaccination of all children in the world by 1990. India has joined this effort, but this is only the beginning. And this is what today is exciting. The last ten years have marked a revolution in biotechnology, a remarkable decade unlike any we have ever witnessed. There are many new tools which permit us to examine viruses, to break them down, to determine exactly what piece of a virus is important in immunity and to produce vaccines in new ways. Quite simply, what once required 10-15 years to accomplish in vaccine research, if it could be done at all, can now be done in two to three years. A whole new array of vaccines are becoming available and will become available over the next decade, including vaccines for hepatitis, malaria and leprosy. There are new vaccines against influenza and a whole series of vaccines against the diarrheal diseases. Many of these are already under test. Old vaccines are being made more potent, more stable and more effective. A decade hence, I venture to say that we will be administering routinely not five or six vaccines, but 10 to 20 vaccines. While the past has been concerned primarily with treating those who are sick, the future is to prevent the illness.

This is truly the beginning of a new era in prevention and public health. We now have oral rehydration therapy for treatment of children suffering from diarrhea, a therapy largely developed here in Calcutta. It is now being used worldwide and is preventing deaths in remarkable numbers. Interestingly, even in my own country, pediatricians are discovering that with the oral rehydration therapy, fewer children

require admission to hospitals for intravenous therapy. For this we thank you in Calcutta. Science indeed knows no boundaries.

There is yet another remarkable new development which I should like to note. Only this past year scientists at Johns Hopkins, with Indonesian colleagues, discovered that a single oral dose of vitamin A given once every six months to young children, diminished death rates by 30% to 40%. The figures appeared unbelievable, but other studies, still in progress, are showing decreases in death rate of up to 50%. Other studies are in progress in other parts of the world to confirm these observations. If they confirm the first results, we have yet another important intervention that can be widely applied.

A new era in population-based medicine is emerging, but it will require changes in our health and management structures. It will require innovation, a different form of planning and different types of training. These are all areas in which the new Institute can and will play a vital role. The founding of the Institute for Health Management Research is, thus, a very timely initiative as we begin to look at what else we can do in medicine, but in preventive medicine rather than curative medicine. My prediction is that in the next ten years, we may observe more progress in health than we have made in the last hundred years.

Thank you.

DAH/vrw