

# BIOTECH EXPRESS

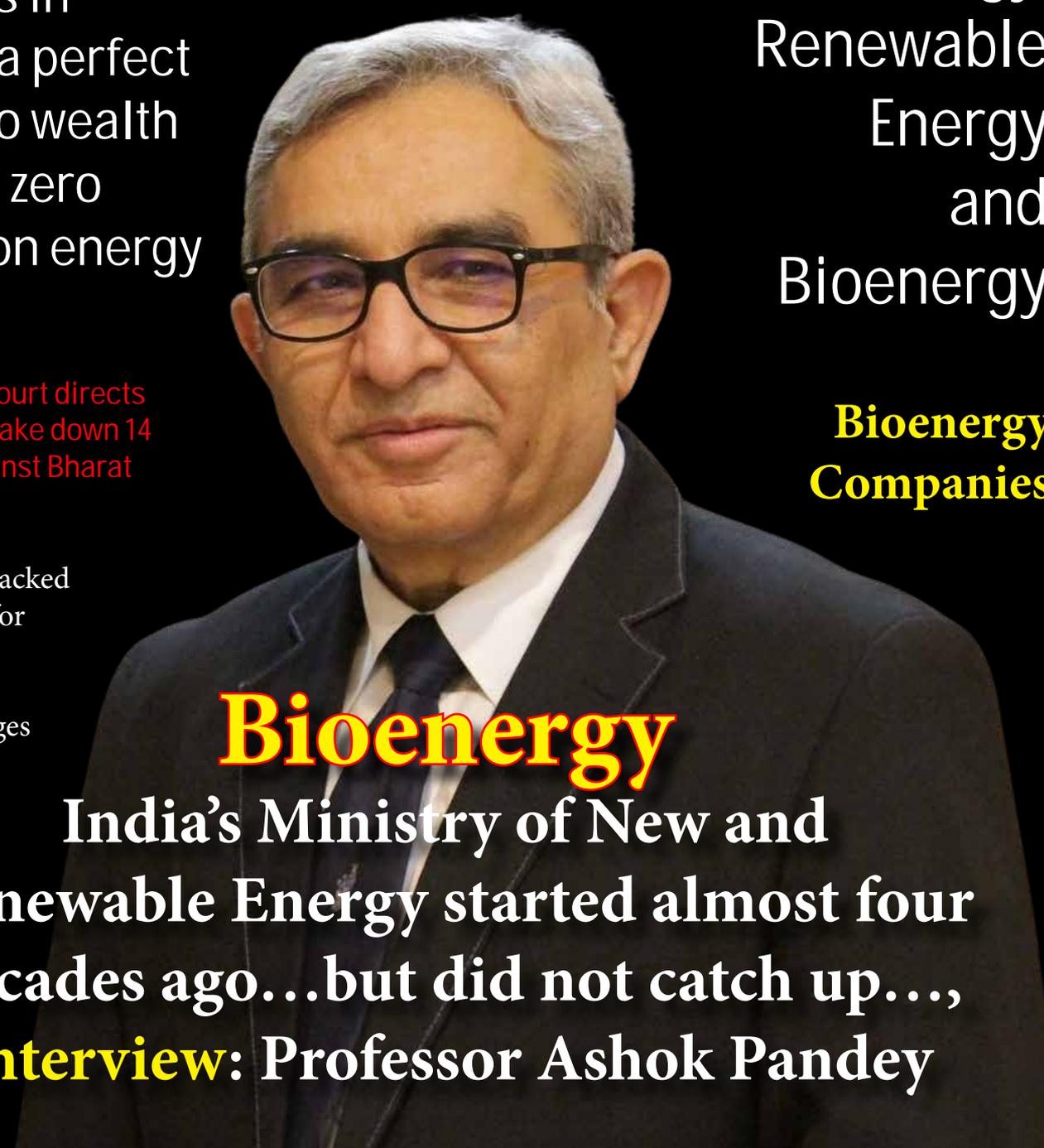
Biofuels in  
India – a perfect  
waste to wealth  
and net zero  
emission energy  
option

Telangana Court directs  
The Wire to take down 14  
articles against Bharat  
Biotech

Moderna Hijacked  
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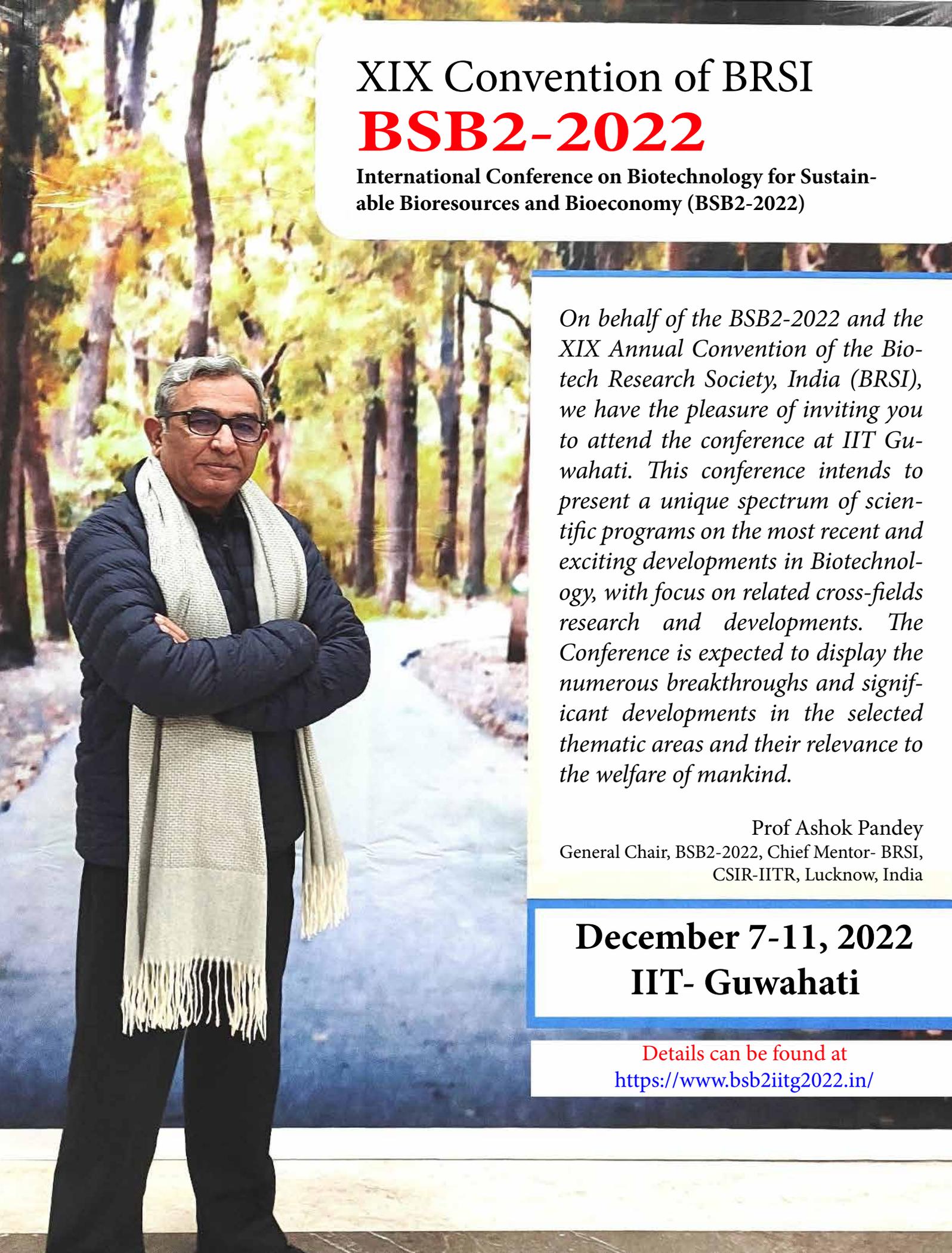
Energy,  
Renewable  
Energy  
and  
Bioenergy

**Bioenergy  
Companies**

A portrait of Professor Ashok Pandey, a middle-aged man with grey hair and glasses, wearing a dark suit, white shirt, and dark tie. He is looking slightly to the left of the camera with a neutral expression.

**Bioenergy**

India's Ministry of New and  
Renewable Energy started almost four  
decades ago...but did not catch up...,  
**Interview:** Professor Ashok Pandey



# XIX Convention of BRSI **BSB2-2022**

International Conference on Biotechnology for Sustainable Bioresources and Bioeconomy (BSB2-2022)

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General Chair, BSB2-2022, Chief Mentor- BRSI,  
CSIR-IITR, Lucknow, India

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# BIOTECH EXPRESS

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March 2022

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# BIOTECH EXPRESS

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# Energy, Renewable Energy and Bioenergy

Dr Seema Pavgi Upadhye

To start with, it is important to note that energy is neither created nor destroyed, it only changes forms. Ultimately we i.e. human use energy for whatever ways we can and using alternatives sources to meet demands. Consumption of energy is a huge part of our day to day living. We eat with energy, we travel with energy, we work with energy and many more. This makes the availability of energy very necessary for humans.

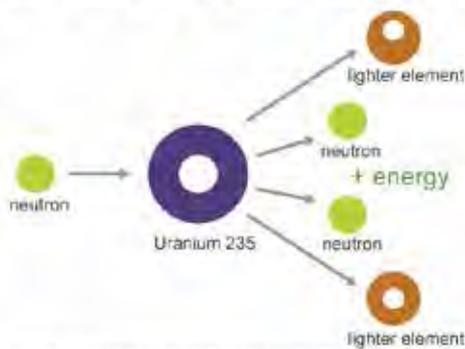
Energy means the capacity to do work. It exists in various forms such as mechanical energy, kinetic energy, potential energy, sound energy, etc. It just changes its types, for example when we burn fuel inside a bike or a car the chemical energy of the fuel gets converted into heat energy which in turn, converted into mechanical power that turns the wheels of the vehicle, when we eat food the photosynthetic energy that plant produces by sun stored in

plants comes to living organism in the form of chemical energy and get distributed in food webs.

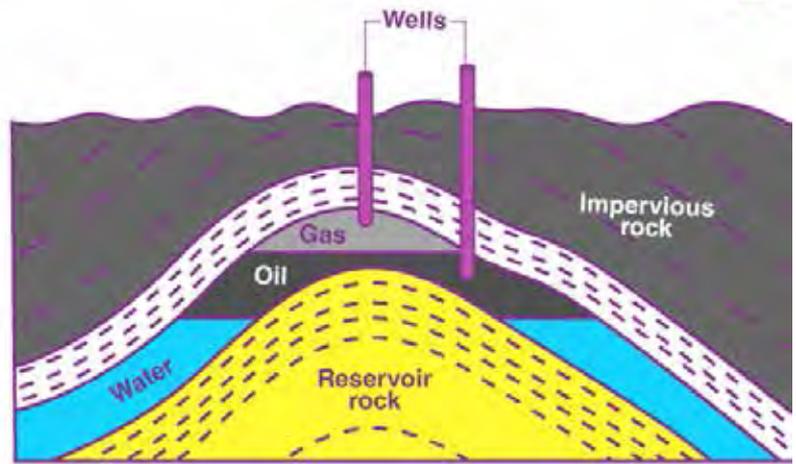
Energy is used for the following purposes:

1. Residential sector- We make use of energy for domestic purpose e.g. Cooking food, heating water, other electrical appliances and for sure the domestic work includes mechanical and muscular energy.

## How fission splits the uranium atom



Source: Adapted from National Energy Education Development Project (public domain)



2. Commercial sector- Use of energy in the commercial sector includes heating, cooling and lighting of commercial buildings and machines.

3. Transport sector- This sector own hundred per cent dependence on energy. Nearly seventy per cent of petroleum and other fuels like diesel go into the transport sector. Without fuel, transport section has no importance but the transport sector gives a lot of contribution to air pollution through the pollutants present in the smoke that is emitted out during the burning of fuel.

4. Industrial sector- This sector uses energy for a wide range of purposes, such as steam and cogeneration, process heating and cooling, lightning, heating and air conditioning for buildings

Today, most energy sources for doing work are non-renewable energy sources, these includes:

1. Petroleum oil
2. Natural gas
3. Coal
4. Nuclear energy

These sources forms a class called fossil fuels which are made from decomposing plants and animals over a period of millions of years. These fuels are found in the Earth's crust and contain carbon and hydrogen, which

can be burned for energy.

Coal is a material usually found in sedimentary rock deposits where rock and dead plant and animal matter are piled up in layers. Oil is originally found as a solid material between layers of sedimentary rock, like shale. This material is heated in order to produce the thick oil that can be used to make gasoline. Natural gas is usually found in pockets above oil deposits. It can also be found in sedimentary rock layers that don't contain oil. Natural gas is primarily made up of methane.

Nuclear power is the use of nuclear reactions to produce electricity. Nuclear power can be obtained from nuclear fission, nuclear decay and nuclear fusion reactions. Presently, the vast majority of electricity from nuclear power is produced by nuclear fission of uranium and plutonium in nuclear power plants.

Though the above sources of energies are widely used, they have several limitations which poses great threat to future generations of humankind, few of the disadvantages are limited quantity and thus exhaustible, their drilling operation disrupts wildlife habitat, they impacts the landscape through the removal of vegetation and increase of erosion which leads to landslides and floods, emits CO<sub>2</sub>, CO,

sulphur and other air pollutants etc.

Unfortunately, fossil fuels are non-renewable resource and waiting millions of years for new coal, oil, and natural gas deposits to form is not a realistic solution. Fossil fuels are also responsible for almost three-fourths of the emissions from human activities in the last 20 years. Now, scientists and engineers have been looking for ways to reduce our dependence on fossil fuels and to make burning these fuels cleaner and healthier for the environment. Scientists all over the world are working to harness the energy from renewable sources to make this feat possible. Some of them have succeeded in utilizing waste to make energy.

Renewable energy, often referred to as clean energy, comes from natural sources or processes that are constantly replenished. While renewable energy is sometimes thought of as a new technology, harnessing the power of nature has long since been used for heating, lighting, transportation, and more. However, over the course of the last few hundred years and especially during the industrial revolution, humans have turned to cheaper and dirtier energy sources. While these are not more abundant than renewable sources like the sun and wind, they



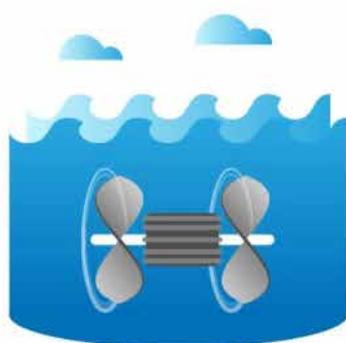
**SOLAR**



**HYDRO**



**WIND**



**TIDAL**



**GEOTHERMAL**



**BIOMASS**

are much more convenient and efficient to use... or, at least, they have been up until now.

These renewable energy sources are important because they provide reliable power supplies and fuel diversification. These help to improve energy security, the environment, and conserve natural resources and habitats.

The major types or sources of renewable energy are:

**Solar Energy:** Sun is considered as ultimate source of energy on earth. Solar energy is the energy derived from the sun. Sun gives energy to plants that comes to our food chain. On commercial scale, the solar energy is stored in devices known as solar cells. The sunlight is allowed to fall on solar panels and then stored in solar cells. Solar energy is harnessed

in the form of light and heat. The solar energy falling on the solar panels is transformed to thermal energy and then this thermal energy is used for various heating purposes. Solar panels have become household items in India now and can be found in rural areas.

**Wind Energy:** Wind energy is obtained from the force of the wind. A large number of windmills are set up in India to harness the power of wind and then generate electricity.

**Tidal Energy:** Tidal wave energy comes from the movement of the sea waves when tides change from high to low.

**Hydraulic Energy:** This type of energy is produced by the water we store in reservoirs or artificial lakes. Examples are Dams which converts potential energy of water to mechanical

energy that rotate turbine to produce electricity.

**Geothermal Energy:** This energy is generated from the heat stored in the earth. This type of energy is used for heating a house or generating electricity.

**Biomass energy:** It is a form of renewable energy that is derived from recently living organic materials known as biomass, which can be used to produce transportation fuels, heat, electricity, and products. Biomass can be derived from plant and algae-based materials that include Crop wastes, Forest residues, Purpose-grown grasses, Woody energy crops, Microalgae, Urban wood waste, Food waste etc.

Renewable energy sources have great advantages over fossil fuels like these types of energy sources are environ-

mentally friendly, abundant, renewable, and sustainable source. They do not release toxic gases like carbon dioxide and don't generate toxic residues harmful to people. Though much industrialization has been done to store energy from renewable sources, they face a major drawback i.e. they depend on nature. Sun can efficiently harness energy in New Delhi in the month of March to July only.

So, the fossil fuels are exhausting and renewable are nature dependent then what would provide a sustainable solution? Bioenergy can be the possible answer to this since biomass is abundantly available in a country like India and has scientists that have potential to convert waste biomass into useful applications using biotechnology which is topic of discussion of next two articles in the series.

To conclude, In the world, The U.S. is the leading biofuel producing country in the world. The United States produced 602,000 barrels of oil equivalent biofuels per day in 2020. U.S. production of biodiesel was 159 million gallons in December 2020.

Also, the Government may seek a long-term solution to stubble burning in northern India, notably Punjab, Haryana and Western UP, by facilitating construction of bio-refineries so that the same can use crop residue to produce ethanol. Bioenergy potential of India has not been understood fully to apply the concept of biotechnology for fuel production and waste to energy promotion which further need heavy investment in the sector for long term benefits, today biomass to energy represent 2.6% and waste to energy represent only 0.1 % share of Total installed capacity of India (Table)

**Table: Total Installed Capacity (As on 31.01.2022)**

INSTALLED GENERATION CAPACITY (SECTOR WISE) AS ON 31.01.2022

Source : Central Electricity Authority (CEA)

Sector	MW	% of Total
Central Sector	98,327	24.9%
State Sector	1,05,314	26.7%
Private Sector	1,91,434	48.5%
<b>Total</b>	<b>3,95,075</b>	<b>100.0%</b>

CATEGORY	INSTALLED GENERATION CAPACITY(MW)	% of SHARE IN Total
<b>Fossil Fuel</b>		
<b>Coal</b>	<b>2,03,900</b>	<b>51.6%</b>
<b>Lignite</b>	<b>6,620</b>	<b>1.7%</b>
<b>Gas</b>	<b>24,900</b>	<b>6.3%</b>
<b>Diesel</b>	<b>510</b>	<b>0.1%</b>
<b>Total Fossil Fuel</b>	<b>2,35,929</b>	<b>59.7%</b>
<b>Non-Fossil Fuel</b>		
<b>RES (Incl. Hydro)</b>	<b>1,52,366</b>	<b>38.5%</b>
<b>Hydro</b>	<b>46,512</b>	<b>11.8 %</b>
<b>Wind, Solar &amp; Other RE</b>	<b>1,05,854</b>	<b>26.8 %</b>
<b>Wind</b>	<b>40,101</b>	<b>10.2 %</b>
<b>Solar</b>	<b>50,304</b>	<b>12.7 %</b>
<b>BM Power/Cogen</b>	<b>10,176</b>	<b>2.6 %</b>
<b>Waste to Energy</b>	<b>434</b>	<b>0.1 %</b>
<b>Small Hydro Power</b>	<b>4,840</b>	<b>1.2 %</b>
<b>Nuclear</b>	<b>6,780</b>	<b>1.7%</b>
<b>Total Non-Fossil Fuel</b>	<b>1,59,146</b>	<b>40.3%</b>
<b>Total Installed Capacity (Fossil Fuel &amp; Non-Fossil Fuel)</b>	<b>3,95,075</b>	<b>100%</b>



# Biofuels in India – a perfect waste to wealth and net zero emission energy option

Kamal Pratap Singh



Since the demand for energy is increasing day by day, the governments in major countries have started to explore options other than fossil fuels and to produce energy from alternative/renewable sources. The Government of India had set an ambitious target of 175 GW renewable power installed capacity by the end of 2022. This target aims to install a total of 10 GW worth of Bioenergy capacity.

Bioenergy so far is especially prominent in rural India since agricultural residues such as straw and cow dung are easily available. As per the Ministry of New and Renewable Energy (“MNRE”), about 32 percent of the

total primary energy use in the country is derived from biomass and more than 70 percent of the country’s population, in one way or the other, depends upon it for their energy needs in the rural regions.

In the previous article in this bioenergy special issue we read about advantages and disadvantages of various sources of energy. The green energy goals of various governments have already explored renewable sources but the least explored is biomass energy.

The biomass energy has become the most seeking waste to wealth source since it is renewable, easily dispos-

able and produce products on every stage of its processing and while other sources of renewable energy like solar, wind, geothermal etc. are dependent on climate, biomass energy can be used all around the year depending upon the availability of biomass from different sources.

Bioenergy is defined as a renewable energy produced from natural sources capable of replacing fossil energy, it is one of many diverse resources available to help meet demand for energy. It is derived from recently living organic materials known as biomass, which can be used to produce transportation fuels, heat, electricity, and other by products.

Biopower technologies convert biomass into biofuels which are then further converted into heat and electricity using processes like those used with fossil fuels. Biomass conversion to bioenergy is done by three processes i.e. combustion, chemical degradation and enzymatic degradation or fermentation. Bioenergy technologies enable the reuse of carbon from biomass and waste streams into reduced-emissions.

Biomass is a renewable energy resource derived from plants and algae-based materials that include Crop wastes, Forest residues, Purpose-grown grasses, Woody energy crops, Microalgae, Urban wood waste, Food waste etc.

***MNRE has set an indicative target of 20 percent blending of ethanol in petrol and 5% blending of biodiesel in diesel to be achieved by 2030.***

India is one of the biggest producer of sugar in the world. In fact India has approx. 550 sugar mills all over the country. In total MNRE is expecting about 5,000 MW power which could be generated through bagasse based cogeneration in these sugar mills itself. As per a recent study sponsored by MNRE, the current availability of biomass in India is estimated at about 750 million metric tonnes per year. The Study indicated estimated surplus biomass availability at about 230 million metric tonnes per annum covering agricultural residues corresponding to a potential of about 28 GW.

Another critical factor to consider biomass energy is that India is highly dependent on crude oil imports, with an approximately 82 percent of total

crude oil imports used to fulfil the domestic consumption demand, which makes this susceptible to price shocks due unforeseen escalations in crude oil prices. India paid \$82.4 billion for the crude oil it imported in the nine months through December 2021, \$101.4 billion of 2019-20 and \$112 billion of 2018-19. India paid \$7.9 billion in 2020-21 and \$9.5 billion in 2019-20 for the import of gas.

Replacing fossil fuels with biofuels—fuels produced from renewable organic material—has the potential to reduce some undesirable aspects of fossil fuel production and use, including conventional and greenhouse gas (GHG) pollutant emissions, exhaustible resource depletion, and dependence on unstable foreign suppliers.

Being the topper in Bioenergy sector in world, its Department of Energy's 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy concluded that the United States has the potential to produce 1 billion dry tons of non-food biomass resources annually by 2040 and still meet demands for food, feed, and fiber. One billion tons of biomass could:

- Produce up to 50 billion gallons of biofuels including cellulosic ethanol, biodiesel, and renewable hydrocarbon
- Yield 50 billion pounds of bio-based chemicals and bioproducts such as plastics, lubricants, industrial chemicals, and many other products currently derived from petroleum or natural gas.
- Generate 85 billion kilowatt-hours of electricity to power 7 million households
- Contribute 1.1 million jobs to the U.S. economy
- Keep \$260 billion in the United

States.

In the last two decades, energy from Solar panels have become common source of it and heavily incentivized by governments. This has led to the reach of solar energy in rural areas too.

First generation biofuels are made from sugar crops (sugarcane, sugar-beet), starch crops (corn, sorghum), oilseed crops (soybean, canola), and animal fats. Sugar and starch crops are converted through a fermentation process to form bioalcohols, including ethanol, butanol, and propanol. Oils and animal fats can be processed into biodiesel. Ethanol is the most widely used bioalcohol fuel. Second generation biofuels, or cellulosic biofuels, are made from cellulose, which is available from non-food crops and waste biomass such as corn stover, corncobs, straw, wood, and wood by-products. Third generation biofuels use algae as a feedstock.

Energy can be recovered from Biomass by major two types of conversions

- (a) Thermochemical Conversion
- (b) Biochemical conversion.

Thermochemical conversion methods employ the basic principle of the breakdown of organic waste by the action of heat. This group includes procedures like incineration, pyrolysis, and gasification, among many other.

Biochemical conversion involves using microorganisms, their associated enzymes, or a range of chemicals to bring about the utilization of the limited range of available biomass. This process's productivity is limited, and an increase in productivity would need a higher investment in terms of capital, such as the installation of big-

ger reactors. The number of products that can be derived from this process is usually one to few, and to increase the number of products, additional microbial cultures, and associated enzymes would be needed. Anaerobic digestion is the method of converting biomass into energy. In this process, organic material is broken down by bacteria, in the absence of oxygen, to create methane-rich biogas. This can then be burned to generate heat and electricity. The solid waste from the process is called digestate and can be used in a similar way to compost or further can be used to obtain other energy products. The biological process has several advantages like:

- Methane - released to the atmosphere during normal storage and utilisation of farm slurries. Methane is 23 times more potent as a greenhouse gas than carbon dioxide (CO<sub>2</sub>). Anaerobic digestion (AD) collects methane and provides a source of renewable energy that is carbon neutral i.e. provides energy with no net increase in atmospheric CO<sub>2</sub>.
- Fertiliser - compared to undigested slurry, the nitrogen in digestate is more readily available as a plant nutrient.
- Pollution - AD can lower the biological oxygen demand,
- Pathogens - pathogens in the feedstock, such as salmonella, are lowered by AD.
- Weed seeds - AD kills many weed seeds and hence there is less need for herbicides.
- Plant nutrients - management of plant nutrients is aided

by mechanical separation of the digestate. Plant nutrients in the fibre fraction can be exported off farm as a soil conditioner, or further processed into granular organic fertiliser or combustible fuel.

The Bioenergy products can be listed as follows

## Bioethanol

In the whole world, the highest producers of bioethanol fuel are the United States and Brazil they produce approximately 62%. Globally, around 60% production of bioethanol is done through the fermentation process. The procedure of bioethanol production is divided into three parts. Firstly, it involves a pre-treatment stage so that the hydrolytic enzymes are easily accessible to get converted into sugars (Zabed et al., 2017). Secondly, the enzymatic hydrolysis is done of cellulose, hemicellulose, and starch. Thirdly sugars are converted into ethanol due to microbiological fermentation (Rezania et al., 2020).

## Biohydrogen

Biohydrogen has gained a lot of attention due to its production through biomass. In production of biohydrogen biomass is categorized into first, second and third generation. The first generation of biomass contains high sugar content crops and starch like potato, sweet sorghum, sugar beet, pumpkin, wheat, oily plants, and seeds as well as their residues obtained after getting treated, which are purposefully grown for plants and animals. The second generation of biomass contains forest wastes, non-edible remaining of crops, agricultural wastes, organic wastes and waste water obtained from industrial, agricultural and domestic sectors are

reported as substrates for production of biohydrogen. The third-generation of biomass is composed of microorganisms like *Ulva lactuca*, *Gelidium amansii*, *Laminaria japonica*, *Chlorella* sp. etc, which catalyses in production of biohydrogen.

## Biopolymers

production through food wastes, crop residues, and animal wastes has gained a lot of attention in recent years. The production of biopolymer through food wastes could be accomplished by fermentation or extraction with pre-treatment or, without pre-treatment by solid-state fermentation to acquire fermentable sugars. Biopolymers such as pectin, starch, cellulose, collagen, and chitin are generally derived from industries of agricultural waste. They are used in many industries like pharmaceutical, leather, food, and cosmetics. The production rate of biopolymer is very high in the global market of plastics, in contrast to the surge of pollution in the world.

## Biogas

Biogas is produced when bio-degradable organic materials/wastes such as cattle-dung, biomass from farms, gardens, kitchens, industry, poultry droppings, night soil and municipals wastes are subjected to a scientific process, called Anaerobic Digestion (A.D.) in a Biogas Plants. Biogas Plant designs depend upon several factors and the feed stock to be processed is of paramount importance. Biogas is the mixture of gases (primarily methane (CH<sub>4</sub>) and Carbon di-oxide (CO<sub>2</sub>) and traces of Hydrogen Sulfide (H<sub>2</sub>S), Moisture) produced by the decomposition/breakdown of bio-degradable organic matter in the absence of oxygen from raw materials. The digested slurry produced from Biogas Plants as a by-product is a better source of

nutrient enriched organic manure for use in Agriculture. Biogas gives direct financial returns when used to generate electricity. Including the value for renewable obligation certificates (ROCs) further increases these returns. Use of a combined heat and power (CHP) unit to produce electricity and hot water is of further benefit, provided the heat produced can be utilised fully to heat the digester and for export. Biogas can also be used in modified gas boilers to produce hot water for use on site, or for export. In addition, biogas can be scrubbed of impurities and fed into a natural gas grid, or used as a fuel for cars, buses and trains.

## Biodiesel

Biodiesel is a highly efficient and environment-friendly substitute of regular diesel. The fuel is essentially a long chain mono alkyl ester of fatty acid produced from by product and waste product of vegetable oil origin or animal fats which is called FAME (Fatty acid methyl ester). Since biodiesel is produced from organic sources, it is 100% renewable. It not only ensures perfect power output but also guarantees excellent engine performance. Additionally, the use of biodiesel leads to a decrease in harmful emissions by a significant 80%. Oil Marketing Companies in India (IOCL, HPCL, BPCL) blend Biodiesel (B-100) upto 5% to Petro Diesel & Sale the Blend through their Retail Outlets.

Indian Railways uses 5% blend of biodiesel with petro diesel to run its locomotives. *Jatropha Curcas* is a low-cost biodiesel feedstock with good fuel properties and more oil than other species.

It is as bio-degradable as sugar, ten times less toxic than table salt.

It has higher flashpoint of about 125°C as compared to petro diesel which has a flash point of less than 60°C, hence its easy & safe for handling & storage.

Unlike regular petrol or diesel, biodiesel is produced from biodegradable vegetable and animal fats. As compared to Petro Diesel, Biodiesel Reduces Carbon Emission by approx. 80% & Sulphur Emission by almost 100%.

Biodiesel has almost 11% inbuilt Oxygen which helps complete Burning of the Petro Diesel after Blending, hence increases the efficiency of the blend.

It ensures constant lubrication to the Engine & also acts as a cleanser, thus increases life cycle of the Engine & reduces Maintenance/Overhaul Expenses.

Biodiesel provides the same power output as petro diesel

As an alternate Fuel, Biodiesel is broadly used in Automobiles, Construction & Mining Equipments, Farming Equipments, Diesel Locomotives, Boilers and Diesel Generators, etc. It is also being used as raw materials for specialty chemicals, Jute & Textile, etc.

## Bioglycerine

Bioglycerine could be selected as fuel based on the current energy situation, since it is obtained as a byproduct in the transesterification process of vegetable oils for biodiesel production. The transformation of glycerol into biofuel in the form of hydrogen is possible, and therefore it is postulated as an alternative to be considered. For this purpose, it is proposed a first stage of hydrogen production by reforming of bioglycerine. Because this glycerol is expensive to purify for use

in the food, pharmaceutical, or cosmetics industries,

Problems in biomass energy implementation

Nevertheless, in the current scenario, bioenergy remains an under-explored and under-utilized sector. Generic barriers, mostly institutional, technical and financial manner, made it difficult for India to develop a Bioenergy footprint. The initial investment required for Bioenergy technology is high. This along with the fact that Indian Government follows long and complex licensing requirements and environmental pollution standards, make it in general difficult for new competitors to enter the market. Additionally, one problem regarding biomass from agriculture is that it is usually just available for a short period after harvesting. Therefore market mechanisms have to be developed for procurement and safe storage of biomass in an efficient way, which ensures a solid supply throughout the year.

## Government initiatives

**Mandatory renewable energy targets** are part of government legislated schemes which require electricity merchandisers to source-specific amounts of aggregate electricity sales from renewable energy sources according to a fixed time frame. The objective of these schemes is to promote renewable energy and decrease dependency on fossil fuels.



# Bioenergy: India's Ministry of New and Renewable Energy started almost four decades ago...but did not catch up... Professor Ashok Pandey

Prof Ashok Pandey is the top scientist who is having h-index at 117, 2nd highest in India. His major research and technological development interests are in industrial and environmental biotechnology, which span over biomass to fuels & chemicals, waste to wealth/energy, industrial enzymes, solid-state fermentation, etc. Professor Pandey is currently Distinguished Scientist at Centre for Innovation and Translational Research, CSIR-Indian Institute of Toxicology Research (IITR), Lucknow, India and Honorary Executive Director at the Centre for Energy and Environmental Sustainability- India. Formerly, he was Eminent Scientist at the Center of Innovative and Applied Bioprocessing (CIAB), Mohali and Chief Scientist & Head of Biotechnology Division at CSIR's National Institute for Interdisciplinary Science and Technology (NIIST) at Trivandrum.

**Here are the excerpts of talk about bioenergy in India with Professor Ashok Pandey**

**When India took initiatives toward biofuel?**

Early 2000, there has been global resurgent, especially with focus on biofuels, primarily for energy and environmental sustainability. Early leads

were taken by CSIR institutes, mainly NIIST Trivandrum together with IIP Dehradun. NIIST team was led by me with team which worked as India Country Consultant for International Energy Agency for developing biofuels in India.

**What was this consultation all about?**

The report – based on scientific find-

ings from the study conducted by us strongly advocated bioethanol from lignocellulosic biomass (chiefly crops residues) but did not support going for biodiesel production in India due to non-availability of feedstock (vegetable oils). My co-workers and I prepared the position paper on biofuels for the Technology Forecasting, Information and Assessment Council (TIFAC, DST, Govt of India) and also brought out the Biomass Availability

## BOX: About Professor Ashok Pandey

Prof Pandey has ~1600 publications/communications, which include 16 patents, 108 books, ~850 papers and book chapters, etc with *h* index of 117 and >59,000 citations (Google scholar). He is highest cited Indian scientist in Biotechnology.

He has transferred several technologies to industries and has completed large number of industrial consultancy/sponsored projects from Indian/International industries.

Prof Pandey is Editor-in-chief of Bioresource Technology, Honorary Executive Advisor of (i) Journal of Energy and Environmental Sustainability, (ii) Journal of Systems Microbiology and Biomanufacturing (iii) Journal of Environmental Sciences and Engineering; Subject Editor, Proceedings of National Academy of Sciences, India; Associate Editor, (i) *Biologia* – Section Cellular and Molecular Biology and (ii) Biotechnology Research and Innovation and editorial board member of several international and Indian journals.

Professor Pandey is the recipient of many national and international awards and honours, which include Distinguished Professor of Eminence with global impact in the area of Biotechnology, Precious Cornerstone University, Nigeria (2020), Highest Cited Researcher (Top 1% in the world), Clarivate Analytics, Web of Science (2019); IconSWM Life-time Achievement Award 2019, International Society for Solid Waste Management, KIIT, Bhubaneswar, India (2019); Yonsei Outstanding Scholar, Yonsei University, Seoul, Korea (2019), Highest Cited Researcher (Top 1% in the world; Top 10 in India), Clarivate Analytics, Web of Science (2018); Life-Time Achievement Award from the Biotech Research Society, India (2018); Life-Time Achievement Award from Venus International Research Awards (2018), Most Outstanding Researcher Award from Career360 (2018), Life-Time Achievement Award from the International Society for Energy, Environment and Sustainability (2017); Academician of European Academy of Sciences and Arts, Austria (2015); Honorary Doctorate degree from Univesite Blaise Pascal, France (2007); Thomson Scientific India Citation Laureate Award, USA (2006); UNESCO Professor (2000); Raman Research Fellowship Award, CSIR (1995); GBF, Germany and CNRS, France Fellowships (1992) and Young Scientist Award (1989), etc. He is Fellow of various academies, which include Royal Society of Biology, UK (2016); International Society for Energy, Environment and Sustainability (2016); National Academy of Sciences, India (2012); Association of Microbiologists of India (2008), International Organization of Biotechnology and Bioengineering (2007) and the Biotech Research Society, India (2005).

Professor Pandey is Founder President of the Biotech Research Society, India ([www.brsi.in](http://www.brsi.in)); Founder & International Coordinator of International Forum on Industrial Bioprocesses, France ([www.ifbiop.org](http://www.ifbiop.org)), Chairman of the International Society for Energy, Environment & Sustainability ([www.isees.in](http://www.isees.in)), Editor-in-chief of Bioresource Technology (<http://ees.elsevier.com/bite/>), Honorary Executive Advisor of Journal of Energy and Environmental Sustainability ([www.jees.in](http://www.jees.in)), Journal of Systems Microbiology and Biomanufacturing (<https://www.springer.com/journal/43393>), Journal of Environmental Sciences and Engineering (<http://neerijese.org/editorial-board/>), Subject Editor, Proceedings of National Academy of Sciences, India (<https://www.springer.com/life+sciences/journal/40011>) and Associate Editor, *Biologia* – Section Cellular and Molecular Biology (<https://www.springer.com/journal/11756/editors>) and editorial board member of several international and Indian journals.

Professor Pandey is or has been Adjunct/Visiting Professor/Scientist in universities in France, Germany, Brazil, Argentina, Mexico, Canada, China, South Korea, South Africa, Malaysia, Thailand, Switzerland, USA, UK, etc and also in several universities several in India.

Report in India (published by TIFAC, DST), which identified major crop residues availability in different regions of India. This has been a unique source of such information- first of its kind in India, which was a great contribution to bioenergy research and policy in the country.

## **Why this report did not support biodiesel, what other biofuels it considered to go forward?**

The report clearly brought out the fact that there was no surplus feedstock, i.e., vegetable oil in our country to use them for the production of biodiesel. In fact, almost 50% of our vegetable oil requirement for food application itself needed import from other countries. Our report was very clear that there was no possible of using any food material for fuel production (which became later the part of National Biofuels Policy also), hence, we strongly recommended not to go for biodiesel production as part of biofuels but gave clear scientific basis and perspectives for the production of bioethanol from surplus available feedstocks to meet the requirement of 10% blending in gasoline (as was proposed that time). We identified some major crops residues (rice straw, sorghum biomass, sugarcane trash/bagasse, bamboo waste, etc) available in

different parts of the country and suggested to undertake techno-economic feasibility studies and scale up.

## **So why India is lagging behind USA and Brazil even after more than two decades of research and development?**

Interestingly, due to pseudo-scientism, there have been a group of wasted interest people who were too keen to take forward biodiesel program in the country. But, bogus science and fake claims do not survive in science. This was well proven here. DBT which is the key department under Govt of India and for biofuels policy in the country withdrew the biodiesel policy after some years- the reason was what same as stated by our report to IEA- non-availability of feedstock to produce biodiesel.

Crores of rupees were wasted in the name of biodiesel research and technology development when it was ample clear that there was not enough feedstock available in India for biodiesel production. As far as bioethanol is concerned, substantial work has been carried out by several institutes and universities. NIIST, Trivandrum undertook several major initiatives and project in collaboration with other organizations. These were chiefly

supported by TIFAC, New Delhi and CSIR. What is very clear that while there has been substantial achievement in the development of technology, primarily focussed on biochemical platform, the cost of the production of bioethanol is far more high than the cost of ethanol produced from the conventional sources, i.e., primary molasses.

It is a flawed approach to consider the cost of ethanol produced from molasses and lignocellulosic biomass identical or almost identical. However, here also some people (academicians and others) made a hype that they have developed technology to produce bioethanol cheaper/equivalent to the cost of molasses ethanol. Claims were fake but they enjoyed getting appreciation, funds in crores of rupees, awards, etc for several years, chiefly with the huge support from a govt department and its managers) but ultimately truth was to come out one day and that came. I am not interested in telling you what happened to such people and projects, but to sum-up, it is the high cost of production of bioethanol which is prohibitive currently for its popular commercialization. I must also emphasis here that in this regard, the weightage for sustainability benefits to the environment considerations have not been duly given, and also, there is lack of policy enforcement.

## What other consultancy on biofuel have you provided to Indian science community?

With my team, I also prepared position paper on biofuels for CSIR which has been the flag carrier for the bioethanol in CSIR/ India and our efforts led to the establishment of first pilot plant on this in NIIST, Trivandrum- the only pilot plant in public sector in the country. We brought the concept of biorefinery with zero waste generation and also established a pilot plant for the production of biomass hydrolysing enzymes. Note that both the pilot plants are national facilities and available to anyone for use. Without any hesitation I can share with you that I led to develop several national and international networks and collaborations on energy and environment program, where sustainability has been given a major thrust.

## What are the current suggestions for the bioenergy sector?

While there is National Biofuels Policy in place, there is lack of vision and enforcement for the bioethanol (second generation) commercialization. Also, not much efforts are being put (in comparison to global efforts) on third and fourth generation biofu-

els and green energy in the country. There are policy contradictions; we intend to use electric vehicles very soon, but without a clear pathway from where we will produce electricity to meet the requirement of additional electricity for those vehicles. I fully endorse development and use of electric vehicles in our country; I also strongly believe that there may not be a single solution to achieve energy and environmental sustainability in our country and to meet the commitments made by our govt and we must keep our efforts to develop indigenous technologies for various kinds of energy, mainly solar energy, bioenergy (biofuels primarily), biogas (also nuclear). However, in context of electric vehicles, note that currently we do not produce enough electricity in the country to meet domestic and industrial demand. Then are we going to burn more coal to generate additional requirement of electricity? If so, will it not produce more CO<sub>2</sub> than what we will save by not using diesel? Has there been any life-cycle and systems analysis to move on this? These all show that there is lack of scientific planning and no clear path for developing green energy. Why so? Is there lack of experts to address this in our country? Obvious answer is NO. There is no dearth of highly skilled and experienced experts in the country but the main issue is not involving right people for such developments, including policy framework and implementation.

## Where you see yourself in green energy 2030 and then 2050 goal?

I very strongly believe that my thoughts and actions are fully dedicated and aligned to achieve these visions and plans. The (good) question is that how are we positioning ourselves for these? Obviously, these require hand-holding of experts (not fake ones) together with policy makers and (industrial) developers. As for me, I have always put the country ahead of me. I do not want to tell you about my contributions and credentials in this regard as these have been well described and mentioned by global agencies, putting me on top position in India in terms of citations of world class publications in energy and environmental areas and several other topmost credentials in the world. However, sometimes I wonder that despite all above, perhaps I have not fully contributed for my country what actually should have been the case. Is this because of nepotism in scientific community in our country? Whatever be the case, I am also confident that our government under the premiership of Sri Narendra Modi will certainly see the quantum of our scientists and will break this nepotism atmosphere for the betterment of country which in turn will be simply enormous beneficial for energy and environmental sustainability.

Professor Pandey is Founder President of the Biotech Research Society, India; Founder & International Executive Coordinator of International Bioprocessing Association, France, and Chairman of the International Society for Energy, Environment & Sustainability.



Image source: <https://www.ifbiop.org/gallery/>

## **Apart from Bioenergy research how you are advancing science in India?**

I strongly believe (and have practised the same since more than four decades of my professional career) that opportunity to get a right platform to showcase one's scientific credentials and to network and collaborate with complimentary people and team are key for doing high quality science with technological orientation. With this vision, I discussed in early 2000 with a large number of leading academicians and researchers in the country (in the area of my broad RTD, which is Biotechnology), I created and established a national professional society, the Biotech Research Society, India ([www.brsi.in](http://www.brsi.in)) in 2003 (founded on 2<sup>nd</sup> October 2003).

With great pride and extreme satisfaction I can tell you that today BRSI is one among the most respected and active professional society in India with about 3000 life-members, which has offered a most unique platform for networking and collaboration to the

Indian researchers, offering potential learning opportunity for younger ones. As by this time, I had already several international collaborations, I also discussed with my international colleagues and we created a similar international forum, International Bioprocessing Association (IBA- [www.ifbiop.org](http://www.ifbiop.org)) which also has a similar agenda like BRSI. Both BRSI and IBA are very popular among Indian researchers working in the cross fields of Biotechnology, Microbiology, Energy Biosciences, Environmental Science and Technology, Biological Engineering, etc, including industries and policy planners.

## **Any message to energy science leaders and scientists?**

There is no alternative to doing good science, the results of which should be disseminated by way of high quality publications but after a careful analysis for their value for technology development. Those findings which could have application potentials should be saved as patent and for fur-

ther development, possibly with industrial linkages. However, it must be clear to all that everyday none can get novel or new results and that only a few could lead to develop a technology. Never indulge in a discussion or argument to do a basic/fundamental or applied research. Do good science which will be good research; good research should be known to scientific community, including industries through publications. I must share with you here that all the industrial projects, including technology transfers which I have done so far, has been based on our publications which were seen by the industries and based on these, they contacted us. I would like to appeal to those sitting on helm of affairs to not confuse the researchers, especially the younger ones by saying "we don't want papers; we want only technologies"; also, be sober enough to not insult the knowledge by using loose phrases such as "we don't want paper scientists". Respect knowledge and contributions made.

**Thank you.**



## Emami Agrotech Limited (EAL) - Indian

Emami Agrotech Limited (EAL) is a leading Manufacturer of Biodiesel (B-100) in India and supply biodiesel to various Applications and Industry Sectors across the country and has Annual Turnover of Rs. 5000 - 10000 Crore.

At Emami Agrotech, Biodiesel is manufactured through a three-stage reaction process. The chemical process called 'Transesterification' splits the feed stock into two parts Biodiesel and Glycerol. Once this happens, the Biodiesel obtained undergoes washing, drying and filtration. Glycerine (80% glycerol minimum and MONG 3% Max) is sold in the open market to its various users like Refiners, Soap, Paint and Cement Manufacturing.

The glycerol obtained as a by-product of biodiesel manufacturing also undergoes refining. Emami Agrotech stores its biodiesel in tanks on the ground in a clean, dry and dark environment. Acceptable storage tank materials include aluminium, steel, fluorinated polyethylene, fluorinated polypropylene and Teflon. Copper, brass, lead, tin, and zinc are generally avoided.



The Company delivers Biodiesel (B-100) from its state-of-the-art factory in 20 or 29 KL tankers. Other methods include supply in 200 Litre Drums for requirement of lower volume. Biodiesel produced by Emami Agrotech Limited can be blended by simply mixing it with Petro-Diesel.

EAL has its state of the art Biodiesel Plant in Haldia, West Bengal with a Production Capacity of 350 tons of Biodiesel (B-100) per day. It has a state of the art NABL accredited Laboratory at Haldia and the Biodiesel Plant has ISO 9001-2008, ISO 14001, OHSAS 18001 & ISCC (International Sustainability & Carbon Certification) Certifications.

EAL is one of the major Suppliers of Biodiesel (B-100) to the Oil Marketing Companies (IOCL, HPCL, BPCL) in India who further blend and sell B7 through their Retail Outlets and is the lead Supplier of Biodiesel (B-100) to Indian Railways for their use of B5 in Diesel Locomotives.

Emami Agrotech Limited is the First Organization to Supply Biodiesel:

For use in Marine & Loco applications in Kolkata Port Trust, Haldia Dock Complex

To State Transport Corporation (West Bengal Transport Corporation)

For making Batching Oil for Jute Industry

EAL is also the first Organization to get RDSO approval for supply of Biodiesel to Indian Railways.

Emami Agrotech Limited is committed to deliver the best Quality Biodiesel (B-100) to its consumers and thereby help in reducing green-house gas emission to make a cleaner & greener India.

## Renewable Biofuels (RBF) - North America

**RBF owns and operates the BQ9000 certified, multi-feedstock RBF Port Neches Facility - the largest biodiesel production facility in North America - which became operational in December 2008. RBF has been serving wholesale biodiesel customers for almost 10 years and has, in that time, developed a reputation for consistently and efficiently delivering the highest quality biodiesel.**



The Port Neches Facility, the largest biodiesel production facility in the US, consists of two parallel process units for pretreatment and transesterification. The biodiesel production facility became operational in December of 2008 and has produced over 750 million gallons of ASTM D6751 compliant biodiesel. With more than seventeen million gallons of storage capacity, along with a deepwater port (42' draft), rail access (KCS line) and proximity to several major refineries and terminals, the Port Neches site has unprecedented access to biodiesel feedstock and biodiesel blendstock markets. Integration with Huntsman's olefins and oxides complex in Port Neches, Texas, allows Renewable Biofuels to capture the benefits of Huntsman's existing infrastructure.

RBF is a BQ-9000 accredited Biodiesel Producer that makes ASTM D6751 biodiesel and EN 14214 biodiesel. BQ-9000 is a voluntary

program in the U.S. and Canada, in which biodiesel producers, marketers and laboratories adhere to a comprehensive quality manual built upon the foundation of ASTM D6751. The backbone of any successful industry is quality, and the BQ-9000 Program is integral in building and maintaining consumer confidence in biodiesel.

RBF Port Neches is a certified biofuel producer under the International Sustainability and Carbon Certification (ISCC) program. ISCC is one of the officially recognized sustainability programs for compliance with the European Commission's Renewable Energy Directive as well as other compliance regimes.

## Universal Biofuels - American Indian

**Universal Biofuels is a wholly owned subsidiary of Aemetis, Inc., United States. Aemetis, Inc. is headquartered in Cupertino, California and is an industrial biotechnology company producing renewable chemicals and fuels using patented microbes and enzymes. Universal Biofuels Private Limited operates an integrated renewable chemical, fuel and natural oil production facility in Kakinada, India.**



UBF facility is connected via pipeline to the deep-water port of Kakinada and is licensed to sell chemicals and fuels in the domestic Indian market and into the international market through its Export Oriented Unit status. Approximately 45 full-time employees operate our Kakinada facility.

UBF Kakinada, India facility operates three refining units: biodiesel, glycerin and natural oil. Biodiesel, produced from non-edible natural oils, is sold as a chemical in the textile and fuel markets. Glycerin has multiple applications as a specialty chemical in the paint, textile, cosmetic, and medical industries. Natural Oils are sold into the Indian food market, mainly to industrial bakers and oil refiners.

UBF Facility Capabilities and Features - Kakinada facility

- Produce 450 tons per day of biodiesel (50 million gallons per year);
- Pre-treat 400 tons per day of crude palm oil (40 million gallons per year);
- Produce 55 tons per day of refined glycerin (4 million gallons per year);

In addition, Kakinada facility has:

- The ability to produce, purge and blanket nitrogen in-house;
- 21,000 ton storage capacity (6 million gallons);
- 7 km underground pipeline connection to the deep-water port of Kakinada; and
- Excellent lab facilities which includes equipment necessary to certify our products against desired specifications (E.g. Kosher, ASTM, EN, IP, USP, et cetera)



## TOMSA DESTIL - Spanish Indian

TOMSA DESTIL is a Company with over 165 years of experience in the alcohol sector. In the late 90's, the company undergoes major changes in its structure and the new company Tomsa Destil S.L. is created. During that period the company decides to leave behind the ownership of distilleries focusing its activities in the engineering and construction of ethanol plants. Since 1997, Tomsa Destil has built over 500 projects all around the world with distillation units ranging up to 1,000,000 litres per day.

In the last 20 years Tomsa Destil has developed projects in more than 33 different countries. Tomsa Destil have offices in Spain, USA, Mexico, and India and our commercial network extends to more than 20 countries.

In the biological area Tomsa Destil count with experienced technicians in the selection of microorganism, isolation and improvement of productive species, freeze dried of yeasts, investigation of fermentation and hydrolysis, etc.

Regarding the field of isolation, Tomsa Destil exceed in the distillation and dehydration of any mixture of alcohols and sub products. In the field of waste water treatment Tomsa Destil have worked in several processes of chemical oxidation of polluting substances, aerobic and anaerobic bio digesters, calculation of BOD, QOD, COV, etc. Tomsa Destil focus its research in microbiology, fermentation and 2nd generation alcohol. Tomsa Destil also provide services for liquids and gas chromatography, alcoholometry and any other chemical analysis.

Among R&D infrastructure Tomsa Destil possess a 1,000 litres fermentation unit for scaling up from lab size. This unit is designed in skid for transportation to perform tests at our clients site. Tomsa Destil also count with a 1,000 litres/day complete pilot plant, including fermentation, distillation and evaporation for testing our results in semi-industrial size plant.

Tomsa Destil India Pvt. Ltd. is located in India in 306/307, Laxmi Complex, Pune Mumbai Road, Chinchwad Station, Pune 411018, Maharashtra, India, T. 020 66304770, [info@tomsadestil.in](mailto:info@tomsadestil.in)

## Shree Renuka Sugars - Indian

**Shree Renuka Sugars (NSE Listed) is a global agribusiness and bio-energy corporation. The Company is one of the largest sugar producers in the world, the leading manufacturer of sugar in India, and one of the largest sugar refiners in the world.**

The company is an excellent example of waste to energy biofuel industry. The Company manufactures fuel grade ethanol that can be blended with petrol. Distillery capacity is 930 KLPD (630 KLPD from molasses to ethanol and 300 KLPD from rectified spirit to ethanol). The Company produces power from bagasse (a sugar cane by product) for captive consumption and sale to the state grid in India. Total Cogeneration capacity is 242 MW with exportable surplus of 135 MW. Bhumadur is an organic manure produced out of sugarcane press mud and distillery spent wash and is rich in organic matter, macro, micro nutrients and beneficial microorganisms. It is a 100% natural product that enriches the soil fertility and useful for all soil types and crops which includes field crops, Fruits, vegetables, plantation crops, kitchen gardens and lawns etc.

KBK Chem-Engineering (100% subsidiary) facilitates turnkey distillery, ethanol and bio-fuel plant solutions.

## Biomax Fuels Limited - Indian

**Biomax Fuels Limited has among the largest Biodiesel facilities in the world. One of their facilities has a manufacturing capacity of 500,000 Tonnes per annum from Multi Feedstock at the Visakhapatnam Special Economic Zone (VSEZ), Visakhapatnam, Andhra Pradesh in South India. Biomax Fuels has a manufacturing capacity of 5 lakh tonnes of bio-diesel from multi-feedstock at VSEZ. There are about 18 storage tanks including six tanks of 5,000 kl; 12 tanks of 2,500 kl; and two tanks of 1,000 kl each.**

According to Zauba, Biomax Fuels Limited is a Public incorporated in September 2005. It is classified as Non-govt company and is registered at Registrar of Companies, Vijayawada. Its authorized share capital is Rs. 1,584,999,940 and its paid up capital is Rs. 1,540,920,060. Directors of Biomax Fuels Limited are Abhimanyu Rath, Kalyan Chakravarthy Mula, Anila Gouri Mula, Ravinder Mula, Ramana Kumar Chejarla.

BIOMAX Group has state of the art GMP level manufacturing facilities in Hyderabad, Visakhapatnam and Chennai with due accreditation from the Department of Scientific and Industrial Research, Department of Science (DSIR), Government of India, New Delhi. The biotech company is the second largest producer of natural carotenoids globally and has developed a highly innovative technology for the manufacture of biodiesel from algae.

The Biodiesel Production Capacity from Multi Feedstock of the Chennai facility is 30,000 TPA while that of the Visakhapatnam Facility is 500,000 TPA. Being multi feedstock facilities with inhouse developed proprietary technology, both plants have very high adaptability and cost efficiency. Biodiesel produced from our facilities are technically exceeding in quality at a global level. We are among the few companies in the world whose biodiesel passes Cold Soak Test.



## My Eco Energy- Indian

MEE the Only Company Which has been exempted from requirement of authorization / permission for marketing Indizel (Renewable Diesel)(biofuel). My Eco Energy is constantly creating renewable fuel solutions and green energy innovations to create a happier, clearer, brighter India. The company is dedicated to the mission of sustainable development to deliver a powerful green fuel experience across the country.

My Eco Energy's flagship brand 'Indizel (Renewable Diesel)' is one of the world's most advanced fuels and a true alternative to diesel. Indizel (Renewable Diesel), allows MEE to offer an ultra-premium, low-emission fuel which is compatible with all diesel engines. Indizel (Renewable Diesel) is recognised as a drop-in fuel as per National Policy on Biofuels, 2018 and is manufactured, processed and tested. Indizel (Renewable Diesel) is an automotive diesel made from

non-fossil sources which meets the automotive diesel fuel standards of BIS:1460 (Indian) and EN590:2013 (European), which are also the recommended standards by all automotive manufactures for usage of fuel in their vehicles. It is located in Maharashtra and ahmedabad

## The BioDiesel Association of India

The Biodiesel Association of India (BDAI) is a non-profit national association representing the biofuels sector, and in particular the biodiesel industry as the co-ordinating body for marketing, research and development in the country to encourage Biofuels, especially Biodiesel & Compress Biogas and assure sustainable agricultural growth, rural development, energy security and equal opportunity for the masses with overall environmental protection.

BDAI's membership is comprised of UCO Aggregators, Biodiesel manufacturer, Feedstock Plantation Organizations, Biodiesel suppliers, Fuel marketers & Distributors and Technology providers.



## Abellon Clean Energy - Indian

Abellon offers several significant advantages including globally proven, industrial scale, mature, and environmentally compliant technology, as well as end-to-end traceability and accountability of the waste, which makes us a preferred waste management agency to help fulfill EPR obligations.

- 5 Operating Plants with total capacity of 45 MW.
- 5 Upcoming Plants with total capacity of 65 MW.
- 6 Segregation Facilities with total capacity of 3100 TPD.

Abellon has evolved an integrated and sustainable model for converting waste into clean energy, with focus on stringent emission control and reduction in PM 2.5 levels, resulting in improved air quality, healthier people, and a cleaner and greener nation. We are a pioneer in the Waste-to-Energy sector in India, with a vision to contribute to nation building through sustainable energy solutions for Power, Heat and Transport. In the rural segment, our focus is on decentralized regional waste to energy plants that use innovative blends of agricultural and other forms of waste to generate clean power for the grid as well as use of industries to meet their Renewable Power Purchase Obligations.

Abellon has a wide range of eco-friendly, carbon neutral solid biomass pellets, as well as eco-equipment that can effectively replace LPG, Diesel and other fossil fuel-based systems across a broad spectrum of applications, especially in the commercial and industrial energy generation, heating and cooking segments, and for co-firing with fossil fuels such as coal and lignite in power plants.

One of the key features of Abellon's waste to energy projects is the capability to process heterogeneous waste in a sustainable and environment friendly manner.

Note: Biotech Express though this magazine do not endorse any bioenergy company or product. The information is gathered from public sources and the editors are not responsible for any information included in this article.





# GENE EDITED-CRISPERED FLOWERS: Blooming with grace

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Flowers are the most beautiful creation of God. Their sight is a joyful feeling. The sweet smell of flowers makes the air pleasant to breathe. Flowers add colour to rooms or gardens and mend the quality of life. They are of various colours and hues. Even the same species of flowers exist in several forms and tinges. Cut flowers, namely rose, lily, chrysanthemum, lisianthus, tulip, gerbera, freesia, alstroemeria, carnation and hydrangea, car-

nations, and chrysanthemums, are commercially important and are sold all over the world.

The global floriculture business is growing at the rate of 6-10 % per annum. India ranks 18<sup>th</sup> in floriculture trade and has only 0.61 percent share in global floriculture trade (Vahoniya et al., 2018). Development of new varieties, cultivation, marketing and value-added products are essential for the success

of floriculture industry. Promoting flowering and flower longevity as well as creating novelty in flower structure, colour range and fragrances are major objectives of ornamental plant breeding.

Various strategies for plant breeding have been employed to improve or enhance colour and shape variation, plant architecture, shelf life, and disease resistance. Multiple cultivars have been developed



on the basis of crossbreeding and mutation breeding approaches, which can be applied to a limited number of traits. Transgenic technologies also can enhance ornamental plants by modifying or engineering changes in the plants' genomes. There are excellent examples of transgenic ornamental

plants such as the creation of blue-hued carnations, roses (Katsumoto et al., 2007; Tanaka et al., 2009), and chrysanthemums (Noda et al., 2018) which could not have been produced using conventional breeding methods.

CRISPR Cas9 based Genome editing approaches, allow the develop-

ment of more precise and efficient tools to induce mutations in plant genes, modifying their expression or silencing them (Hahne et al., 2019). The clustered regularly interspaced short palindromic repeats (CRISPR)-associated protein 9 (Cas9) system, which originates from bacteria and archaea (Wiedenheft et al. 2012), is the most widely used genome editing system. Cas9 is a nuclease that can cleave double-stranded DNA. Target DNA specificity is governed by a single-guide RNA (sgRNA) that guides Cas9 to bind to a 20-nucleotide (nt) sequence on the target DNA (referred to as the protospacer). The target DNA requires an additional 3-nt element (protospacer-adjacent motif (PAM)) with the NGG sequence in its downstream to be bound and cleaved by Cas9 (Jinek et al. 2012). DNA cleavage occurs at three base pairs upstream of PAM. The repair of the Cas9-induced DNA double-strand breaks (DSBs) within the protospacer can induce insertion/deletion mutations of variable length. The target specificity of the nuclease is determined directly by a short sequence in the sgRNA.

Therefore, it is necessary only to insert the desired sequence as a DNA oligonucleotide into a vector construct for target site selection. This makes the construction of the CRISPR/Cas9 system easier than other gene editing approaches like ZFNs and TALENs. Moreover, the expression of multiple guide RNAs can be used at once (Mali et al. 2013), which reduces costs and the time needed to generate plants

with multiple target mutations. Genome editing methods in plants rely on transgenic technology to incorporate the genome editing system. Just as transgenic plants can inherit a transgene, genome-edited plants can pass on the introduced mutation to its offspring.

Although transgenic technology requires the integration of the transgene to produce the desired traits, genome editing does not require the integration of the transgene into the genome. Therefore, integrated transgenes could be segregated in progeny. Thus, after the transgenes are segregated, genome-edited plants ideally cannot be distinguished from the plants that are mutated via conventional breeding method. Thus, whether such transgene-free genome-edited plants should be treated as transgenic plants under many regulations is a matter of debate. In addition, genome editing is programmable and leads precisely to a specific mutation in the target sequence. Therefore, it is expected to be more effective than conventional mutation breeding to create desired mutant plants.

## Conclusion

CRISPR Cas9 mediated genome editing is a great breakthrough for breeding technology that can be adopted in numerous floriculture crops for improving floral attributes (Ma et al. 2016). The possibility to implement such approaches in breeding of ornamental species, however, relies on information about structure and function of plant genomes and genes,

and availability of efficient transformation and regeneration protocols. This technology is poised to become a common breeding method for ornamental plants. In addition, novel genome editing technologies are expected to accelerate the speed of breeding programs as the main option for revealing gene function and producing new cultivars in floral crops.

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# New Mica imaging platform from Leica Microsystems brings previously inaccessible experiments to all life science researchers

March 8, 2022



Leica Microsystems, a leader in microscopy and scientific instrumentation and a Life Sciences company of Danaher Corporation (NYSE: DHR), has launched Mica, the world's first Microhub. A Microhub is a new type of wholly integrated imaging solution that leverages machine learning software, automation tools and unique fluorescence unmixing techniques to automate the imaging workflow for researchers, regardless of their microscopy experience levels.

“Research paradigms are constantly evolving, as we have seen with the recent evolution of single cell and transcriptomics. The next frontier is about essentially putting this dissociated information into spatial context, as location is critical to understanding biological mechanisms. The trend is driving more researchers to utilize complex imaging in their research. We have built Mica for these researchers, who need to focus more on

their biology than the specialism of microscopy,” says James O’Brien, Vice President Life Sciences at Leica Microsystems. “The Microhub era will supercharge the microscopy experience for everyone.”

All researchers, regardless of expertise, can now work in a single digital imaging platform, moving confidently from setup to beautifully visualized results, allowing true access for all. The Microhub intelligently automates sample-finding, parameter-setting and focus constancy, replacing manual setup with just one push of a button. Mica eliminates over 85 percent of the tedious setup steps in the conventional imaging workflow.

Users can visualize four labels simultaneously in widefield using Leica’s patented FluoSync technology, which offers four times more data with 100% correlation compared to traditional fluorescence imaging methods. They can then switch seamlessly to confocal without moving the sample, to explore unexpected paths with no constraints. Mica also fully integrates everything a researcher needs for radic



# Featured Biotech News

## World Council for Health expert declares Covid-19 vaccines 'dangerous'



Feb 17, 2022

Experts from around the world in the field of medicine, law and science explored the advocacy routes in cases where there are adverse effects on the human body due to the administration of vaccines.

They attempted to draw causal conclusions on the link between vaccines given to the general public and a variety of negative health effects.

In introducing the conference, the WCH's Dr. Mark Trozzi said it was important in terms of de-monopolising the information bubble around Covid-19 vaccines.

"For those of us who have done extensive research over the last two years, it is difficult to imagine that there is still a dispute regarding forced vaccine injections. It is my submission that they are both dangerous and ineffective," said Trozzi.

**Advocate Sabelo Sibanda said there was an "unholy alliance" between governments and private corporations shutting down justice voices in the vaccine debate.**

"Big pharma and its allies, on the other hand, appear to have inexhaustible resources, especially given the record profits they have garnered from their Covid-19 vaccines. They have gained control over governments and institutions. The aim of the conference is to ensure there is not a monopoly on information, and that the law is equal to all, protect human rights and ensure institutional integrity."

He cited the example of the South African vaccine injury fund, where

manufacturers required that the government protect them, at least in part, from liability and future lawsuits if the shots caused serious adverse effects.

Lawyer and convenor at CHO, Shabnam Mohamed, said research done by various organisations had shown the adverse effects of the vaccine, adding that the conference would help understand and prove vaccine causation.

"From research, victim and expert interviews, and our work at the World Council for Health, I realised that people are experiencing adverse effects from Covid-19 injections. Vaccine adverse effects reporting systems like VAERS, MHRA, Eudravigilance, and South Africa's SA VAERS show a range of adverse effects most people don't know about," said Mohamed.

"Only 1-10% of adverse effects are reported. Many people do not connect the dots, don't bother reporting to governments, or are convinced that the adverse effect post-vaccine is unrelated. This means they do not seek the medical and psychological care they need, nor do they apply for compensation for negative effects, injury, or death."

# Why Europe is the epicentre of COVID-19 protests



16 February 2022

As many as 32 countries have seen COVID-19-related protests since the beginning of the pandemic and 15 of them were in Europe, according to the database maintained by Carnegie Endowment for International Peace, an international think tank that has been tracking such demonstrations.

**The reasons for the protests, the group observed, were as wide-ranging as frustrations boiling over pandemic-induced restrictions to economic downturn to overcrowding at prisons as witnessed in Lebanon.**

One broad trend that emerged is that Europe is struggling to implement pandemic-related policies. Citizens of Belgium, Austria, Switzerland and Italy took to the streets opposing social restrictions and various mandates.

Covid-19-related demonstrations also took place in Thailand, Israel and Bahrain. In Israel, the protests took a political turn because of the various authoritarian policies implemented by the nation's then prime minister, Benjamin Netanyahu. Using the pandemic as an excuse, Netanyahu declared his government would be tracking carriers of the virus by using phone surveillance, shut down courts, adjourned the parliament and had plans of annexing parts of the West Bank. These moves were perceived as

anti-democratic and authoritarian by the Israeli population, which led to widespread protests across the country.

Argentina saw the biggest uprising in the world, with more than 100,000 citizens protesting against the government's stringent lockdown measures, coupled with the fact that the pandemic has been economically draining. COVID-19-related demonstrations were also seen in South America, Brazil, Argentina, Paraguay, Bolivia and Colombia.

In Brazil, the protests were a direct retaliation to the pandemic-containment measures implemented by President Jair Bolsonaro. Inadequate hospital resources, under-investment in vaccines, ineffectual government response, misinformation and denialism regarding virus triggered mass protests across the country.

New Zealand, the first country to lift lockdowns (June 2020), also saw protests stemming from frustrations due to pandemic-related restrictions and stringent vaccine mandates. Similar dissent were seen in neighbouring Australia too.

Truckers recently blocked the US-Canada border crossings in protest of the Canada government order that the country's truck drivers need to be fully vaccinated or face two weeks of quarantine on their return.

# Tired of DU shutdown, students protest at North Campus, boycott online classes



February 8, 2022

Protests raged at Delhi University's North Campus as student organisations held a demonstration at the Arts Faculty and outside the Vice-Chancellor's office demanding the reopening of the university. Several students across colleges also boycotted online classes for the day in support of the demand.

**While the North Campus protests were led by Left student organisations such as the Students' Federation of India (SFI) and All India Students' Association (AISA), the Akhil Bharatiya Vidyarthi Parishad (ABVP) also submitted a memorandum to principals of 55 DU colleges Monday demanding that they reopen for offline classes.**

"The university administration, in

writing, asked for police assistance in getting the premises vacated of the unruly protesters.

DU Registrar Vikas Gupta, meanwhile, said meetings were being held with principals to work out the modalities for reopening. "We are trying to see when we can open but we will not do it immediately because we don't want to panic students. We will give at least 7-10 days' notice. It is not fair to compare JNU with DU, because JNU's total student strength is around the strength of one DU college. We have around 65% students from outside. Where will they stay? We need to consider all these factors," he said.

During the protest, students hung an 'out of service' placard over the gate of the V-C office compound. The SFI said they would start 'sadak pe kaksha' or 'classroom on the street' from February 9 until the university reopens.

"It is a message to the administration that both teachers and students want to begin offline classes. If they have any respect left for us, they should

open the classrooms immediately," said Abhishek, co-convenor of SFI DU.

AISA activists said the DU Proctor met them, who "assured that notice for reopening will come up in the evening, but later turned down her promise and said it will take a week".

Both organisations have given a call for a 'chakka jaam' or blocking the Chhatra Marg at North Campus.

The ABVP said it would organise a protest outside the Academic Council meeting venue on February 9 over the issue. ABVP state secretary Sidharth Yadav said, "Guidelines have been issued regarding opening of schools and colleges by DDMA. Now, the Delhi University administration should take a decision to open the campus immediately keeping in mind the interest of students. Delhi University has been closed for almost two years and due to this, the quality of education has gone down."

Students from different colleges also joined the protest. Rusham Sharma, a first-year student from Hindu College, said online classes were only benefiting colleges.

Nancy Maurya from Dyal Singh College also participated in the protest. "Is Covid happening only in the DU campus that it can't be opened? University authorities also don't want the campus to open because they were bringing in changes with the NEP and the UG curriculum framework and they don't want to face student protests," she said.

# The Risks of Covid Vaccination for Pregnant Women Are Real

In August 2021, 31-year-old Mahima Mathew was excited to realize she could be pregnant with her first child, just three months after marrying the love of her life, Ranjith. Mahima, a social worker, was looking forward to starting a family with her new husband. But fate had something else in store for the young couple. Suspecting pregnancy, the excited soon-to-be parents visited a gynecologist in their town of Kanjirappally in southern India's Kerala state. Mahima's gynecologist advised the couple to immediately get vaccinated against Covid-19, assuring them that the vaccine was safe to get during pregnancy. After the couple got vaccinated, the doctor told them they could return in the evening to undergo formal pregnancy tests.

Trusting her doctor, Mahima received a dose of the AstraZeneca-Oxford Covishield vaccine (manufactured in India by Serum Institute) that same day and returned for pregnancy tests later that evening. Much to Mahima and Ranjith's delight, the tests confirmed a 7-week pregnancy with twins. Thrilled, the couple returned home.

A few hours later, Mahima awoke to a series of excruciating headaches.

"My daughter just kept complaining of unbearable headaches. The doctors initially associated [the headaches] with pregnancy and gave her medicines, but when the headaches did not go away, they started running tests," Mathu Kutty, Mahima's father, told Covid Update. Tests confirmed that Mahima's platelet count had dropped significantly and, on August 15, she suddenly fell unconscious.

Mahima never regained consciousness. Doctors continued to run blood tests, trying to figure out the cause of her illness, until she died five days later.

**Mahima's death is one of just a few in India that is directly attributed to a Covid vaccine: her death certificate indicates that she died of "vaccine-associated thrombocytopenia" – a fatal drop in the number of platelets in her blood.**

The minutes-of-meeting from the Indian National Technical Advisory Group on Immunization (NTAGI) meeting in May last year clearly state that "before vaccination, pregnant women should be fully informed that the long-term adverse reactions and the safety of the vaccine for fetus and child are not yet established." They also note that "rare complications associated with vaccines e.g., thrombosis and thrombocytopenia (with COVISHIELD) [should] be communicated to every pregnant woman before administering the vaccine."

Mathu Kutty, however, told Covid Update that none of this was explained to his daughter or the family before they were vaccinated.

Gynecologist Dr. Maya Valecha is sounding the alarm about the risks associated with vaccinating pregnant women against Covid-19. She has written to Prime Minister of India

Narendra Modi asking him to stop the administration of the vaccines and to improve adverse event reporting.

"All of the three vaccines in India do not have any literature and no peer-reviewed data available. These are experimental drugs and thus administering them to women of child-bearing age is highly condemnable," Dr. Valecha told Covid Update.

She pointed to the recently released COVISHIELD phase 2/3 data, noting that the data "did not include participants with uncontrolled co-morbid conditions, immunocompromised people, pregnant and lactating women."

Dr. Deepak Natarajan, cardiologist and Director of Cardiac Sciences at Supreme Hospital in Delhi, has also been speaking out against giving Covid vaccines to pregnant women. In an interview with Covid Update, he explained how spike proteins from Covid vaccines, once introduced to a woman's body, travel to the ovaries, where they can interfere with the subtle processes of pregnancy.

"These spike proteins can attach themselves and thus cross-react with the human placental protein called Syncytin, which helps placenta adhere to the mother's body," said Dr. Natarajan, who served as the cardiac surgeon for former Indian premiers and was the appointed cardiologist to Nelson Mandela. Dr. Natarajan is not only firm in his belief that Covid vaccines should not be given to pregnant women.

# CDC Under Fire for Allegedly Hoarding COVID-19 Data



Feb 22, 2022

The U.S. Centers for Disease Control and Prevention is under fire for failing to publish large swaths of hospitalization data related to the COVID-19 pandemic that the organization has collected but failed to make public.

First reported by The New York Times, the CDC hospitalization data is broken down by age, race and vaccination status. Two weeks ago, the government agency published data on the efficacy of booster shots in adults younger than 65. However, the Times reported that the CDC neglected to include data for individuals ages 18 to 49. The data showed that that group was least likely to benefit from COVID-19 vaccine boosters because they were already well-protected by the first two doses.

According to the Times, without the available data from the individuals ages 18 to 49, experts who advise the government have had to rely on data

from Israel to make recommendations for boosters. Paul Offit, M.D., a vaccine expert and adviser to the Food and Drug Administration, told the Times the data is considered unreliable for the United States, considering the different definitions of severe illness that Israel and the U.S. health agencies use.

In multiple statements to the Times, the CDC said it withheld publication of the data because “it was not yet ready for primetime.” Spokesperson Kristen Nordlund said the agency wanted to ensure the data it published was accurate and actionable so that the information is less likely to be misinterpreted.

“We want better, faster data that can lead to decision making and actions at all levels of public health, that can help us eliminate the lag in data that has held us back,” Jernigan told the Times.

According to Nordlund, the CDC has received more than \$1 billion to mod-

ernize its systems, which may help pick up the pace.

In addition to outmoded systems, the CDC is also a victim of bureaucracy. Multiple divisions within the agency have to give the green light before data can be made public. CDC officials must notify the Department of Health and Human Services and the White House of the data it releases, creating additional delays due to the political nature of the agencies involved.

The sample size of the data has also been an issue. Nordlund told the Times that the collected data represents only 10% of the population of the U.S. That’s the same amount of sample size the CDC has used for tracking influenza, but with the nature of the pandemic and the call for vaccination, there were concerns about the data being twisted in the volatile political storm that has surrounded mass vaccination efforts.

## Califf Closes in on Second Stint as FDA Commissioner Despite Opposition



Feb 15, 2022

Robert Califf's nomination to resume his role as FDA Commissioner continues to advance in the U.S. Senate, despite some noted opposition from a key Democrat, Sen. Joe Manchin of West Virginia, over the opioid epidemic and the role the FDA has played in the ongoing crisis.

A cardiologist, Califf previously served as commissioner of the U.S. Food and Drug Administration in the administration of President Barack Obama. He held the role from February 2016 to January 2017. Current President Joe Biden, who served as vice president under Obama, tapped Califf for the role in the fall of 2021 as acting Commissioner Janet Woodcock's brief time in the role was running out.

Manchin has been opposed to Califf's nomination since the president first nominated the former commissioner of the U.S. Food and Drug Administration last fall. In November, Manchin said he would not vote to confirm Califf because he believed that having a former FDA Commissioner resume the position would not bring about a change in culture at the regulatory agency.

"Dr. Califf's nomination makes no sense as the opioid epidemic continues to wreak havoc on families across this country with no end in sight. 2020 was the deadliest year on record for drug-related overdose deaths with 1,386 West Virginians and nearly 95,000 Americans dying from a drug-related overdose. I have made it abundantly clear that correcting the culture at the FDA is critical to changing the tide of the opioid epidemic," Manchin said in November.

He said that Califf's nomination "is an insult" to the families who have suffered from the opioid epidemic. Manchin also did not support Califf's nomination in 2016, citing his ties to the pharmaceutical industry. Manchin said he wants the administration to nominate a potential commissioner who "understands the gravity of the prescription drug epidemic and the role of the FDA in fighting back against the greed of the pharmaceutical industry."

On Monday, he reiterated his opposition.

# FDA Executive Officer Exposes Close Ties Between Agency and Pharmaceutical Companies



FEBRUARY 16, 2022

Project Veritas published Part Two of its series on the FDA on Wednesday night which featured FDA Executive Officer, Christopher Cole, speaking about the inner workings of the agency including the FDA's conflicts of interest, overspending, and why it's hard for those within the agency to speak out on such abuses.

FDA Executive Officer Chris Cole: "The drug companies, the food companies, the vaccine companies. So, they pay us hundreds of millions of dollars a year to hire and keep the reviewers to approve their products."

Cole on FDA fees: "Congress approved user fees for [the] FDA. Basically, we charge the industry millions of dollars in order to hire more drug reviewers and vaccine reviewers which will speed up the approval process. So, they [pharmaceutical companies] make more money."

Cole: "They [FDA] tone down the impact of the user fees on their operations because they know they're dependent on the drug companies, and the vaccine companies, and these other companies for their agency to operate."

Cole on blowing the whistle: "There's not an incentive to speak out in gov-

ernment, surprisingly. You would think there would be, but there's not. It's better just to just not say anything and just ignore it."

Cole on retaliation in government: "You'll be marked from getting other jobs because another office is not going to want to hire you if you've spoken out about something, right or wrong. They don't look at what you've spoken out about. They're just not willing to- government's about rocking the boat and they don't want to- which is the problem I have with government is, like, they don't like people rocking the boat, for right or wrong, at all costs. They want to hire

# Economist Ernst Wolff believes that a hidden alliance of political and corporate leaders is exploiting the pandemic

February 27, 2022

The German economist, journalist, and author Ernst Wolff has revealed some facts about Schwab's "Young Global Leaders" school that are relevant for understanding world events during the pandemic in a video from the German Corona Committee podcast. While Wolff is mainly known as a critic of the globalist financial system, recently he has focused on bringing to light what he sees as the hidden agenda behind the anti-Covid measures being enacted around the world.

The story begins with the World Economic Forum (WEF), which is an NGO founded by Klaus Schwab, a German economist and mechanical engineer, in Switzerland in 1971, when he was only 32. In 1992 Schwab established a parallel institution, the Global Leaders for Tomorrow school, which was re-established as Young Global Leaders in 2004.

There are currently about 1,300 graduates of this school, and the list of alumni includes several names of those who went on to become leaders of the health institutions of their respective nations.

But the school's list of alumni is not limited to political leaders. We also find many of the captains of private industry there, including Microsoft's Bill Gates, Amazon's Jeff Bezos, Virgin's Richard Bran-

son, and the Clinton Foundation's Chelsea Clinton. Again, all of them expressed support for the global response to the pandemic, and many reaped considerable profits as a result of the measures.

Wolff believes that the people behind the WEF and the Global Leaders school are the ones who really determine who will become political leaders, include not only Americans and Europeans, but also people from Asia, Africa, and South America, indicating that its reach is truly worldwide.

Wolff believes that many elite universities play a role in the process determined by the WEF, and that they should no longer be seen as operating outside of the fields of politics and economics. He cites the example of the Harvard Business School, which receives millions of dollars from donors each year, as well as the Harvard School of Public Health, which was renamed the Harvard T. H. Chan School of Public Health after it received \$350 million from the Hong Kong-born billionaire Gerald Chan. The same is true of the Johns Hopkins School of Public Health, which became the Johns Hopkins Bloomberg School of Public Health after media mogul Michael Bloomberg donated \$1.8 billion to the school in 2018.

The pharmaceutical industry's international reach is also considerable: Wolff mentions that

Global Leaders alumnus Bill Gates, for example, had long been doing business with Pfizer, one of the main producers of the controversial mRNA anti-Covid vaccines, through his Foundation's public health initiatives in Africa since long before the pandemic began. Perhaps not coincidentally, Gates has become one of the foremost champions of lockdowns and the Covid vaccines since they became available, and The Wall Street Journal has reported that his Foundation had made approximately \$200 billion in "social benefits" from distributing vaccines before the pandemic had even begun. One can only imagine what its vaccine profits are today.

One of the goals of the current policies being pursued by many governments, Wolff believes, is to destroy the businesses of small- and medium-sized entrepreneurs so that multinational corporations based in the United States and China can monopolize business everywhere. Amazon, which was led until recently by Global Leaders alumnus Jeff Bezos, in particular has made enormous profits as a result of the lockdown measures that have devastated the middle class.

Wolff further explains that the lockdowns and subsequent bailouts that were seen around the world over the past two years left many nations on the verge of bankruptcy. In or-

der to avoid an economic catastrophe, the governments of the world resorted to drawing on 650 billion special drawing rights, or SDRs, which are supplementary foreign exchange reserve assets managed by the International Monetary Fund. When these eventually come due, it will leave these same governments in dire straits, which is why it may be that the introduction of digital currency has become a sudden priority – and this may have been the hidden purpose of the lockdowns all along.

The ultimate conclusion one must draw from all of this, according to Wolff, is that democracy as we knew it has been silently cancelled and that an elite of super-wealthy and powerful individuals effectively control everything that goes on in politics, as has been especially evident in relation to the pandemic response.

The best way to combat their designs, Wolff says, is simply to educate people about what is happening, and for them to realize that the narrative of the "super-dangerous virus" is a lie that has been designed to manipulate them into accepting things that run contrary to their own interests. If even 10% of ordinary citizens become aware of this and decide to take action, it could thwart the elite's plans and perhaps open a window for ordinary citizens to take back control over their own destinies.

# Medicago and GSK announce the approval by Health Canada of COVIFENZ<sup>®</sup> first plant based covid vaccine



February 24, 2022

Medicago, a biopharmaceutical company headquartered in Quebec City, and GlaxoSmithKline (GSK) today announced that Health Canada has granted approval for COVIFENZ<sup>®</sup>, COVID-19 vaccine, (plant-based virus-like particles [VLP], recombinant, adjuvanted). This vaccine is indicated for active immunization to prevent coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in individuals 18 to 64 years of age.

“The approval of our COVID-19 vaccine is a significant milestone for Canada in the fight against the pandemic. We appreciate Health Canada’s timely review,” said Takashi Nagao, President and CEO at Medicago. “We’re also grateful for the Government of Canada’s

support in the development of this new vaccine, and we are manufacturing doses to start fulfilling its order.”

**COVIFENZ<sup>®</sup> is not currently approved or authorized for the prevention of COVID-19 or any other indication anywhere other than Canada.**

Roger Connor, President of GSK Vaccines, added, “This first approval is an important milestone in our approach of pairing GSK’s well-established pandemic adjuvant with promising antigens to develop protein-based, refrigerator-stable COVID-19 vaccines to help protect people against COVID-19 disease. We look forward to working with Medicago to make the vaccine available in Canada and to progress further regulatory submissions.”

The Government of Canada has a contract with Medicago (the Marketing Authorization Holder) to supply the COVID-19 vaccine. Medicago is committed to fulfilling this order as soon as possible.

COVIFENZ<sup>®</sup> uses Coronavirus-Like Particle (CoVLP) technology with the vaccine composed of recombinant spike (S) glycoprotein expressed as virus-like particles (VLPs) co-administered with GSK’s pandemic adjuvant. The vaccination regimen calls for two doses given intramuscularly 21 days apart (3.75 micrograms of CoVLP antigen in combination with GSK pandemic adjuvant in the same injection). The vaccine is stored at 2 °C to 8 °C. COVIFENZ<sup>®</sup> antigen will be manufactured in Canada and in North Carolina (US).

## Moderna Hijacked Technology for COVID-19 Vaccine, Lawsuit Alleges

## Moderna Projects COVID-19 Vaccine Sales at \$19 Billion for 2022

February 24, 2022

Moderna only has a single marketed product, but it's a blockbuster, for now at least. That product is the company's mRNA vaccine against COVID-19, dubbed Spikevax. In today's fourth-quarter 2021 annual report, the company announced \$7.2 billion in fourth-quarter revenues and full-year 2021 revenues of \$18.5 billion.

Moderna also indicated it had increased its signed advance purchase deals for this year, totaling \$19 billion, with options for another \$3 billion.

"Spikevax is now approved in more than 70 countries around the world protecting hundreds of millions of people and real-world evidence from multiple independent studies has confirmed its strong effectiveness," Chief Executive Officer Stephane Bancel stated.

He added, "In 2021, we delivered 807 million doses with approximately 25% of those doses going to low- and middle-income countries, and we will continue to scale in 2022 to help end the COVID-19 pandemic. Moderna has experienced exponential growth and we have more than doubled the size of our team over the last year with a global team of 3,000. We also have announced plans to scale to 21 commercial subsidiaries across the world including four new locations in Asia and six new locations in Europe."

Although the vaccine is the tip of the spear, the company has 44 mRNA programs in development with data readouts this year in rare genetic diseases and oncology. This is probably good because it's not clear to Moderna or the rest of the world how long



March 5, 2022

Two biotechnology companies filed a lawsuit against Moderna this week and alleged the vaccine manufacturer infringed on patented technology in the development of its commonly used COVID-19 shot.

Arbutus Biopharma and Genevant Sciences, the companies, claim in a civil lawsuit that Moderna used "breakthrough technology Arbutus had already created and patented" to create the COVID-19 vaccine such as the lipid nanoparticle delivery system, according to a complaint (pdf) filed in the U.S. District Court in Delaware. Genevant is owned by Roivant, a company that licensed the patents in question from Arbutus.

"Moderna was well aware of Arbutus's LNP patents and licensed them for other product programs, but it chose not to do so for its COVID-19 vaccine. Instead, it attempted to invalidate several of the patents before the United States Patent and Trademark Office, and when those efforts

largely failed, Moderna simply used the patented technology without paying for it or even asking for a license," the complaint read. The two companies alleged that Moderna committed seven counts of patent infringement. They are asking for financial compensation from the company.

In a statement, Moderna denied the allegations contained in the civil lawsuit. "Moderna denies these allegations, and will vigorously defend itself against Genevant's claims in Court," a Moderna spokesperson told The Epoch Times.

With the lawsuit, Genevant and Arbutus said they are not seeking a court injunction because it would "impede the sale, manufacture or distribution of MRNA-1273" in vaccines, said William Collier, the CEO of Arbutus, in a statement. However, we seek fair compensation for Moderna's use of our patented technology that was developed with great effort and at great expense, without which Moderna's COVID-19 vaccine would not have been successful.

### ICMR got Rs 172 crore royalty from sale of Covaxin from Bharat



February 8, 2022

Indian Council of Medical Research (ICMR) has received royalty of Rs 171.74 crore from Bharat Biotech from sales of Covaxin.

The Council had spent around Rs 35 crore in research and development (R&D) of Covaxin. “Indian Council of Medical Research (ICMR) has received royalty of Rs 171.74 crore till 31st January, 2022 from Bharat Biotech from sales of Covaxin,” Minister of State for Health and Family Welfare Bharati Pravin Pawar said in a written reply in Rajya Sabha.

The Minister further said that funds with ICMR are utilised for health research activities including emerging research priorities and research capacity building. Leader of Opposition in the Rajya Sabha Mallikarjun

Kharge had asked the question.

Covaxin is the first Covid-19 vaccine that has been developed completely in India. In March 2020, following the successful isolation of the SARS CoV-2 virus at ICMR-National Institute of Virology (NIV), ICMR entered into a public-private partnership (PPP) with Bharat Biotech International Limited (BBIL) to develop the virus isolate into an effective vaccine candidate.

ICMR-NIV characterized the vaccine developed by BBIL through in-vitro experiments and electron microscopy studies. People in India have mostly received Covishield and Covaxin vaccine doses in the wake of pandemic. As many as 170.21 crore vaccine doses have been administered so far under nationwide vaccination drive. UN NK

### Krsnaa Diagnostics secures 5-year contract from Govt. of Himachal Pradesh



February 22, 2022

The Govt. of Himachal Pradesh, the Health and Family Welfare Department (Govt. of Himachal Pradesh) awarded a tender to Krsnaa Diagnostics for providing diagnostic/ laboratory services to state govt. health institutions.

The tenure of the contract is up to five years from date of signing the contract.

The company's net profit soared 331.80% to Rs 17.23 crore on 8.6% increase in net sales to Rs 106.31 crore in Q3 December 2021 over Q3 December 2020.

Krsnaa Diagnostics is India's fastest growing differentiated diagnostic services provider, both in radiology and pathology.

# World's First Potato Genome Decoded by German Research Team



**For the first time, researchers from the Ludwig Maximilian University in Munich and the Max Planck Institute for Plant Breeding Research in Cologne have completely decoded the highly complex genome of the potato.**

March 9, 2022

The researchers, led by geneticist Korbinian Schneeberger from the Max Planck Institute for Plant Breeding Research have now succeeded in assembling the first complete genome of the potato, a breakthrough that paves the way for breeding new and robust varieties.

“Potatoes are increasingly becoming part of basic nutrition around the world,” says Schneeberger. He added that even in Asian countries like China where rice is the traditional staple, the potato is gaining ground. This study can now support genome-based breeding of new potato varieties that are more productive and resilient to

climate change, which has a huge impact on global food security for decades to come.

The potato has low diversity and anyone who buys potatoes today is very likely to go home with a variety that was around more than 100 years ago. Low diversity has always made potato plants susceptible to diseases, as evident during the Irish famine in the 1840s. Likewise, reconstructing the potato genome was a far greater technical challenge than the human genome because the potato inherits two copies of each chromosome from each parent.

Four copies of each chromosome mean four copies of each gene, which

makes creating new varieties with the desired combination of individual traits very difficult and time-consuming.

Schneeberger and colleague Hequan Sun and other employees circumvented this problem by not using the DNA taken from the leaf tissue as usual but analyzing the genomes of individual pollen cells. Unlike other cells, each pollen cell contains only two copies of each chromosome, making it easier to reconstruct the genome.

With this new information, researchers can now easily identify gene variants that are responsible for desired traits, researchers added.

# Telangana Court directs The Wire to take down 14 articles against Bharat Biotech, COVAXIN in ₹100 crore defamation suit



**In a statement, the editors of The Wire said that they saw the report on Bar and Bench, and that they were not served any notice or intimated in any way about the proceedings.**

February 23, 2022

Telangana court has directed The Wire to take down fourteen articles published on its website against COVID-19 vaccine manufacturer, Bharat Biotech International Limited. As per reports, the court also restrained The Wire from further publishing any defamatory articles on Bharat Biotech and its product COVAXIN.

The order was passed by an Additional District Judge at Ranga Reddy District court in a ₹100 crore defamation suit filed by Bharat Biotech against the publication. The suit was filed against the publisher of The Wire, Foundation for Independent Journalism, its Editors Siddharth Varadarajan, Sidharth Roshanlal Bhatia and MK Venu, and nine others who wrote the articles against Bharat Biotech and COVAXIN.

The court also highlighted the fact that

Bharat Biotech is the only candidate which has been authorized to manufacture the vaccine for children between 15 to 18 years and that the defamatory articles published on the website will lead to vaccine hesitancy. The court has directed removal of the defamatory articles from the website within 48 hours and also restrained The Wire from publishing any defamatory articles about Bharat Biotech and its product COVAXIN.

The suit not only named the publisher of the Wire, Foundation for Independent Journalism, The Wire's editors Siddharth Varadarajan, Siddharth Bhatia and MK Venu, as well as nine authors of articles. These included Vasudevan Mukunth, Priyanka Pulla, Banjot Kaur and Neeta Sanghi.

The Wire's editor Siddharth Varadarajan took to Twitter to say that it was not given the chance to refute the claims made by Bharat Biotech.

“So 14 deeply reported #Covaxin stories— published over a year—ordered to be taken down by a local AP court with no notice served on @TheWire\_in, no chance given for us to refute whatever false claims @BharatBiotech has made against us! Let me say this—BB's bullying will not work,” he wrote.

“At no stage were we contacted by Bharat Biotech or its counsel. The Telangana court's order, which we have learned about only through Bar and Bench, has been passed without giving The Wire an opportunity to be heard. The Wire will, as a matter of course, legally challenge this order, which we have not seen yet. We have not been properly notified of any order, much less a certified copy of the same,” the statement said.

## Govt nod for setting up WHO Global Centre for Traditional Medicine in Gujarat



**The Union Cabinet, chaired by Prime Minister Narendra Modi has approved the establishment of a World Health Organization Global Centre for Traditional Medicine (WHO GCTM) at Jamnagar, Gujarat.**

March 10, 2022

The Union Cabinet, at the meeting chaired by Prime Minister Narendra Modi on March 9, gave its nod for the setting up of the World Health Organisation Global Centre for Traditional Medicine (WHO GCTM) in Gujarat's Jamnagar.

The centre will be established under the Ministry of AYUSH, which is dedicated towards the medicinal sectors of Ayurveda, Yoga, Naturopathy, Unani, Siddha, Sowa-Rigpa and Homoeopathy.

“This would be the first and only glob-

al outpost centre (office) for traditional medicine across the globe,” the Centre said in a press release.

One of the benefits of the WHO GCTM is that it will “position AYUSH systems across the globe”, the government said, adding that it will also provide leadership on global health matters pertaining to traditional medicine.

Among other goals is “to ensure quality, safety and efficacy, accessibility and rational use of traditional medicine”, and to “develop specific capacity building and training programmes” in the areas of relevance.

A Joint Task Force (JTF) is being constituted for coordination, execution and monitoring of activities for the establishment of the WHO GCTM. JTF will comprise representatives from the Government of India, Permanent Mission of India, Geneva and the World Health Organization.

Under the ambit of this, an interim office is being established at the Institute of Teaching and Research in Ayurveda (ITRA) in Jamnagar to execute the identified technical activities and planning of fully functional WHO GCTM, the statement noted.

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# Research and Govt. News

## CSIR-CDRI licenses nucleic acid staining dye tech to GenetoProtein



February 17, 2022

Lucknow based national laboratory CSIR-Central Drug Research Institute (CDRI), has licensed the technology of Nucleic Acid Staining Dye GreenR™ to GenetoProtein Pvt. Ltd., a start-up company registered in Uttar Pradesh in the year 2020. This startup is involved in developing an array of enzymes, kits and biochemical used in Lifesciences research, particularly

molecular biology. The dye GreenR™ has been developed by CDRI Senior Principal Scientist Dr. Atul Goel in a joint collaborative project with an industry partner Biotech Desk Pvt. Ltd., Hyderabad.

The director CSIR-CDRI Dr. Srinivasa Reddy said that “the nucleic acid staining dye segment seems to be dominated by costly imported products of multinational companies and

this make-in-India product is cost-effective and will reduce our dependency on foreign supplies. He further mentioned that CSIR-CDRI, Lucknow is committed to nurturing the development of pharma cluster and startup culture in Uttar Pradesh, and this is another step in this direction.”

While talking about the technology, Dr. Atul Goel informed that the product GreenR™ may be used to stain DNA and RNA for research and diagnostics to detect and quantify them. It binds to nucleic acids like genomic DNA, PCR products, plasmids and RNA under blue light or UV exposure.

Dr. Shradha Goenka, Director of GenetoProtein Pvt. Ltd. commented that the efficacy and toxicity of GreenR™ have been tested, and various applications for this dye are now being studied. We have been dependent upon stains like Ethidium bromide, which intercalates between the DNA strands and is a known mutagen to bacteria, animals, and humans. Hence its usage is risky for the user and its disposal needs special treatment. To overcome these toxicity issues, some foreign companies have invented safe DNA dyes such as Sybr Safe™ by ThermoFisher. However, these dyes have substantial costs as they are expensive to import.

The development of the new safe dye that team has named “GreenR™” will help researchers in the field of Lifesciences and DNA-based diagnostics to bring down their cost substantially. This would enhance the product portfolio of her company and help Indian research go one step closer to Aatmanirbhar Bharat. The product also has applications in molecular diagnostics and would support in PCR-based testing of diseases.

## Centre signals third wave is ending, writes to states: Remove extra curbs

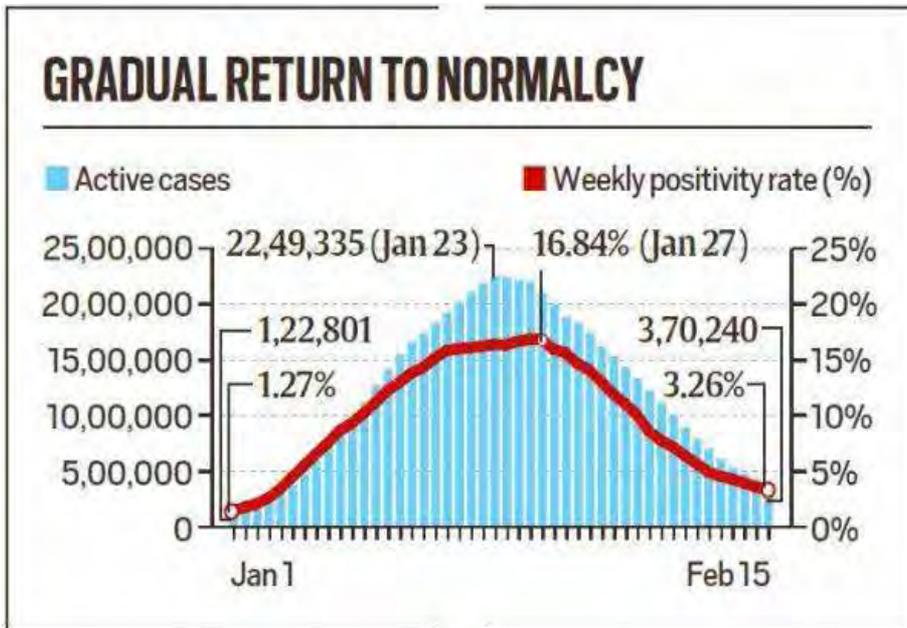
The death count is still high compared to the start of the third wave, but this trend usually shows a lag of about two weeks. The daily toll outside Kerala had fallen below 50 in the last week of December — as of now, this number is about 200.

Kerala has been continuously updating its toll by adding previously uncounted deaths because of which its daily numbers have been inflated. The state has already recorded more than 62,000 Covid-related deaths, the highest for any state except Maharashtra, where the death toll exceeds 1.47 lakh.

In the letter to chief secretaries, Bhushan wrote: “I am sure that under your continued leadership, the states would continue to address the challenge of Covid-19 while minimizing its impact on the lives and livelihood of people.”

During the third wave, the states had taken control measures like night curfews, restrictions on the size of gatherings, closure of educational institutions and limitations on occupancy in restaurants and theatres. Most of these restrictions are already in the process of being lifted. Haryana State Disaster Management Authority (HSDMA) lifted all Covid-related restrictions across the state in its revised guidelines. “However, the residents of the state are advised to strictly follow Covid appropriate behavioural norms including social distancing,” stated the order issued by chief secretary Sanjeev Kaushal.

Last week, the Centre had relaxed guidelines for international passengers arriving in India. They no longer need to quarantine themselves for seven days or get tested at the airport if they come from an at-risk country, or undertake a repeat test on Day 8 of arrival. It had, however, warned against complacency, given the unique challenges the virus can still pose, and the



February 19, 2022

WITH ALL indicators signalling a steady return to the situation that prevailed two months ago, the Union Health Ministry on Wednesday directed states to ease, or even do away with, the additional restrictive measures that had been imposed to deal with the third wave of the pandemic.

In a letter to chief secretaries in states, Health Secretary Rajesh Bhushan said it is important that movement of people and economic activities do not remain under the same level of restrictions now. The Centre’s letter comes at a time when the daily case count has dropped to about 30,000, around the lowest this year. This count had peaked on January 20, when more than

3.47 lakh new infections were detected, and has been declining for over three weeks now.

Similarly, active cases are back to levels of the first week of January after peaking on January 23. As on Tuesday, there were about 3.7 lakh active cases in the country. The weekly positivity rate, at 3.2 per cent, is also back to where it was in the first week of January after going up to as high as 17 per cent.

Just about 75 districts are now reporting a weekly positivity rate of more than 10 per cent. At the height of the third wave, towards the end of January, close to 400 districts had a weekly positivity rate of more than 10 per cent. Almost 80 per cent of districts now have a positivity rate less than 5 per cent.

# NIAB discover potential biomarker for Japanese encephalitis virus



situation in some states and districts.

February 21, 2022

NIAB discover potential biomarker, NS 1 protein for Japanese encephalitis virus. Non-Structural 1 protein, a potential diagnostic biomarker for Japanese encephalitis virus. A diagnostic biomarker refers to a biological parameter that aids the diagnosis of a disease and may serve in determining disease progression or success of treatment.

Japanese Encephalitis Virus (JEV) is the leading cause of mosquito-borne encephalitis in South-East Asia and Western Pacific and is often misdiagnosed as Dengue. JEV belongs to the family Flaviviridae and genus Flavivirus and exists in a zoonotic cycle. Since there is no cure available for JEV, early detection is essential to mitigate a breakout.

National Institute of Animal Biotechnology (NIAB), Hyderabad developed Fluorine Doped Tin Oxide (FTO) electrode fabricated with reduced Graphene Oxide (rGO) for as an electrochemical based immunosensor for the rapid, sensitive and specific detection of the Non-Structural 1 (NS1) secretory protein, which is suitable biomarker for JEV found circulating in the blood and has been reported to elicit an immune response.

Since the conventional methods for JEV diagnosis are expensive, more hazardous and time-consuming diagnostic techniques and requires an elaborate laboratory set up and trained expertise, the developed biosensor may be able to overcome these limitations.

Detection of the NS1 instead of antibody has an added advantage since the antigen is present from day 1 of the infection and hence facilitates

early detection.

On the other hand, antibodies appear only after Day 4/5 of the infection. Docking studies were used to identify the specificity of the epitopes for different flaviviral NS1 with JEV NS1 antibody paratopes, followed by JEV NS1 sequence amplification, cloning and transformation. The NS1 protein was expressed in E. coli, characterised, and immunized in rabbits to raise the polyclonal antibodies.

The NS1 Antibodies were purified from serum, characterized, and used as the bioreceptor to fabricate the electrode with reduced graphene oxide as a conductivity enhancing nanomaterial for the detection of JEV NS1 antigen (Ag).

The LOD (limit of detection) was determined as 0.92 fM in buffer and 1.3 fM in spiked serum ranging from 1 fM-1  $\mu$ M. This detection range is more sensitive than other sensors developed for JEV and can detect the minimal infective dose of circulating NS1 ranging anywhere from 7-284 ng/ml in clinical samples as tested in other flaviviral infections.

The fabricated immunosensor was also specific towards JEV NS1Ag as compared to other flaviviral NS1Ag. Therefore, the proposed immunosensor could be a promising candidate for the development of an accurate, and rapid, diagnosis for specific and sensitive detection of JEV from clinical samples.

The findings are published in Biosensors and Bioelectronics. And the authors of the findings are from DBT supported institutes like NIAB, Hyderabad and Regional Centre for Biotechnology, Faridabad.



# Bad Science



## Ivermectin papers slapped with expressions of concern

February 16, 2022

A journal has issued expressions of concern for a pair of 2021 meta-analyses purporting to find that ivermectin is an effective treatment for Covid-19 after data sleuths raised questions about some of the research in the studies.

“Ivermectin for Prevention and Treatment of COVID-19 Infection: A Systematic Review, Meta-analysis, and

Trial Sequential Analysis to Inform Clinical Guidelines” – began to wobble when data central to its conclusion were retracted from the journal *Virus*. That article has been cited 37 times, according to Clarivate Analytics’ Web of Science, making it a highly-cited, “hot” paper.

The other article was titled “Review of the Emerging Evidence Demonstrating the Efficacy of Ivermectin in the Prophylaxis and Treatment of COVID-19” and was written by a group led by Pierre Kory. Kory is a controversial Wisconsin physician whose ideas about how to treat the infection, and particularly ivermectin, have made him a darling of ivermectin proponents like Joe Rogan.

Kory’s group lost a different Covid-19

paper last November over problems with the data, and a paper similar to the one now subject to an expression of concern was removed from a *Frontiers* journal last year.

The two meta-analyses were the subject of an editorial in the November/December 2021 issue of the journal by its editor, Peter Manu, who cautioned that:

The ivermectin reviews published in the *American Journal of Therapeutics* do not contain anything that should keep people from vaccination.

The expressions of concern – both of which cite a paper in *Nature Medicine* by Jack M. Lawrence, Gideon Meyerowitz-Katz, James A. J. Heathers, Nicholas J. L. Brown, and Kyle A. Sheldrick

detailing the issues with work on ivermectin – are nearly identical, save for a critical difference. The one for “Review of the Emerging Evidence,” by Kory and colleagues, reads:

The decision is based on the evaluation of allegations of inaccurate data collection and/or reporting in at least one of the primary sources of the meta-analysis contained in the article. These allegations were first made after the publication of this article. The exclusion of the suspicious data appears to raise questions regarding ivermectin’s potential to decrease the mortality of COVID-19 infection. Currently, the investigation of these allegations is incomplete and inconclusive.

The primary source in question here is a 2021 study in the Asian Pacific Journal of Tropical Medicine by researchers in Iran titled “Ivermectin as an adjunct treatment for hospitalized adult COVID-19 patients: A randomized multi-center clinical trial.” Lawrence and his fellow sleuths said those findings appear to be marred by “unexpected stratification across baseline variables” – another way of calling them “implausible.”

The notice for the other meta-analysis, from a group in the United Kingdom led by Andrew Bryant and including Theresa Lawrie, goes a step further, stating:

The exclusion of the suspicious data appears to invalidate the findings regarding ivermectin’s potential to decrease the mortality of COVID-19 infection ...

Both notices, which at the moment are not mentioned on the original articles, go on to state that the journal’s action:

does not imply that the methodology used [by the authors] was incorrect. The use of summary data published by others is a generally accepted approach in biomedical metanalytic research.

To be sure, meta-analyses are important tools for scientists – but need to be updated in light of new evidence or evidence that underlying data are flawed.

## Researchers need to observe ethical standards during a pandemic

March 14, 2022

Researchers need to observe ethical standards during a pandemic, say Ben Kasstan, Rishita Nandagiri and Siyane Aniley, and journals should hold them to these standards.

The pandemic has changed academic research. It has led to gender gaps in authorship, questions about the quality of scientific publishing, and shifts in peer review processes. As the effects — short and long term — of the pandemic continue, more research will be produced under pandemic-shaped conditions and submitted for publication.

Himani Bhakuni and Seye Abimbola argue that authorship, research partnerships, and editorial practices in global health — the bread and butter of academic research, writing, and publishing — are ‘peppered with epistemic wrongs that lead to or exacerbate epistemic injustice’. These epistemic injustices play out in a number of ways, including credibility deficit, questionable research practices, and editorial racism. Ethical shortfalls in the increasingly marketised academic publishing industry are not new, but risk being compounded by the pandemic.

Editors of high profile journals have

retracted papers published during COVID, highlighting issues around the veracity of data and ethical violations in the biological and clinical sciences. We direct our attention to social science research that draws on fieldwork data, often conducted in different communities or countries.

Journal websites should display a ‘pandemic ethics’ section that outlines expectations and requirements for submitting authors to uphold. This may include detailing precautionary measures (e.g., guidance on lockdown, rapid testing protocols) that are specific to the pandemic in order to safeguard participants, researchers and collaborating stakeholders, or brief explanations of the pandemic conditions assessed prior to in-person data collection (e.g., social distancing). This is applicable to both in-person and remote research, when working with colleagues in-country to collect data.

## Study of cryotherapy for COVID-19 anosmia fails the sniff test

March 14, 2022

The authors of a study suggesting that a deep freeze might help reverse one of the curious complications of COVID-19 have put their paper on ice after determining that they lacked adequate ethics approval for the research.

“Whole-Body Cryotherapy as an Innovative Treatment for COVID 19-Induced Anosmia-Hyposmia: A Feasibility Study,” was written by a group in France led by Fabien D. Legrand,



of the University of Reims. The article appeared online this January in the *Journal of Integrative and Complementary Medicine*.

The randomized study looked at the effect of cryotherapy in 45 people whose sense of smell had been disrupted by COVID. Two-thirds received either high- or low-dose cryotherapy – which Legrand’s team defined as exposure to “extremely low temperatures ( $-60^{\circ}\text{C}$  to  $-110^{\circ}\text{C}$ ) in a double Cryoair chamber (MECO-TEC, Pforzheim, Germany) for 3 min” – while a third were assigned to a control group.

According to the investigators, whose affiliations included the French Society of Whole-Body Cryotherapy — and who nonetheless registered their protocol in the Iranian Registry of Clinical Trials:

In this pilot study, gains in olfactory function were clinically important in anosmic or hyposmic patients who received high-dose WBC (5 sessions over 1 week), with improvements  $\geq 50\%$  when comparing pre-intervention with follow-up assessments. We conclude that WBC might be benefi-

cial and safe for patients with SARS-CoV-2-induced OD; however, further research is necessary to confirm the findings of this pilot study, and to investigate the mode of action.

The study got some attention – from the cryotherapy world, at least. As this article reported, with pictures, no less:

Bastien Bouchet, Founder of France-based cryotherapy center company Cryotera, has co-authored a recent study with Fabien Legrand, Lecturer in Psychology, University of Reims. He explained:

“We came across this by complete chance. Two of our clients, who happened to have had Covid, were undertaking whole body cryotherapy sessions for pain relief and realized that after two sessions each, they had partially regained their sense of smell.” ...

Of the 30 people who undertook the cryotherapy sessions, 28 saw a 200% improvement in their sense of smell score, while just two experienced no effect. To date, the participants who did regain some of their sense of smell have retained it at that level.

But as the retraction notice rather, um, frostily states, the researchers had missed a critical step in their work:

The article entitled, “Whole-Body Cryotherapy as an Innovative Treatment for COVID 19-Induced Anosmia-Hyposmia: A Feasibility Study,” by Legrand FD, Polidori G, Beaumont F, Bouchet B, Morin A, Derruau S, and Brenet E (Epub ahead of print Jan 13, 2022; DOI: 10.1089/jicm.2021.0254) is officially retracted at the request of the authors.

This request came after the paper had undergone full peer review, three rounds of revisions, acceptance, page proofs, and ultimately, online publication.

The Methods section of the published paper states that the study had “secured University ethics clearance...”<sup>1</sup> but the authors explained that, “after re-discussion and internal reassessment, it appears clearly that this study required, according to French law, the approval of a specific committee known as the ‘[C]ommittee for the [P]rotection of [P]ersons (CPP)’ and not a simple ethical agreement. For this reason, [we] request, in good faith, that the article be retracted. We apologize for this delay in taking a position, but this study gave rise to a re-discussion with our peers of the methodology which led us to realize our error ‘a posteriori.’”

The authors’ respective institutions have been notified by the publisher.

*Journal of Integrative and Complementary Medicine* is committed to upholding the rigors of scientific publishing and the veracity of the literature.



# Biotech Industry News

## Biocon Biologics to Acquire Viatris' Biosimilars Assets for up to USD 3.335 billion

February 27, 2022

Biocon Biologics Ltd., a subsidiary of Biocon Ltd. (BSE code: 532523, NSE: BIOCON), announced today that it has entered into a definitive agreement with its partner Viatris Inc. (NASDAQ: VTRS). Accordingly, Biocon Biologics Ltd. (BBL) will acquire Viatris' biosimilars

business to create a unique fully integrated global biosimilars enterprise. Viatris will receive consideration of up to USD 3.335 billion, including cash up to USD 2.335 billion and Compulsorily Convertible Preference Shares (CCPS) in BBL, valued at USD 1 billion.

The Board of Directors of both companies have approved the transaction.

BBL will have a comprehensive portfolio comprising its current range of commercialized insulins, oncology and immunology biosimilars as well as several other biosimilar assets currently under development. BBL also has access to the vaccines portfolio through its previously announced partnership with Serum Institute Life Sciences

(SILS).

Combining Viatris' biosimilars business with BBL accelerates the build out of our commercial capability in developed markets in order to become a strong global brand with a direct presence in U.S., Europe, Canada, Japan, Australia and New Zealand.

BBL currently has a portfolio of 20 biosimilars. The acquisition of biosimilars assets of Viatris significantly strengthens BBL's position in providing affordable access to patients through its portfolio in diabetes, oncology, immunology and other non-communicable diseases.

By integrating Viatris' portfolio, BBL will have one of the broadest and deepest commercialised biosimilars portfolio in the industry:

Comprehensive biosimilar insulins portfolio, including rh-Insulin, bGlargine and bAspart;

A growing biosimilar oncology portfolio, including bTrastuzumab, bBevacizumab, bPegfilgrastim;

A significant presence in autoimmune segment through in-licensed products like bAdalimumab, bEtanercept.



## Kriya Medical Technologies gets DCGI nod for RT-PCR kit

February 20, 2022



Medical devices firm Kriya Medical Technologies has received manufacturing licence from the DCGI (Drugs Controller General of India) for its product KRIVIDA Novus, an RT-PCR kit that can detect the Omicron variant and its sub-lineages in 45 minutes. Priced at Rs 150 plus taxes, the test is affordable and most suitable for entry point screening at airports, the company said in a statement.

The company said it will roll out the kit from its Chennai-based manufacturing facility. The company currently has a production capacity of 5 million tests per month and plans to increase it to 10 million tests per month within the next two weeks.

“Our focus is to make testing for Covid-19 variants faster, affordable

and accessible to everyone, thereby enabling swift prevention and timely treatment. Since KRIVIDA Novus can detect the Omicron variant (B.1.1.529) and all its sub-lineages, such as BA.1, BA.2 and BA.3 in 45 minutes, it is most ideal and beneficial for entry point screening at airports and remobilisation of normal conditions in workplace and institutions,” Kriya Medical Technologies CEO and Founder Anu Moturi noted.

## The F.D.A. rejects an India-made Covid vaccine for those under 18

March 4, 2022



The American pharmaceutical company Ocugen said on Friday that the

Food and Drug Administration had rejected its application seeking emergency authorization for an India-made Covid vaccine for those ages 2 to 18.

The vaccine, made by the Indian pharmaceutical company Bharat Biotech, has not yet been tested in the United States, nor has it been authorized for any age groups in the United States. It is not clear if the vaccine has a path forward with American regulators, when the country already has a surplus of authorized doses.

A clinical trial in India that enrolled those ages 2 to 18 found that two doses of the vaccine generated strong immune responses and did not cause serious side effects. Another large-scale clinical trial in adults in India found that the vaccine provided good protection against Covid, with very strong protection against severe disease. Both of those studies were conducted pre-Omicron, when earlier versions of the virus were circulating.

Ken Inchausti, a spokesman for Ocugen, said the company is “disappointed” by the agency’s decision. The company said in a news release that it still wants to try to find a path forward for the vaccine to be made available for 2- to 18-year-olds in the United States. Ocugen’s stock fell 23 percent on Friday.

Ocugen is continuing to seek full approval for the vaccine in the United States. The company has said it plans to soon start enrolling adult volunteers in the United States for a clinical trial that will evaluate the immune response generated by the vaccine.



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