

# Lecture during the inauguration of National Seminar on Trends in Pharmaceutical Sciences, Practice & Education

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## **Dimensions of Healthcare**

“Knowledge makes you great”

I am delighted to participate in the inauguration of National Seminar on Trends in Pharmaceutical Sciences, Practice & Education and deliver the first Distinguished lecture of JSS Mahavidyapeetha. I am very happy to be in JSS college of Pharmacy campus which is not only providing quality Pharma education but also advanced during research and testing. The research and education is recognized in national and international level. My greetings to the organizers, scientists, technologists and students participating in this seminar. I would like to talk on the topic “Dimensions of Healthcare”.

## **Pharma Vision**

The global production of pharmaceuticals, branded and generics put together is of the order of \$550 billion. The Indian Pharma industry at present has a turnover of \$12.5 billion of generics for domestic and export markets against the production of \$78 billion worth of generics in the world. Pharma Council has evolved the Pharma Vision 2020; I have suggested that Pharma community should identify all missions which will make India the leader in drug production. We should set a target of producing 40% of world generics production. Indian pharmaceutical companies has got the core competence for producing cost effective and quality Pharma products. The Pharma specialists assembled here must keep these targets in mind and contribute adequately for the realization of Indian Pharma Vision 2020, for which acquisition of knowledge and development of new drugs is indeed very important.

Now I would like to discuss about my experience with Pharma Research and Development laboratory and the production establishments.

## **My experience with Pharma industry**

I have visited number of Pharma R&D Centers. There is a great movement in transforming molecules to drug. In Wockhart, I found the development and marketing of three products: Biovac-B, Wepox and Wosulin are indeed competitive in the pharma market. In Nicholas Piramal research Centre, I witnessed the development of anti cancer drug, inflammation inhibitor and drug for type 2 diabetes by overcoming insulin resistance. Ranbaxy has acquired a malarial drug molecule and they are progressing towards clinical trials. International Centre for Genetic Engineering and Bio-technology in collaboration with Bharat Bio-tech is developing a vaccine for Malaria which is under toxicity trials on animals now. With Sun Pharma's experience in the field of providing healthcare solutions particularly in the area of cardiology, neurology, psychiatry and gastroenterology, the Sun Pharma Advanced Research Centre (SPARC) will have

potential to design and develop molecular entities for respiratory and inflammatory disorder. The first antibody product for cancer has been indigenously developed by BIOCON in collaboration with a partner. This product is Epi-dermal Growth Factor Receptor antagonist targeting Mono-clonal Antibody. Orchid Chemicals is providing healthcare solutions particularly in the area of anti-infective therapies, Cardiovascular, and neurological treatment and anti-diabetic therapies and nutra-ceuticals products. Orchids are well known for the production of antibiotic more particularly “Cephalosporins”. I had also visited Alembic which is famous for antibiotic production such as penicillin, erythromycin, anti-cough & cold formulations and painkillers. Indian industry is poised to design, develop and manufacture cost effective DICOM compatible Digital X-Ray systems.

These experiences, give me the confidence that our Pharma industry is well on its way to revolutionize through the development of number of drugs needed by our country and abroad.

### **Contribution of Indian R&D**

I have come across research and development taking place in the country in advanced field of Pharma and biotechnology leading to healthcare solutions, where R&D laboratories Pharma industries and educational institutions are partners. I would like to mention few of them.

### **Faster cure for TB:**

India has made significant contributions in developing drugs that are critically required for us. One of the achievements comes from a laboratory of the Council of Scientific and Industrial Research (CSIR). CSIR lab has developed a new therapeutic molecule for Tuberculosis. This molecule has shown the potential to cure TB in around 2 months, as against the standard treatment of 6 to 8 months. This breakthrough is very important for the researchers. The medicine is undergoing clinical trials. I would suggest specialists assembled here to participate in this TB treatment effort which is vital for the nation.

### **Typhoid Detection Kit:**

Typhoid Detection Kit has been developed by DRDE, Gwalior using the nano sensor developed by Prof. A.K. Sood, and his team from IISc, Bangalore. In India, the morbidity due to typhoid varies from 102 to 2219/100,000 population in different parts of the country. In some areas typhoid fever is responsible for 2-5% of all deaths.

A collaborative work has been carried out with Prof. A.K. Sood of Indian Institute of Science, Bangalore, the sensitivity of the test has been increased 30 times by applying a small electric charge (1.5 V). With this improvement, extreme low concentrations of the antigen in clinical sample can be detected. Moreover, very small quantity of clinical

sample as low as 2-3  $\mu\text{l}$  is required to perform the above test as compared to 10-15  $\mu\text{l}$  samples required for latex agglutination test.

### **Drug delivery system:**

A research group headed by Professor A. N. Maitra of the University of Delhi's Chemistry Department has developed 11 patentable technologies for improved drug delivery systems using nanoparticles. Four of these processes have been granted U.S. patents. One of the important achievements at the initial stage of drug delivery research was development of a reverse micelles based process for the synthesis of hydrogel and 'smart' hydrogel nanoparticles for encapsulating water-soluble drugs. This method enabled one to synthesize hydrogel nanoparticles of size less than 100nm diameter. This technology has been sold to Dabur Research Foundation.

Another important software tool for design and development of drug is Biosuite, which has been developed by one of our IT industry in partnership with CSIR and IISc.

### **Biosuite:**

During my visit to Hyderabad, I launched the Bio-Suite which is a state-of-the-art software package that caters to all aspects of computational biology from genomics to structure-based drug design. It incorporates the latest publicly known algorithms, as chosen by a panel of academic partners, and has been coded entirely by the TCS team, using the best software engineering practices. It can be used by academic and R&D institutions, small/medium and large biotechnology companies. I would suggest the scientists and technologies assembled here to examine the possibility of using this bio-suite developed for cost effective drug development.

### **The science of proteomics**

India missed the great opportunity in partnering the human genome project and thereby lost the utility of right type of data. I suggest the Indian biomedical community to take the initiative to become a working partner in the proteomics project of gene characterization. Proteomics is the study of all the proteins expressed by the genome of a cell. It is the logical extension of genomics. Proteomics helps to understand the basic biological processes critical to normal cellular functions as well as the development of diseases. It identifies the essential components of these processes and exploits these components as targets in the development of new methods to prevent or treat diseases. The national programme on proteomics has to be accelerated with partnership from industries and R & D laboratories. I would suggest that this should be pursued as a mission mode project. The proteomics resulting into a gene chip can become the future diagnosis and treatment regime for many diseases. The scientists and technologists assembled here must be aware of the progress made in the proteomics programme and understand the processes at the molecular level. This will enable genetic characterization leading to forecasting and diagnosis of the disease for adopting suitable preventive and curative measures.

Now I would like to discuss the genetic mapping of Indian population which is result of the research work of over 150 scientists.

#### Genetic mapping of indian population

Indian statistical institute, Kolkatta and anthropologists from various institutes of india, and the centre for Genomic applications, Delhi has generated genetic information on over 4000 genetic markers from over 1000 biomedically important and pharmacogenetically relevant genes in reference populations encompassing diversity of populations from across the country. The first phase of these results on 55 populations involving several hundred markers has been released in the April 2008 issue of journal of genetics.

This study has resulted in clear genetic profile of our populations, explicitly indicating that there is a strong association between genetic and linguistics profiles in india and that there are significant genetic differences in the frequencies of disease – associated genetic markers. For example, this study has revealed that a known protective genetic marker against HIV-1 is virtually absent in india, implying the absence of natural or genetic protection against HIV-AIDS in our country.

The overall results of this study would help in (A) making predictions of both diseases as also the effectiveness of specific drugs used for various diseases, and (b) designing future scientific studies to understand genetic underpinnings of major diseases in India. These results have also provided the first set of insights into the processes of human adaptation to different type of environment in india.

The study reveals that the genetic landscape of indian populations captures the genetic diversity of the world – indian populations from a continuum of genetic spectrum bridging the two distinct HapMap populations, the Caucasians and the oriental Asians. Besides, there are populations that are unique to india mostly derived from Austro-Asiatic and Dravidian speaking studies and selecting suitable populations for testing drug efficacy. For instance, a pilot pharmacogenomic study on response to salbutamol (a Beta-2- adrenergic agonist used to treat Asthma) identified genetic markers in a receptor gene which could classify individuals as poor and good responders – a finding that would help in better management of the disease.

It is anticipated that the indian genome variation data along with epidemiological and associated phenotype data would help in the construction of “specific drug response/disease predisposition maps” to aid policy level decision making for drug dosage interventions and disease risk management, especially for complex as well as infectious diseases.

Dear friends, let me now focus on the international competitiveness in the Pharma sector.

## **International competitiveness**

I notice that some of our companies have been producing erythromycin for over 35 years. It is necessary to collect the clinical data from various users of erythromycin to know whether the Indian population has attained immunity against the medicine particularly the second generation users. This type of research is needed to ensure that the replacement product is planned well ahead of time to face international competitiveness. Another area where the researchers would like to work on is the development of anti-malarial drug using *Artemisia annua*.

Arte-misin is the key plant molecule, derived from the plant *Artemisia annua* which is presently the most effective alternative when the malarial infection takes place due to chloro-quine resistant parasite *Plasmodium falciparum*. The demand of this drug is on a continuous rise and currently not even 50% of the drug demand world wide can be fulfilled mainly because of unavailability of raw material (plant herb, the source of drug molecule). Around 500 million cases of malaria are reported each year in the world and result in loss of human lives.

I would suggest our Pharma companies should become a major manufacturer of arte-misin derivatives using indigenous arte-misin available in India. Recently, a novel distinct high yielding herb with arte-misin genotype 'CIM-Arogya' has been developed through biotechnology approach of systematic DNA marker assisted selection at very early seedling stage from nursery itself. This genotype is the first biotech plant variety developed through molecular breeding approach and has a unique globular canopy and yields very high arte-misin content and herb yield. The scientists and technologists can consider large scale plantation of this 'CIM-Arogya' in the near by villages adjoining their factories. I would suggest the scientists and technologists to take up advanced research in the following areas in partnership with Central Drug Research Institute, Lucknow, National Institute of Pharmaceutical Education and Research and Post-Graduate Institute of Medicine, Chandigarh.

- a) Advanced macro-lide based antibiotics
- b) Application of nano-technology for increasing the bio availability of the drug with targeted delivery.

This research will enable our Pharma companies to enhance its competitiveness in the national and international market. Also the patient will have to cope with reduced toxicity levels of the drug.

## **Innovations in Cancer Therapy**

Dear friends, let me now share with you certain innovations in cancer therapy that I have witnessed during my visit to Texas, USA in OCT 2007. I visited one of the best institutions of cancer research and treatment in the world, The University of Texas - M. D. Anderson Cancer Center, Houston. I had visited their R&D Centre, hospital, met and

interacted with the patients and also held a detailed discussion with Dr. John Mendelsohn, President of MD Anderson Cancer Centre, Houston and his team to understand the innovative cancer therapy and treatment pioneered by the institutions.

### **Proton therapy:**

He explained about the largest and most advanced Proton therapy facility in USA to provide high-energy proton beam therapy that spares healthy tissue surrounding tumors for multiple types of cancer and to expand research exploring new ways to combine proton therapy with chemotherapy. They have found many innovations in the therapy. Anderson Institute has created the largest bone marrow and stem cell transplantation program in USA, enabling treatment of about 600 patients with high-dose chemotherapy annually. They have also pioneered the use of reduced, less-toxic doses of chemotherapy for bone marrow stem cell transplantation, resulting in lower mortality rates and also enables performance of transplant procedures in older patients, now a widely accepted standard of therapy.

### **Genetic Research:**

In genetics research, they have developed the C-banding technique for labeling chromosomes, enabling scientists to pinpoint the precise location of genes in various chromosomes. Demonstrated that particular unstable sections of a DNA molecule can become deformed, producing mutations and chromosomal breaks in the absence of external chemical agents, thus discovering a new way that cancer-causing genes can be produced. Demonstrated that p53, the most prevalent cancer-causing gene, acts differently depending on whether it is deleted or has specific mutations in its DNA sequence. Scientists have discovered that colon cancers in patients from different geographic areas are different because different genes are being mutated or abnormally regulated. It is also been demonstrated the specific precancerous (forerunner) genes are inactivated to stimulate early proliferation of premalignant cells in the development of bladder cancer.

### **Molecular Biology research:**

Molecular biologists have demonstrated that cell surface receptor molecules not only mediate traditional chemical signals activating proliferation but also travel to the nucleus, where they can act on genes and other nuclear proteins to regulate transcription, DNA repair, and DNA synthesis. Preclinical models are getting ready to show that adult stem cells of mesenchymal origin can be genetically modified to deliver anticancer molecules to the site of cancer.

Breast Cancer Study Opens for HER2-Positive Patients: Women newly diagnosed with HER2-positive breast cancer are being enrolled in a national clinical trial for comparing the effectiveness and safety of different combinations of trastuzumab (Herceptin®) with standard chemotherapy before surgery. Between 25% to 30% of breast cancers are known to overproduce the human epidermal growth factor receptor 2 (HER2), a protein that fuels growth and aggressiveness of the cancer. Trastuzumab is a drug designed to block

the action of these receptors, but its use alone has shown only modest benefits. The multi-center trial is based on a previous Phase III M. D. Anderson study of 42 patients. In that trial, 67% of patients treated with trastuzumab and standard chemotherapy experienced a complete disappearance of cancer within the breast and nodes, compared to 25% of patients who received chemotherapy alone.

### **Conclusion**

Eradication of liver diseases, controlling cardiovascular diseases, Cancer, preventing spread of HIV by developing anti HIV vaccine, controlling allergy and inflammatory disorders by multiple technologies and practices and creation of competitive Pharma businesses - all need one important element, apart from other resources. That is creative leadership in health care. Who are the creative leaders? What are the qualities of a creative leader? The creative leadership is exercising the task to change the traditional role from commander to coach, from manager to mentor, from director to delegator and from one who demands respect to one who facilitates self respect. Higher the proportions of creative leaders with vision in the health care area, higher the potential for successes in research and discovery of healthcare products, leading to a healthy, happy and wealthy India.

With these words, I inaugurate the National Seminar on Trends in Pharmaceutical Sciences, Practice & Education. My greetings to all the scientists, technologists, researchers and students participating in this seminar. My best wishes to the Pharma community for success in their mission of developing and producing cost effective, state of the art, quality, healthcare products for meeting national and international needs.

May God bless you.

**Dr. APJ Abdul Kalam,**  
**02.05.2008**