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â€œAnna University's NHHID enables indigenous instrument manufacture for highly affordable healthcare"

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To begin with, can you outline the nature of NHHID for our readers?

Undue dependence (85%) on imports costs us dearly. Therefore quick augmentation of our ability to develop instruments of global standards right at University level is imperative. This led to NHHID as a viable approach to sustainable solution for affordability of quality healthcare.

NHHID is a novel facilitation concept and structure conceived by Department of Science and Technology under the auspices of Technology Development and Transfer Division and implemented by Anna University by integrating Scientists, Engineers, Technologists, Clinicians, Industrialists and Businessmen to accelerate indigenous healthcare instrumentation.

It is formed by bringing together six different engineering/ technology groups of Anna University (Electronics & Communication Engineering, Centre for Biotechnology, Manufacturing Engineering, Electronics Engineering and groups with similar and complementary expertise from six other reputed institutions such as Indian Institute of Science, Madras Veterinary College, Christian Medical College, CSIO, IIT(M) and Central Electro Chemical Research Institute to begin with. It translates and transfers commercially viable healthcare innovations from these academic departments and research institutions to companies.

It's major roles: serves as R&D arm of small and medium enterprises and hospitals; bridges the gap between prototype development and its commercialization after multi-centric validation through its product realization facility; runs testing and calibration facility for medical devices; trains manpower and educates medical and engineering professionals in the areas of biomedical engineering and instrumentation; aids apex bodies like DST, NHSRC and BIRAC to identify commercially-viable ideas and projects on healthcare devices and provide necessary support. In brief, using a multipronged approach, NHHID enables indigenous instrument manufacture for highly affordable healthcare.

What are the major instruments and equipment designed by the institute and how have these instruments made a mark in the medical field?

Antibiogram device: An inexpensive fluorescence imaging device for quicker (6-8hrs) antibiotic selection for effective treatment, particularly Urinary Tract Infection.

Leptospirosis kit: IgM-based ELISA test kit replaces the cumbersome MAT-microscopic agglutination test cutting the cost by a fifth of the present.

Chikungunya Kit: Isothermal amplification of viral RNA with non-gel based instrumental detection affordable and amenable for primary healthcare.

CMCdaq: CMCdaq is a hand-held, versatile recording system designed for long-duration electrophysiological data acquisition suitable for human recording. Sophisticated electronics ensures high quality recording.

Mass screening gadget for ophthalmic lesions: An automated system to aid ophthalmologists in the analysis of Fundus images for the diagnosis of glaucoma and diabetic retinopathy.

Hystero electrical activity mapping device: It acquires and processes uterine contractile potential, Electro Hystero Gram (EHG), and foetal ECG (FECG) non-invasively to warn obstetricians of foetal distress condition as labour progresses and help decide the right course of action.

Synthetic milk tester: This is a simple 'dip-and-read' reagent-free electrochemical device to detect synthetic milk adulteration, a major problem faced by the country without proper tool.

Milk protein estimator: A 3-digit portable colorimetric gadget and proprietary method specifically developed for measuring raw milk protein, accurately by the collection centres for paying according to quality and food labs.

The technologies of Leptospirosis kit and CMCdaq have been transferred to respective manufacturers for multi-centric validation and manufacture. The rest of the instruments are in various stages of technology transfer for commercialization.

How are the Department of Science and Technology and Anna University supporting the Institute (in terms of funding and technology support)?

The idea of a structure like Hub facilitating instrumentation development originated in the Technology Development and Transfer (TDT) division of DST way back in 2006. It is a matured idea based on collective wisdom of the Advisors of the TDT Division, Chairmen of various Instrumentation Committees of Instrumentation Development Program (IDP) and from decades of experience in supporting a number of instrumentation projects covering diverse areas of industrial, commercial and social importance and need-of-the-country. Their constant experimentation with strategies to convert project outputs into tangible products led to the realization that a dedicated infrastructure like NHHID was necessary to bridge commercial and academic worlds.

Consequently, after thorough evaluation of Anna University's proposed model by three different Expert Advisory Committees of IDP for two years, DST sanctioned Rs. 12.4 Cr in 2011 for five years to set-up this national facility. Highly diversified engineering and technology disciplines (more than hundred) including proven competence in instrumentation development and track record in commercialization worked favorably.

Working closely, DST constantly monitors and guides Hub development through half-yearly review by a 15-member Steering Committee consisting of complementary mix of renowned scientists heading mega national/international projects, highly respected academics, successful business leaders, policy makers and regulators from across the country.

Anna University and DST worked hard for two years in carefully designing and shaping the National Hub. Multidisciplinary research environment and ecosystem established in the last 15 years through pioneering and novel programs like Centre with Potential for Excellence by UGC, availability of critical support infrastructure for IPR filing and technology transfer, intellectual management with long-term vision of the Vice Chancellors with matching administrative flexibility guided by Registrars, who themselves are academic researchers, all contribute to the success of this bold initiative.

The RD&C (where C is for commercialization) policy of the present Vice Chancellor, Prof. M Rajaram, Ph.D. has been the

driving force behind the rapid advancements of the Hub in the last two years. As a result, NHHID is able to help even partner institutions to file their patents, develop products and technology-transfer them to companies.

In this 5-year (2010-2015) period, what are the significant advances in medical instrumentation and how has the institute been part of this progress?

The major advances in medical instrumentation in this period are: miniaturization and automation for high-throughput multi-parameter analysis of biochemicals and molecular markers; improvements in imaging hardware and software for better physician aids in diagnosis; sensor-based instrumentation on mobile platform for point-of-care patient aids and telemedicine, additive manufacturing of customized prosthesis and robotics-assisted precision surgery.

Keeping these developments and our own ground realities in mind, NHHID is progressing towards developing highly affordable devices for prevalent diseases of our land.

Could you name the regional collaborations that the institute has signed and how have these collaborations yielded results?

NHHID thrives on collaborations, both regional and national. Regionally we collaborate with institutes, industries, hospitals, and stakeholder associations/bodies. Most significantly, exclusive MoU with Directorate of Medical Education (DME) based on Govt. of Tamilnadu GO {GO(D) 201} enables joint product development, training, awareness of testing and calibration of medical devices etc. Commercialization of products from regional partner institutions, Joint Development Agreement with industries, establishment of crucial facilities like product realization, joint outreach programmes in biomedical engineering etc are other significant outcome.

Are there any medical conditions that lack proper instrumentation? What measures is the Institute adopting to design such equipment?

Instrumentation for Infectious diseases remains neglected despite the medical and economic burden of these diseases. Classical microbiological methods, which are low-throughput, laborious and less affordable, are quite inadequate and ineffective. Consequently "Multi Drug Resistance" is a major problem and a grave concern. In contrast, even serious non-infectious diseases like diabetes and heart attack are diligently and effectively managed using modern instrumentation. Ironically, for the past two decades, molecular-level details about most of the infectious diseases are known to enable new instrumentation methods and instruments.

NHHID has developed an inexpensive instrumentation solution to enable doctors to prescribe the right antibiotic within 6-8hrs or second dose of an antibiotic. This could be a game changer in antibiotic therapy and compliance for a test before therapy. Initially we are targeting Urinary Tract Infections, prevalent among female population and diabetic patients and notorious for MDR and spread in communities. Leptospirosis kit and method for Chikungunya detection are based on innovation using modern knowledge.

Customized prosthesis for Indian population based on emerging additive manufacturing or 3D printing of skeletal parts or exoskeleton is a boon. Preparing the best-fitting 3D model from 2D radiological images demands innovative image processing and modeling and we specialize on this along with surgeons and industrial partner.

Medical devices, particularly life-saving medical devices like vital sign monitors and ventilators, require periodic testing and calibration for absolute reliability. Paucity of facilities offering such services and lack of policy for making such procedures mandatory are addressed by DST through NHHID. We are establishing a NABL-accredited testing and calibration centre for this purpose and creating awareness among doctors, biomedical engineers and even patients. We'll develop calibration procedures for new indigenous instruments.

This generation is witnessing the spin-off of startup entrepreneurs. Has the institute supported any such startup?

The mandate of NHHID is to promote and support indigenous healthcare instrumentation developers including startup entrepreneurs. We are transferring technology mainly to small and medium enterprises with limited research, manufacturing and testing capabilities. We are looking at entrepreneurship development out of institutions, which can provide adequate intellectual and infrastructure support for product realization and commercialization. In this regard Biotechnology Industry Research Assistance Council offers excellent schemes. Alumni support of public academic institutions and management support of private academic institutions are also viable options.

What are the future plans for the institute (2015-2020)?

Having initiated well and learned valuable lessons, we'll remain focused on strengthening the leads like clinician/industry-driven projects and rare facilities like the Product Realization Center, Business Liaison and Promotion Division and Testing and Calibration Center to accelerate and sustain indigenous healthcare instrumentation development.

We'll network with major stakeholders and their apex bodies like DST, BIRAC, DHR, National Health Systems Resource Centre (NHSRC), NABL, Association of Indian Medical Devices (AIMED), Indian Medical Association (IMA), CII, FICCI, TANSTIA, Madras Chamber of Commerce (MCC) and All India Management Association (AIMA) to synergize and bring the manufacturers, users, govt. agencies and academics under one umbrella for quick decisions and road map to market Indian healthcare devices and accessories. Already a forum called UDAIMED with NHHID playing the key role of integrating academics with users, developers and industries has been formed.

To aid funding organizations, health ministry's technical wing, NHSRC, and even medical device manufacturers, who are looking for IPR-protected innovative ideas or prototypes, NHHID will build healthcare instrumentation informatics and mine for relevant details for timely support and RD&C. We'll aid establishing testing, calibration and certifying facility, as in NHHID, pan-India to ensure accessibility to uniform quality and make such requirement essential for accreditation.

Awareness about and training on biomedical instrumentation is vital for the engineering- and technology-driven medical profession, manufacturing and marketing. It will be actively pursued through a number of outreach programmes including certification courses.

Internal Revenue Generation (IRG) to become self supporting is a prime motive of NHHID. Such models can then be replicated in other parts of India to build a robust Indian healthcare instrumentation capability to increase our presence in our own country and provide more affordable healthcare for public.
In essence NHHID should become an asset in the country's healthcare infrastructure fostered by Anna University.

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