

## A potential solution for monitoring severity of COVID-19 patients

Artificial Intelligence (AI) is the future. It is revolutionizing various industrial sectors including healthcare. Innovators are already using AI in healthcare to deliver better health-related facilities for the masses through Apps. AI is marching forward in the medical field.



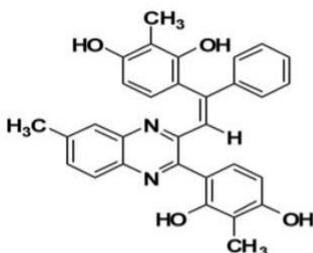
One such start-up is Predible Health Pvt. Ltd. It has come up with an innovation called Lung IQ. This innovation is a holistic AI-based application for the diagnosis and monitoring of respiratory conditions. The solution currently enables early detection of lung cancer, characterization of chronic obstructive pulmonary diseases and monitoring of interstitial lung diseases.

This innovation has been developed by using large proprietary datasets with customized algorithms for detection, qualification and diagnosis. It is compatible with all kinds of CT scanners. It can help radiologists detect and quantify findings better in daily practice. It is also available as a joint solution with teleradiology for an end to end reading.

The Department of Biotechnology's public sector undertaking Biotechnology Industry Research Assistance Council (DBT-BIRAC) is supporting the innovation. It is a potential solution for monitoring the severity of COVID-19 patients. It can help radiologists detect, quantify and communicate COVID19 findings from Lung CT images. The findings of COVID19 are very similar to that of other infectious and inflammatory diseases and this ready-to-use product can be helpful in the fight against COVID19 pandemic.

## Discovery of a novel inhibitor of HDAC SIRT1 which kills colon cancer cells

A team of scientists and their chemist collaborators at DBT's Center for DNA Fingerprinting and Diagnosis (CDFD), Hyderabad, have discovered a novel anti-cancer molecule (4bb) which specifically kills colon cancer cells. It is a small molecule inhibitor of human histone deacetylase, and SIRT1. Team investigated the effect of 4bb on viability of colon cancer cells and its molecular mechanism of action for better understanding of how it works within the cell to stop growth of colon cancer cells.



In human cells, to fit our long genetic material, DNA into tiny nucleus, it is wrapped around beads made of histone proteins, this complex of DNA and protein is called Chromatin. Chromatin structure can be altered by chemically modifying the DNA and the histone proteins by acetylation, methylation etc. These modifications do not change the composition of the DNA. However, they can change gene expression *i.e.*, the program by which proteins are formed within a cell. Such changes are called Epigenetic changes.

Cancer is a major health problem world over. Currently existing drugs are not satisfying as they cause traumatic side effects. Therefore, the need for development of more specific and relatively non toxic drugs is quite urgent. Epigenetic therapeutics of cancer such as inhibitors of DNA methyltransferases and histone deacetylases (class I and classII) are already being used in combination with the standard cytotoxics with encouraging results. The Sirtuins (class III NAD-dependent deacetylases) are being considered as important targets for cancer therapeutics as their level increase in many cancers. As these are enzymes, inhibition of sirtuin's deacetylase activity allows re-expression of silenced tumor suppressor genes, leading to reduced growth of cancer cells.

However, no sirtuin inhibitors have entered into the clinic yet as an anticancer agent. The NAD<sup>+</sup>-dependent protein deacetylase SIRT1 is an important target for epigenetic therapeutics of colon cancer as increase in its level is associated with cancer progression. SIRT1 represses tumor suppressor, p53 function via deacetylation, promoting tumor growth. Therefore, inhibition of SIRT1 activity is of great therapeutic interest for the treatment of colon cancer. In vitro, 4bb is a significantly more potent SIRT1 inhibitor than  $\beta$ -naphthols

such as sirtinol, cambinol. The viability of colon cancer cells reduces with increasing concentration of 4bb, but, does not affect the viability of normal dermal fibroblasts depicting cancer cell specificity. Further, 4bb treatment increased p53 acetylation, Bax expression and induced caspase 3 cleavage suggesting that the death of HCT116 colon cancer cells occur through intrinsic pathway of programmed cell death (apoptosis).

Overall, we presents 4bb as a new class of human SIRT1 inhibitor and suggest that inhibition of SIRT1 by 4bb induces prograded cell death of colon cancer cells at least in part via activating p53 by preventing p53 deacetylation, increasing Bax expression and inducing caspases. Therefore, this molecule provides an opportunity for lead optimization and may help in development of novel, nontoxic epigenetic therapeutics for colon cancer. This would aid in the development of novel Sirtuin inhibitor as a potential anti-cancer drug either by itself or in combination with cytotoxics and other epigenetic drugs such as methyltransferase inhibitor or HDAC inhibitor. In addition, determination of the molecular basis of anti-tumor effect will help in understanding of functions of Sirtuins in cancer formation.

The research work titled “A novel SIRT1 inhibitor, 4bb induces apoptosis in HCT116 human colon carcinoma cells partially by activating p53” by Ananga Ghosh, Amrita Sengupta, Guru Pavan Kumar Seerapu, Ali Nakhi, E. V. Venkat Shivaji Ramarao, Navneet Bungc, Gopala Krishnan Bulusuc, Manojit Pal and Devyani Halidar” was published in journal “Biochemical and Biophysical Research communications”.

**Related Link**

- 1.<https://www.semanticscholar.org/paper/A-novel-SIRT1-inhibitor%2C-4bb-induces-apoptosis-in-Ghosh-Sengupta/ef46965bea972dcfea8bdf1a9bde9e20596edcde>
- 2.[https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_01B\\_14July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_01B_14July2020.pdf)

## Guidelines for Evaluation of Nano-based Agri Input and Food Products in India



New Delhi, July 14: The multidisciplinary nature of nanotechnology and its rapidly increasing scope for development of commercially viable applications pose a huge challenge to regulatory bodies across the globe. Nanotechnology involves an amalgamation of knowledge from various disciplines of science including chemistry, materials science, physics, biology, engineering and medicine.

As on date, there are no unanimously accepted international guidelines for nano-based agri-input and food products. A few provisions are in place globally for NMs with certain specific guidelines for quality, safety and efficacy. However, continued innovation with alteration of functionality of NMs makes it difficult to apply a universal set of evaluation parameters for emerging nanoproducts.

The Department of Biotechnology in the Ministry of Science & Technology and the Ministry of Agriculture, and Farmers' Welfare has developed the first ever "Guidelines for Evaluation of Nano Based Agri Input and Food Products in India". These guidelines are an outcome of extensive inter-ministerial exercise and consultations with experts, scholars and other stakeholders in the field of nano-biotechnology and are intended to ensure quality, safety and efficiency as well as encourage the commercialization of nanotechnology based innovations. These guidelines would help policy makers and regulators to frame effective provisions for future novel nano-based products in agri-input and food sectors of India and encourage the Indian innovators and industries to develop and commercialize new nano-based agri-input and food products.

The guidelines apply to nano-agri-input products (NAIPs) and nano-agri products (NAPs). They also apply to nanocomposites and sensors made from NMs and those that require direct contact with crops, food and feed for data acquisitions. These guidelines do not, however, apply to the conventional products or formulations with incidental presence of natural NMs.

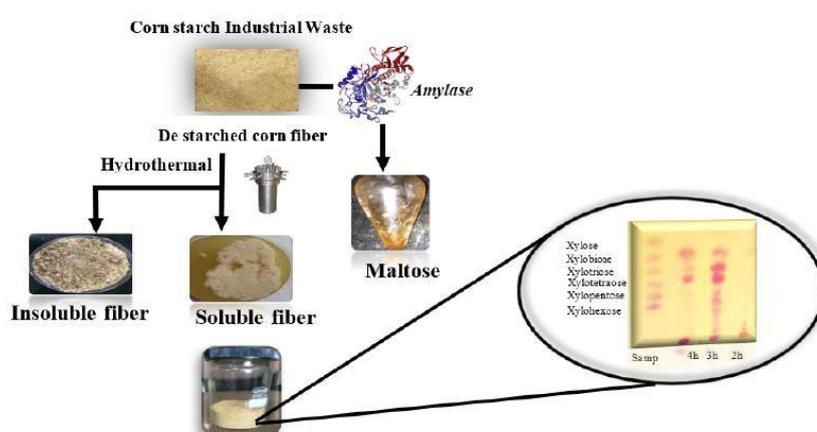
Dr. Harsh Vardhan, Honourable Union Minister of health and Family Welfare, Earth Sciences and Science and Technology along with Shri Narendra Singh Tomar Honourable Union Minister of Agriculture and Farmers Welfare and Honourable Union Minister of State

for Agriculture and Farmers Welfare, Shri Parshottam Khodabhai Rupalahas released the “Guidelines for evaluation of nano-based agri-input and food products in India”.

**Link:** [https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_01S\\_14July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_01S_14July2020.pdf)

## Production process and uses of *Cornvita* containing corn fibers and dairy whey or its derivatives

A group of researchers from DBT's Center of Innovative and Applied Bioprocessing (DBT-CIAB), Mohali has developed a novel food product called as *Cornvita* from corn starch industry by-product (pericarp) and dairy industry by-product (Whey). Corn fiber (pericarp) is processed by combination of enzyme and thermochemical methods to yield maximum soluble fibers (47%, w/w), which are used as an additive to whey to generate the product "*Cornvita*" which contains arabinoxylan, oligosaccharide, antioxidant, protein and minerals and whose merits include taste, flavour, nutritional value and nutraceutical properties of soluble fibers.



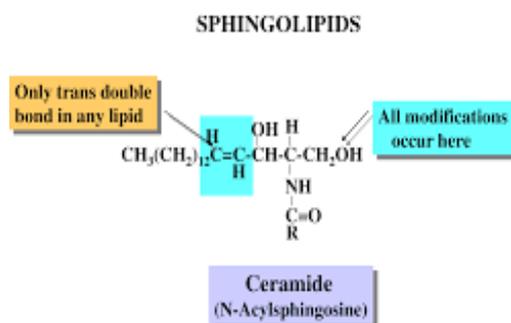
### Integrated approach to isolate multiple products from corn starch industrial waste along with corn soluble fibers

Addition of 10% sugar and 0.5% salt to enhance the taste and other flavors like mint, ginger or tea were also added for taste benefits. The beverage (*cornvita*) appeared to have good color, aroma and refreshing taste. While extraction of soluble fibers from by-product of corn starch industry, the side products are also formed like maltose (34%, w/w) and insoluble fiber (51.6%, w/w), which are also suitable for food industry.

Such integrated process development not only converted the fiber to valuable products like maltose, soluble fibers and insoluble fiber but is also a sustainable approach for utilization of starch industry processing by-products of corn. The research work has been led by Dr. Meena Krishania Choudhary and co-workers. The work was filed for an Indian patent (201811000749).

## Quantitation of sphingolipids in mammalian cell lines by Liquid Chromatography-Mass Spectrometry in analysis of membrane lipids

In this chapter, scientists at DBT's Regional Centre for Biotechnology (RCB), Faridabad presented a simple, sensitive, and robust method to simultaneously quantitate sphingolipids of the early steps of the metabolic pathway by a liquid chromatography–mass spectrometry-based method using mammalian cells as model system.



Sphingolipids are a major class of bioactive structural lipids that also play diverse roles in signalling events in different disease conditions like cancer. They form a dynamic metabolic network, and alterations in their metabolism are known to contribute to progression of the disease. Therefore, quantitation of such metabolites from mammalian cells as a disease model system can provide us a vivid picture of the regulatory nodes in the pathway that can be targeted to identify sphingolipids-based biomarkers or targets for future therapies.

### Related Link

1. [https://link.springer.com/protocol/10.1007/978-1-0716-0631-5\\_7](https://link.springer.com/protocol/10.1007/978-1-0716-0631-5_7)
2. [https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_01B\\_16July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_01B_16July2020.pdf)

## Researchers study effect of delay in transportation of glucose into heart cell



You might have heard that the duration between an insulin dose and meals is significant for people with diabetes. Or the fact that people with diabetes are more at risk of getting a cardiovascular disease. Ever wondered why?

Glucose present outside a heart cell (cardiomyocyte) is transported into the cell by a set of proteins called glucose transporters (primarily GLUT4). This process of glucose transport is regulated by circulating insulin levels. A secondary messenger, calcium, continuously moves and oscillates to maintain the contraction and relaxation mechanism of the heart cells. The glucose inside the heart cells fulfills the energy requirement of a healthy heart. There is orchestration with the plasma glucose, plasma insulin, intracellular glucose, and cytoplasmic calcium inside a heart cell. A delay in transport can affect a proper maintenance of healthy cardiac function.

Dr. Samrat Chatterjee and his team at the Department of Biotechnology's Translational Health Science and Technology Institute (DBT-THSTI) studied these complex interactions through a four-dimensional delay-induced model under set conditions. The study aimed to understand the role of the delay in transport of glucose in a heart cell and explore restoration mechanisms as therapeutic targets in diabetes-like conditions.

The team developed a four-dimensional delay differential model involving plasma glucose, plasma insulin, intracellular glucose, and cytoplasmic calcium concentration in a heart cell (cardiomyocyte) as state variables. This helped to find out that the glucose input rate in the bloodstream (during diabetes) is the most sensitive parameter influencing all other state variables. They found glucose adsorption rate by non-cardiac cells, insulin production, and degradation rate as other sensitive parameters. Any perturbation in these sensitive parameters leads to the irregular oscillations of calcium in heart cells leading to heart dysfunction.

Further analysis identified that the rate of degradation of intracellular glucose is pivotal in deciding the calcium dynamics of a heart cell. In this model, mimicking the diabetic condition was achieved by changing parameters related to the uptake rate of insulin-dependent glucose and delay in glucose transport. Thus, the regulated input of glucose in blood plasma is suitable for normal oscillations of calcium in cardiomyocytes. Other ways to control calcium oscillations and glucose are to manipulate other parameters depending on time delay associated with the uptake rate of intracellular glucose.

**Link:** <https://link.springer.com/article/10.1007/s10867-020-09551-8#citeas>

**Link:** [https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_02S\\_14July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_02S_14July2020.pdf)

## **Role of Type III IFNs in visceral leishmaniasis / Kala azar possible approaches for treating such neglected diseases**

Scientists at DBT's National Institute of Biomedical Genomics (NIBMG), Kalyani have recently discovered type III interferons (IFNs), also known as lambda interferons. These are the least studied IFNs. They are located in tandem on chromosome 19 and known to modulate immunity in infectious and autoimmune diseases through activation of JAK-STAT pathway and upregulation of interferon-stimulating genes (ISGs). Their role in *leishmania* infection is yet to be elucidated.

Interferons (IFNs) are the cytokines belonging to a large group of proteins which activate the immune cells by imparting protection from infections and helps in eradication of pathogens. There are three classes of IFNs: Type I IFN, Type II IFN and Type III IFN. All the three classes are beneficial for fighting viral infection. The role of Type I IFN is previously known in *Leishmania* infections.

Visceral leishmaniasis (VL), also known as Kala azar may lead to high fatality if not diagnosed and treated properly. The most typical symptoms of this parasitic killer are fever, swelling of spleen and liver. It is caused by sand fly vector found in tropical or temperate regions of the world. In India, most of the cases are reported in Bihar. The commonly available drugs for treatment of VL are amphotericin B, miltefosine, paromomycin etc.

The disease outcome is associated with impairment of the host immune cells leading to non-protective immunity. Thus, therapeutic strategies involved in inducing immunomodulation are beneficial for developing protective immunity in order to combat this deadly parasitic disease.

The study was funded by the DBT-RA program, and it fills the lacuna of knowledge by testing the effect of interferon lambdas during *Leishmania* infection.

## **DBT-THSTI collaborated with TIFR & others research organizations to study sero-prevalence of SARS-CoV2 in Mumbai**

The Department of Biotechnology's Faridabad based institute, the Translational Health Science and Technology Institute (THSTI) has tied up with institutes in Mumbai for serosurveillance to gain an understanding of (i) number of people infected with SARS-CoV-2, (ii) the virus SARS-CoV2, and (iii) how it is spreading through the population.

**Community serological testing for COVID-19 infection in Mumbai**

- Disease progression
- Clinical interventions
- Population-level risk
- Informed Public Health Policy decisions
- Influence measures to kick start the economic activities

10K samples in 3-wards  
Slum/non-slum population  
Assess risk-factors  
Multiple rounds for epidemic trajectory

Partners: THSTI, Kasturba Hospital, ATECF, IDFC

As we know that it just took a few months for a tiny virus to take over a city of about two crore population and renamed it from the financial capital of India to the COVID-19 capital of India. On July 1, 2020, the number of cases touched 1.8 Lakhs. Thus, in this week THSTI, entered into an agreement with the Tata Institute of Fundamental Research (TIFR) Mumbai, Kasturba Hospital, A.T.E Chandra Foundation, IDFC Institute, and Municipal Corporation of Greater Mumbai. The collaborative project aims to estimate the prevalence of current and past COVID-19 infections in various representative communities in Mumbai at different time intervals. Conclusively, this study will aid our understanding of how the virus has spread over time within Mumbai.

For surveillance, serology testing will be done for better understanding of how many infections with SARS-CoV-2 have occurred at different points in time within Mumbai.

Serology tests look for antibodies in blood. If antibodies are found, that means there has been a previous infection. Antibodies are proteins that can fight off infections.

Investigations using serology testing are called seroprevalence surveys. These surveys also help us in understanding the underlying risk factors of the disease including a person's age, location, or co-morbidities. Since DBT and THSTI are also involved in vaccine development, the study's prospects to determine how long antibodies last in people's bodies following infection will also be useful.

**Related Link**

- 1.[https://www.tifr.res.in/TSN/news\\_detail.php?id=MEtGM2pvMXA4L0REQUg4RDFLU2ttZz09](https://www.tifr.res.in/TSN/news_detail.php?id=MEtGM2pvMXA4L0REQUg4RDFLU2ttZz09)
- 2.<https://www.tifr.res.in/TSN/>
- 3.[https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_02B\\_13July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_02B_13July2020.pdf)

## **Colored wheat developed by scientists at DBT-NABI (Mohali) has improved income of farmers in aspirational districts of Punjab**

The colored wheat (black and purple) developed at DBT-National Agri-Food Biotechnology Institute (NABI), Mohali is a rich source of the health promoting antioxidants due to presence of plant pigment anthocyanins. Research at the institute showed good effect of colored wheat on the control of blood glucose and body fat in high fat diet induced mouse models.

This wheat was grown at the farmers' field in the aspirational districts of Moga and Ferozepur under the DBT funded project for societal development. 29 farmers from 6 villages have directly benefitted due to the project. Farmers were happy as they could get Rs. 2000 to 4000 higher income per acre after the sale of their produce. Further, the intervention at farmer's field increased iron, zinc and protein content of grains that has addition health benefits for the consumer. Farmers are looking at it as an opportunity for higher income generation and making and selling products at the village level.



New healthy colored wheat has improved income of farmers in Aspirational district of Moga and Ferozepur, Punjab under the Department of Biotechnology (DBT) funded project entitled “*Bio fortified antioxidant rich colored wheat cultivation under organic and agronomic supplementation (Fe, Zn, Protein) strategies to increase farm income and improve their health status*”. The crop has been developed under DBT’s Societal Development Program.

Industry is looking on it as a new opportunity in the health food sector. It can be easily stored, consumed daily and cooked easily, and a wide range of food products like chapatti, biscuit, dalia, bread, roasted snack etc can be developed from it. NABI has shared its technology with more than 20 companies after signing MOU/NDA with them. Companies are interested in

contract farming and marketing different products like atta, dalia, roasted snacks and bakery products. Black wheat is attracting attention of farmers, consumers and industry and it is expected to increase to huge level in the coming years.

**Link:** [https://vigyanprasar.gov.in/wp-content/uploads/vigyan\\_samachar\\_dbt\\_02B\\_16July2020.pdf](https://vigyanprasar.gov.in/wp-content/uploads/vigyan_samachar_dbt_02B_16July2020.pdf)