Health Research in the Context of Changing Social Needs

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Growth of Indian state: successes and failures

- Transformation of India into a modern developed nation has been by and large been a success story.
- While a major challenge of equitable distribution of opportunities and facilities is yet to be effectively tackled, our institutions have grown and science agencies have made fair amount of investment into health research.
- Our health indicators though bad in some states have overall improved very well almost reaching the western levels in many a states.
- This shows a robust health system and hard work by public health people.
History of innovations in Health Sector

• A developed society produces technology which takes care of its needs and also competes globally.
• India is a civilization with legends like Sushruta and Charaka in medicine.
• Recent record of innovations in India: Not inspiring in Health Sector and it hurts the national pride.
• It is argued that domination of colonial civilizations stifled our originality.
• Revival in 65 years of Independent India?
Public Health in India

- Public health architecture of India was thought of by a Britisher, Joseph Bhore just before Independence - we implemented it well with great amount of success but can not have the pride of creating it.

- Public health: Considering importing it from well established western institutions and medical schools.

- Affordable tools of intervention including hygiene by Indian investigators, are hardly cited.

- When indigenous thinking is not respected, can be think of changing the atmosphere by attracting young talent?
Excellence in designing treatment methods

• Many Indian clinicians and researchers have excelled in designing effective regimens with appropriate use of available drugs.
• Concepts of Current DOTS and MDT in leprosy including new uniform regimen in leprosy have origins in India.
• There are several other examples in different branches of medicine and surgery.
• It is usual that after others in West accept, our scientific community and policy makers give recognition.
Stages of translation and role of different science agencies

• Translation process has many levels starting with new leads from biological and behavioural research and ending up with usable products/processes.

• **Dream and slogans**: Create our knowledge, develop new molecules/products for diagnosis and treatment in an affordable manner has been the dream nurtured by many Indians – scientists, politicians, administrators and common man.

• Several science agencies such as DST, DBT, CSIR, ICMR, DRDO etc. have invested fairly well in basic and applied research.
Other Science Departments Relevant in Health Research

- ICAR is focusing on production of adequate amount of right kind of food and also partnering with ICMR on control of zoonotic diseases.
- Departments of Atomic Energy, Department of Space, Department of Information technology and other user Ministries like Women and Child Development, Environment and Forests; Rural Development etc are providing / are willing to provide their collaborative support.
Where we stand?

• With research funded by various agencies (mostly Govt), a large number of leads, potentially useful diagnostics and therapeutics have been identified / developed.

• How many have reached the final destination?

• Very few tools or products developed in India are available for use others remain restricted to their developer’s labs at best.

• Why it has happened?

• How we can a turn around by removing the roadblocks?
ICMR has created a system of translational research.

Twenty six translational research cells have been established at ICMR’s Institutes/Centres.

A translational research cell has also been established at ICMR Hqrs. Which coordinates the programmes of ICMR’s Institutes/Centres under translational research and assist in carrying forward their technologies for implementation.

One hundred and two (102) technologies / programmes of ICMR’s Institutes/Centres identified during 2008-10.

Seventy-five being developed and evaluated further.
TRANSLATIONAL RESEARCH

• During last two years, 26 Translational units have been established in various ICMR institutes/centres.
  • 1st Phase: Fifty-two technologies/processes
• 29 technologies for diagnostics for various diseases;
• 5 for vaccines;
• 5 for mosquito control products;
• 3 for prevention of occupational hazards;
• 5 for process development;
• 2 for drug development;
• 2 for health systems for programmes, and
• 1 for early warning system for Japanese encephalitis).
• Phase II: Another twenty are under review.
• Three initiatives by HFM (Diabetes and H1N1)
Technologies for Diagnostics

- Viral diseases, viz. Dengue, Chickunguinea, Hepatitis, Polio, J.E., etc. : 05
- Tuberculosis : 06
- Leprosy : 01
- Diarrhoea including Cholera: 03
- Lungs Fluke : 01
- Leptospirosis : 02
- Filariasis : 01
- Kala Azar : 02
- Malaria : 03
- Chlamydia : 03
- Cancer : 01
- Thallassemia : 01
- Osteoporosis : 01
- Mental Health : 01
- Diabetes : 02

Indian Council of Medical Research
(DHR)
Department of Scientific and Industrial research : Council of Scientific & Industrial Research

- CSIR laboratories have developed several drugs that for the treatment of tuberculosis, malaria, leishmaniasis diabetes mellitus and others.
- Products from CSIR are available for fertility control.
- Several devices / appliances from CSIR are also ready.
- Open Source Drug Discovery (OSDD) programme of CSIR is creating waves.
Department of Biotechnology (DBT)

- Department of Biotechnology (DBT) has made a major impact on the development of biotechnology related products.
- Several diagnostics, vaccines and other health care products have been developed with financial support from DBT.
- Creation of Translational Health Research Institute is a landmark.
- Several other programmes of DBT such as SBIRI are changing the Indian landscape.
Department of Science and Technology (DST)

• DST, the biggest science agency in India, funds biomedical basic and applied research in a significant manner.

• Areas include those pertaining to infectious and non-communicable diseases.

• DST funded research has influenced almost all facets of medical sciences.

• Many leads from this research including newer areas such as nanotechnology have been available for quite sometime.
DRDO

• DRDO has developed several methods for diagnosis of infectious diseases, bioremediation, vector control as well as alternate more nutritious foods.

• Good affordable equipment such as respirators have been developed by DRDO laboratories.
Other Science agencies and Health research

- Many significant contributions from Departments of Atomic Energy, Space, Information Technology, Department of Environment and Forests;
- All others who are contributing to processes.
- Coordination mechanisms established but yet to make impact.
Roadblocks : Mindset of community

• Mindset of user community specially the middle class is a major driver of industrial and social growth.
• Major section of our medical fraternity is suffering from colonial inferiority complex.
• Public has subconscious fixation for “foreign”.
• As a result our indigenous “Indian” products (specially microdevices, appliances) start with a big disadvantage against “imported” varieties.
• Government and enlightened people within the civil society will have work hard to catalyse attitudinal changes.
Misplaced Priorities

- Non-communicable diseases – recently getting targeted.
- Mental Health, Bone health, oral health, geriatrics – too little effort.
- Tribal and other marginalized communities not adequately targeted.
- Health systems research just picking up – critical to achieve MDGs
- Made in India Appliances (stents, implants etc) !!
Evaluation and Regulatory Process as Roadblock

• Translation requires all support from peer groups for evaluation and field testing and finally regulatory approvals.

• Due to various reasons this process has been very slow. There are very few laboratories (in government and private sectors) that could quickly provide either samples or carry out independent evaluation.

• Regulatory structure has not been keep pace with the changing needs.
Funds as a limiting factor

- There has been a perception that not enough money for translation has been available.
- It is true to some extent but is not the sole hindering factor.
- Several agencies like DBT, DRDO, ICMR have invested heavily in research aimed at translation for health.
Human Resource

• Human resource is the major limiting factor.
• Our scientific community usually likes to investigate scientifically interesting or glamorous ideas rather on spend time on developing new tools that may benefit the masses.
• Large number of leads remain lying in the heap of “new unutilized knowledge”.
• Increase in the investments many fold by science departments and also the industry in the recent years has not led to parallel increase in the output because of lack of adequate and properly trained human resource.
Infrastructure for the usage of new technology/ tools

- Health infrastructure is not developed in many parts of country
- Government run hospitals have problems of manpower and infrastructure in several states;
- Very little effort on implementation research and transfer/adaptation of new technology
- Little effort to honestly synergize with other systems.
- Medical leaderships even in well developed states lacks vision and have inadequate knowledge of technology advances versus their potential to improve the patient care individually and at public health level.
- Examples of molecular diagnostics in tuberculosis.
NEW GENERATION DIAGNOSTICS FOR TUBERCULOSIS DEVELOPED IN INDIA

PCR based techniques for detection:
* Khandekar Group (NII, New Delhi)
* P. Seth, J. Tyagi, H.K. Prasad (AIIMS, New Delhi)
* R. Srivastava (CDRI, Lucknow)
* Kadival (BARC, Mumbai)
* Grover (NDRI, Karnal), Hasnain (CDFD, Hyderabad)
* Narayanan (TRC, Chennai)
* Sarman Singh (AIIMS, New Delhi)

Techniques for DNA fingerprinting:
* Narayanan (TRC, Chennai), Katoch (JALMA), Hasnain (Hyderabad)
## PCR SYSTEMS DEVELOPED IN INDIA

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JALMA (ICMR)
SOLITARY
ISH+ SITE
**Mycobacterium chimaerae**: New pathogenic mycobacteria, first report from India

Sequences producing significant alignments:

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Gene amplification – restriction analysis of mycobacterial isolates targeting hsp 65 gene region digested with *Hae III*

Lane 1 Lane-*M. avium* (reference strain), Lane 2- *M. chimaerae* (patient isolate), Lane 3-4 *M. interacelululare* (reference strain), Lane5- Uncut (439 bp), Lane M- molecular weight marker
DNA chip for studying the genes encoding efflux pumps in M. tuberculosis

*A microarray encoding efflux pumps of M. tuberculosis prepared at JALMA.

*Ten efflux genes were found to be overexpressed, eight identified for the first time.

* Higher transcription levels, correlation with blocking observed commonly with INH, EMB, aminoglycosides and FQs.
DNA Chip of *M. tuberculosis* consisting of 62 genes of efflux pumps, membranes permeability & transcription etc in a MDR strain

2 genes found to be over-expressed with Ofloxacin

One reported for the first time from JALMA

A: Labeled control, B: FQ resistance associated gene, C: ABC family efflux pump
Commitment of Stakeholders

• To create a vibrant network conducive for translation research strong commitment from innovators, promoters and regulators in government as well as private set ups is required.

• Industry and several players (regulators as well as promoters) will have to be active and work in a mission mode.

• There will have to be some market assurance to industry and farmers to produce what the people need. Market forces will drive the process once it reaches the market.
Positive Developments - Recent examples

- **DBT and ICMR**: creation of dedicated institutes/set-ups on translation and a grand vision for translation in this country.
- **DHR**: Bills; Health Technology Promotion/assessment boards.
- **Political commitment and administrative action**: Success tasted when facing H1N1 pandemic; home based care for new-born based on Indian evidence.
- **Market demands and forces**: creation of facilities like Clinical research organizations (CROs) but not happening for all the sectors which are important but do not have the interest of market forces at that moment of time.
- **Things are changing for the better but miles to go when we can proudly say that we are generating knowledge (particularly developing methods/products) accordingly to societal needs!!!**
Urgency

• Message of Sh Ghulam Nabi Azad, Hon Health and Family Welfare Minister delivered at the start of centenary celebrations of ICMR on 15th Nov 2010. To quote “I will urge ICMR scientists to put special efforts on translational programmes as the country needs these technologies now and cannot wait indefinitely”.

• In reality this applies to all of us within ICMR and also outside ICMR.
Team/ Collaborating Group for Studies on Molecular Epidemiology and Genomics

V.M.Katoch, D.S.Chauhan, K.Katoch, P.Sharma, VD Sharma & HB Singh; Rahul, Hirawati, Mallika Lavania, A Gupta, GPS Jadaun, P.Singh, Mradula Singh, K.Venkatesan and others
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