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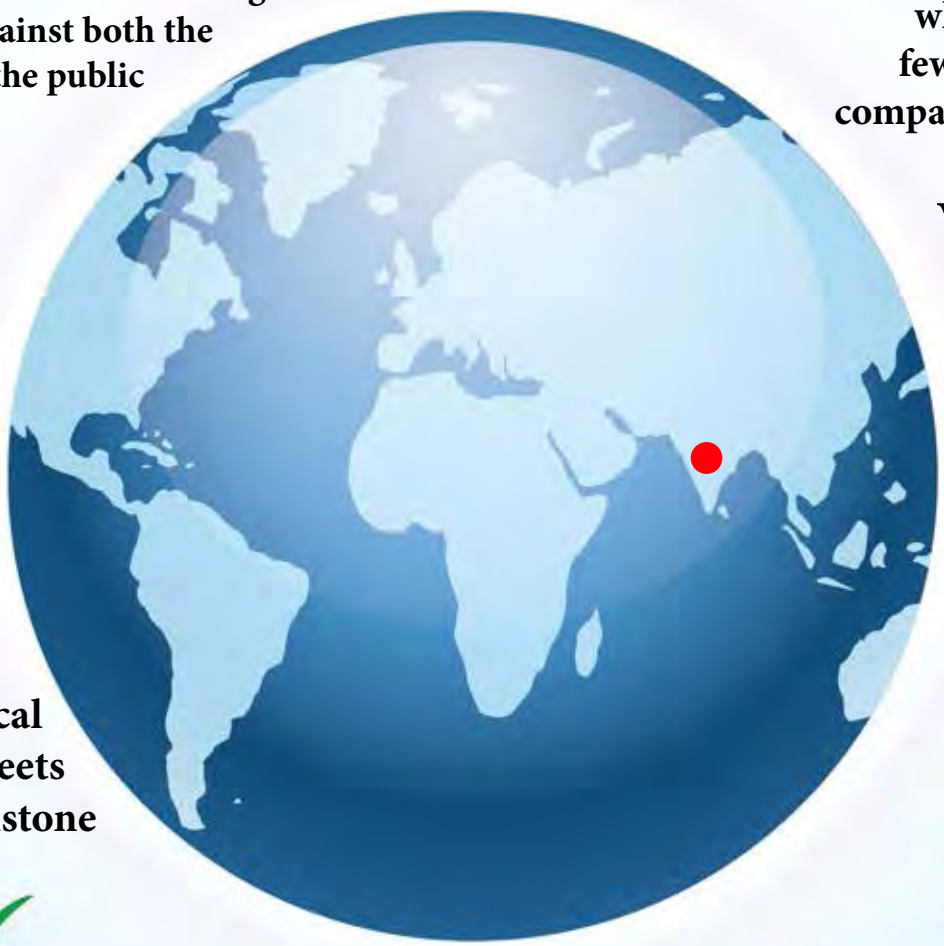

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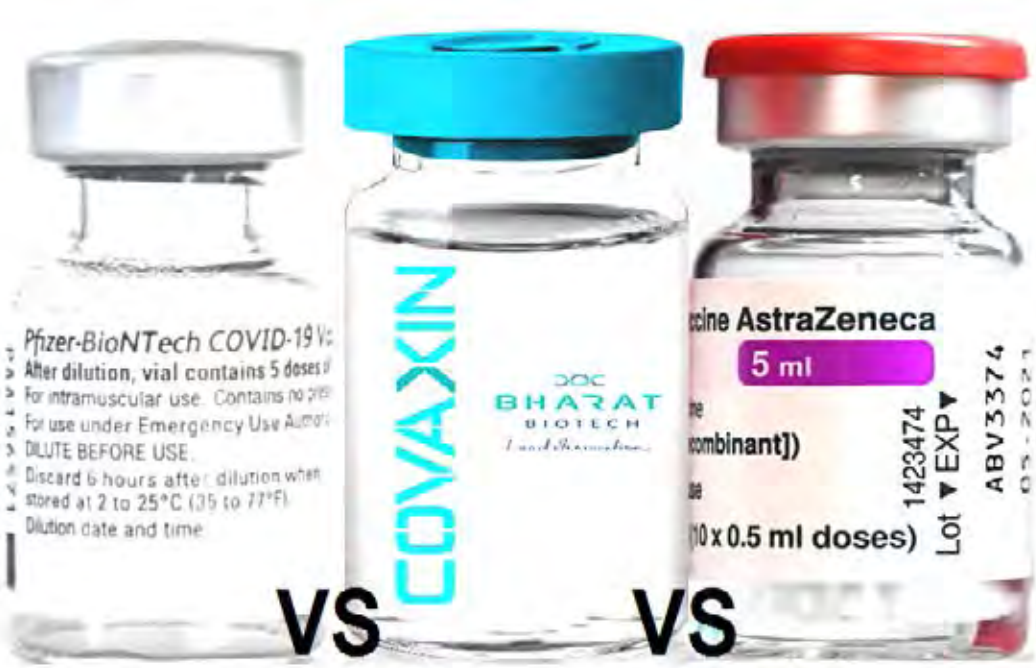

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Editorial

India's Bharat Biotech Covaxin shows best results among three COVID-19 vaccines present worldwide: What else WHO needs for EUA?

by Kamal Pratap Singh | First Appear Online: July 05, 2021

The Indian company Bharat Biotech (BB) on 3rd July 2021, released a press release about the final analysis for COVAXIN efficacy as part of phase 3 clinical trials after publishing preprint data on medRxiv. Here in this article we are comparing Phase 3 results of world's 3 most popular COVID vaccines that are in vaccination drives around the world. 2 out of 3 got huge funding from international organizations for R&D and manufacturing and already have won Emergency Use Approval from WHO and FDA but Covaxin has to wait despite its high effectiveness and safety profile because it is from third world country.

It has been discussed in other articles of this issue that how the provenience of vaccine plays a role in approval through WHO and FDA. We have also seen in other articles from Biotech Express that how in COVID pandemics, the FDA and WHO have had become puppets of high im-

Highlights

After analyzing paper of BB's phase 3 results, we found several advantages over other COVID vaccines in scenario, some are here:

1. Covaxin is effective against emerging variants including delta variants that is recently causing high number of cases
2. It considered pregnancy issues
3. Covaxin dosage is very less which reduce chances of allergy/infection from vaccine
4. It can be stored at 2-8 which can reduce wastage in preparation and useful for long term storage
5. It has consistent batch to batch safety and efficacy
6. It has secondary response or immunity against further infections
7. Least serious adverse events like reported in other vaccines
8. The COVAXIN is the vaccine for those who are waiting for safe vaccine amidst vaccine hesitancy

pact journal like the Lancet and NEJM and changed their decisions toward COVID treatment in alternate manner when these studies were published and then retracted.

According to WHO and other health organizations, the vaccines are the most effective tool against the deadly coronavirus that is making fatalities around the world. From the very starting the world is trying to make a vaccine that can address various concerns regarding safety and efficacy but all the drugs and vaccines that are approved till now have come under scrutiny because they were contradicted by experts, some of them even banned for use and guidance was provided to not use them, the greatest example is HCQ. All have been objected except the Covaxin of Bharat Biotech which has not shown any severe side effects or deaths after vaccination.

We have seen the present condition of vaccine hesitancy and discussed separately in an article in this issue, that how despite having so many vaccines people are not willing to take them because they are not sure of trial results. Using a table we have articulated points that are destined to understand doubts about vaccine hesitancy in each vaccine and to check which vaccine can remove hesitancy from the minds of people all around the world.

Since the start of pandemic we have seen that every Chinese product has been questioned and subsequently rejected given the quality of products, for example the diagnostic kits which were rejected by several nations including India and Italy. Keeping this in mind the article has not included Chinese Sinovac's CoronaVac, because its efficacy has been questioned recently in Indonesian population.

In current times, the most intriguing questions about COVID vaccine include safety, efficacy, effectiveness against variants, pregnancy, symptomatic efficacy, neutralization response etc. so we will discuss these points and try to find out the best vaccine.

Now coming to the most abundant vaccines that have been inoculated to masses till now are of Astrazeneca (ChAdOx1 nCoV-19), Pfizer (mRNA-1273) and Bharat Biotech (Covaxin). The former two released phase 3 results much earlier than latter.

To start with, though Astrazeneca has published results but still it is interim analysis whereas other two have published final results. None of the vaccine has considered vast racial and ethnic diversity.

Most importantly in current scenario after emerging variants, Covaxin group has studied the effects on variants specially the delta variant while other two have reported no studies in this respect. Pfizer currently asked WHO for booster dose for delta variant but Covaxin is ready for the same purpose without any additional cost and efforts.

Cost is an important factor to inoculate whole population, Astrazeneca's vaccine in this respect can be a great worry as it requires booster dose for complete effect while other two do so in doses as described in trial results. Also Covaxin dose is very low so the manufacturing cost, and at the same time because the dose is low the chances of allergic reactions or side effects are also negligible.

The storage of vaccine is great for COVAXIN and Astrazeneca but because the conditions are stringent for Pfizer, the cost of maintaining the lots and the chances of wastage are also high.

Vaccine manufacturing lots consistency was questioned worldwide after it was found that Pfizer's mRNA concentration was different in the supplied vaccine as compared to trial vaccine, as per the leaked documents analyzed by BMJ. Covaxin is the only vaccine that has considered manufacturing lot consistency and so each vial has the same material and as much safe as the material used in trials.

When we talk about the vaccine trial conditions, the COVAXIN has recruited largest number of participants as well as done studies to the longest time to see the post vaccination effects. It also considered pregnancy related studies in females whereas other two did not. Covaxin and Pfizer also considered subjects at risk whereas data for the same is not available for Astrazeneca's vaccine, lack of this data does not tell us that how this vaccine works against serious cases.

To study the effect of vaccine it is important to know how many subjects still got the disease after the therapy i.e the safety of vaccine. In Covaxin the number of subjects who got symptomatic after vaccine is far less than the other two in both patient group as well as the placebo. The higher number of symptomatic cases in placebo group in comparison to patient group after vaccination, showed that vaccine prevented the COVID symptoms.

The overall Efficacy of Covaxin lies between Astrazeneca's and Pfizer vaccines but the efficacy in severe cases which is real efficacy of vaccine is shown only in Covaxin and not other two, it is 93.4% in Covaxin group and thus it can prevent serious COVID cases.

Table: comparison of COVID vaccines that are widely circulated in the market

Astrazeneca/ Serum Institute	Pfizer/Moderna	Bharat Biotech	Information as on 14th July 2021	
https://www.thelancet.com/action/showPd-	https://www.nejm.org/doi/pdf/10.1056/NEJMoa2035389?articleTools=true	https://www.medrxiv.org/content/10.1101/2021.06.30.21259439v1.full.pdf	**Paper Reference**	**Publishing Information**
UK/ India	USA	India	**Origin of Studies**	
December 8, 2020	February 4, 2021	June 02, 2021	**Date Of Publication**	
Pooled Interim Analysis	Final	Final	**Observations**	
UK, South Africa and Brazil	U.S. demographics	Indian demographics	**Ethnic And Racial Diversity**	**Diversity**
No	No	Yes	**Variants Studies**	**CoV-2 Variants**
ChAdOx1 nCoV-19 (AZD1222)	mRNA-1273	Covaxin (BBV152)	**Vaccine Name**	**Vaccine**
Recombinant Virus Vector	mRNA vaccine	Inactivated Whole-Virion	**Type Of Vaccine**	
Half dose (2.5x 10^{10}) – Full dose (5 × 10^{10}) vectors	100 µg	0.5 mL (6 µg)	**Dose Conc.**	
0-69 days	0-28days	0-28days	**Dose Gap**	
2- 8°C	-20° C	2- 8°C	**Storage**	
NO	NO	Yes	**Variant Inclusion**	
1-3	2	2	**Number Of Doses**	
Yes	No	No	**Booster Dose**	
NO	NO	Yes	**Vaccine Lots consistency**	
WHO /FDA/DCGI	WHO /FDA	FDA/DCGI	**WHO/FDA/ DCGI**	**Emergency Approval**
ClinicalTrials.gov, NCT04324606	ClinicalTrials.gov, NCT04470427	clinicaltrials.gov: NCT04641481	**Registration**	**Trial**
April 23 and November 4, 2020	July 27, 2020 - November 25, 2020	November 16, 2020 - January 7, 2021	**Recruitment Period**	
Nov 4, 2020	November 25, 2020	May 17, 2021	**Data Cut-Off Date**	
Yes	Yes	Yes	**RT-PCR**	**COVID-19 Test**
Yes	Yes	Yes	**Serology**	
Yes	Yes	Yes	**Physical**	
No	No	Yes	**Pregnancy test done**	**Pregnancy Studies**

What will happen to future immunity against virus, it is not sure in Astrazeneca's and Pfizer vaccines because both other two have not done studies to see the effect whereas Covaxin has shown that it produces neutralizing antibodies that provide long term immunity against virus so there is no need of further expenses to get booster dose in future. Serious adverse events were also reported in Astra and Pfizer vaccine like Anaphylaxis, Transverse Myelitis Myocardial Infarction, Cholecystitis, Nephrolithiasis, Bell's Palsy that if not considered for further studies can lead to wipe out of huge population or long term effects on health. Covaxin in this respect has been proved as safe because it reported no side effects after vaccination.

23,848	30,420	26,028	**Total Number of Participants**	**Subjects' Recruitment**
1:1	1:1	1:1	**Patient: Placebo ratio**	
11,636	14,134	16,973	**Participants considered for per protocol analysis**	
Not Available	25.3%	20.5%	**Subjects At-Risk**	
>18 years	>18 years	>18 years	**Age**	
131	269	130	**Symptomatic After Vaccine**	**Safety**
30	11	1	**Vaccine Group**	
101	225	15	**Placebo**	
62·1%	94.1	77.8	**Overall Efficacy**	**Vaccine Efficacy**
Not Available	Not Available	93.4	**Efficacy (Severe)**	
67.1%	90.9%	77·8	**Symptomatic Efficacy**	
No	No	Yes	**Neutralization Response Studies**	**Secondary Response**
168	304	99	**Total**	**Serious Adverse Events**
10	Not Available	None	**Hospitalization**	
Anaphylaxis, Transverse Myelitis	Myocardial Infarction, Cholecystitis, Nephrolithiasis, Bell's Palsy	None	**Reported Event**	
1	1	1	**COVID Deaths**	
Not Available	97 days	146 days	**Maximum Days**	**Follow-Up Period**

Conclusion:

From the above discussion it is easy to conclude that though Covaxin was little late in doing studies and producing little doses than others but it has come out as the safest and most effective vaccine on several parameters that were not considered by other vaccine producers. It is an answer to people who are showing vaccine hesitancy. It is manufactured in safe environment and so the chances of contamination are negligible. If we set aside the politics, the WHO should approve this product for the benefit of human race and international funding agencies should fund Bharat Biotech to increase the manufacturing capacity of COVAXIN as the delta variant is again emerging and the cases are rising in USA and other countries. We have seen that none of the vaccine is effective against delta variant and thus Covaxin is the only choice the world has to save its people.

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Editorial

The Bharat Biotech's COVAXIN®Phase-3 Clinical trial report meets WHO's touchstone

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COVAXIN® is India's indigenous COVID-19 vaccine developed by Bharat Biotech Company in association with the Indian Council of Medical Research (ICMR) - National Institute of Virology (NIV). The vaccine is developed via Whole-Virion Inactivated Vero Cell technology. Inactivated vaccines fail to replicate and hence they are improbable to revert and root pathological effects. They comprise dead virus, inept of infecting people but still able to inculcate the immune system to escalate a defensive reaction counter to an infection. COVAXIN® is incorporated along with adjuvants, which are augmented to the vaccine to enhance and boost vaccine's immunogenicity. The course of vaccination consist of two doses of COVAXIN® administered 28 days apart.This vaccine does not claim for sub-zero storage conditions, stored in multi-dose vials and remain stable at2-8°C which is ready to use without any reconstitution.

Figure 1: Phase 3 Clinical trial data of COVAXIN®

Serum Institute of India's Covishield and Russia's Sputnik V are the other two Covid-19 vaccines that have been administered to Indian citizens so far. Notably, COVAXIN® has not enlisted in the Emergency-Use Listing (EUL) of World Health Organization (WHO) vaccines due to inadequate data of Phase 3 clinical trials. The lack of endorsement from WHO has been hampering travel plans for individuals as many countries are only accepting vaccines approved by the public health body. However, COVAXIN®

has been acknowledgedwith emergency use authorizations in 16 countries together with Brazil, the Philippines, Iran and Mexico.

Finally, the Bharat Biotech company shared the final phase-3 clinical trial pre-print data on medRxiv on 3, July, 2021. According to the data provided, the company recruited 25798 subjects between November 16, 2020 and January 7, 2021(Figure 1). These participants were randomized to BBV152 or placebo groups. The purpose of this study is to gauge the efficacy, safety, and immunogenicity of COVAXIN® in volunteers of and above 18 years. The prime outcome was laboratory-confirmed symptomatic COVID-19, befalling at least fourteen days after the second dose. Ancillary outcomes were efficacy in18≤ 60 years and ≥ 60 years sub-groups and in volunteers with previous stable medical circumstances. The company also assessed safety, reactogenicity and consistency of immune responses for three sequential manufacturing lots.

Out of 24419 participants, 12221 received two doses of BBV152 and 12198 received placebo. In a case-driven analysis, 130 cases of symptomatic COVID-19 were recounted in 16,973 (0·77%) participants with sequelnot less than two weeks after the second vaccination. Out of 130 cases, 24 befell in the vaccine group and 106 in placebo recipients showing an overall vaccine efficacy of 77·8%. Out of 16 cases, one vaccinee and 15 placebo recipients, met the severe symptomatic COVID-19 case characterization demonstrating a vaccine efficacy of 93·4%. Efficacy against asymptomatic COVID-19 was 63·6%. The vaccine conferred 65·2% protection against the SARS-CoV-2 Variant of Concern, B.1.617.2 (Delta) with nil cases of anaphylaxis or vaccine-related deaths. Safety analysis demonstrated that adverse events reported were similar to placebo, with 12% of subjects experiencing commonly known side effects and less than 0.5% of subjects feeling serious adverse events. The vaccine has confirmed to neutralize the variants - B.1.1.7 (Alpha) first isolated in UK, P.1-B.1.1.28 (Gamma) & P.2 - B.1.1.28 (Zeta) first isolated in Brazil, B.1.617 (Kappa) first isolated in India, B.1.351 & B.1.617.2 (Beta & Delta) first isolated in RSA & India.

Dr.Soumya Swaminathan (Figure 2), the chief scientist at WHO, revealed to CNBC TV-18 on July,8,2021 that the final phase-3 clinical trial data for COVAXIN® "looks good" and encounters the safety profile of the international public health agency so far. She remarked that although COVAXIN®'s efficacy against the Delta variant of Covid-19 is a bit low, it is still not bad, while the overall efficacy is "quite high." She said that WHO keeps a close watch on all the vaccines which are on the pipeline for emergency listing, adding that the agency is anticipating more data for a concluding say on the matter.

Figure 2: Dr.SoumyaSwamination, Chief Scientist at WHO

In the interview, she also affirmed that most parts of the world have seen an uptick in coronavirus cases with no reduction in the number of COVID-related deaths, except in America. She also added that India can take inspiration from countries like the United Kingdom and strive to boost their shots as they are. By the way, she uttered that the WHO still does not recommend booster shots, adding that every country's prime focus should remain on widening the scope of primary COVID-19 vaccinations.

While on the subject, she also stated that one of the major reasons behind the spike in the number of COVID-related death, in Africa and other nations, is the spread of the Delta variant of the SARS-COV-2 that was first found in India. Listing out the reason for worry, she said the original strain could infect three people, the Delta variant can infect 6-8 and added that the world could witness another surge in coronavirus cases if the virus mutates further.

Last of all, she emphasized the need for social distancing and the usage of face masks. She pronounced that even after 70 percent of a nation's population is vaccinated, the remaining 30 percent stay at rest. In the end, the WHO Chief Scientist, Soumya Swaminathan concluded that vaccines alone are not enough and the government needs to continue with the testing and tracking method.

After the pre-print submission, Dr. N. K. Arora, Chief of National Technical Advisory Group on Immunisation, India (NTAGI, India)(Figure 3), supposed that these results will aid the vaccine to get acknowledgement from the WHO and people who have been administered COVAXIN® in our country will be capable of travelling across the globe without any restraints.

Figure 3: Dr. N. K. Arora, Chief of National Technical Advisory Group on Immunisation, India. (NTAGI, India)

Amidst unease over the lack of international recognition for locally manufactured COVAXIN®, the statement given by the Chief Scientist, Dr Soumya Swaminathan, emerge as a budding outbreath of liberation for students, officials and others who meant to travel abroad.

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Guest Article

Vaccine Pass? An option to Ignore 'Make in India' vaccine

by Deepak Rathi

Millions of fully vaccinated people in India and Africa are confused to land Europe under the EU's new vaccine passport(Digital Green Certificate) scheme. That's despite the fact that they all have taken a vaccine that, on the face of it, is already authorized in the EU, as well as by the UK and the WHO.

The EU backed up by UK is allowing one brand of the AstraZeneca jab, named Vaxzevria, but its identical, Indian-made version Covishield manufactured under license by India's Serum Institute, is not one of the vaccines listed for the EU's new digital travel pass. It means all Indians will not be allowed to enter European nations though we have trusted and got inoculated by EU nation's vaccine formula.

Vaccines, which have been authorized by the European Medicines Agency, are: Comirnaty (BioNTech/Pfizer), Spikevax (Moderna), Vaxzevria (AstraZeneca) and Janssen (Johnson & Johnson)

This has become an issue of international debate between leaders of healthcare sectors in various contries, that how vaccine passports could be discriminatory against a section of the world's population (18 % Indian and others). An issue was raised by Indian External Affairs Minister S Jaishankar, he asked why not people who are tested before for international travel and tested on arrival are allowed to travel but some countries have now introduced the issue of vaccination. It is a real ethical concern when it comes to the concept of vaccine passports.

According to experts, it will lead to politicization of vaccine because every nation will favour their own vaccine if they do to not wish to give their economic chunk to other nations, and the poor nations will get nothing, neither money nor the immunity from the virus. WHO is the international organization and is responsible to see the various aspects health and it should see this as a matter of great speculation. Vaccine passport means that those who are vaccinated can enjoy the freedom to move and thereby can have access to larger opportunities, while others remains in lockdown.

It is also to understand that these political or profitable situations is equally hurt health of nations when some nations could make their own effective vaccine but their science has been disapproved by money making organizations.

This isn't the first time the world has been engaged in a conversation about "vaccine passports." The problems have been seen after smallpox pandemic in 1900 when fake vaccine passport became common thing. The vaccination process was so brutal, and partly because anti-vaccination crusaders exaggerated the risk of contracting tetanus or syphilis through the vaccine, there were plenty of people who tried to avoid vaccination by any means necessary.

There is a version of a passport currently in use – the WHO approved yellow card known as *Carte Jaune,* which since 1969 has been a document for travellers to certain countries to show proof of vaccination for yellow fever and other shots, without which they can't enter some countries.

If the matter goes out of control from WHO and if nations on their own can make their passport then why not India should go like this and ban travel like the EU commission. India has 3 vaccines under EUA and can reiterate by allowing individuals into its territory who got only India approved. If this happens, there are many things that will halt like tourism including medical tourism, educational visits, business trips etc.

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Editorial

For India, From India: A strategic battle to win against both the pandemic and the public psychology

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COVID-19 pandemic, the biggest global issue nowadays, is universally agreed to be won by effective vaccination only, as no conclusive drug and/or treatment strategy is available till date. In comparison to the developed countries like the United Kingdom and the United States of America, the rate of vaccination in India is lower and the percentage of vaccinated persons are much lower.

Despite the Central Government's awareness campaigns and vaccination offers via CoWIN site, this lower rate of vaccination is heightening the risk of the speculated third wave of COVID. But there are a few reasons behind the lower rate, which should be addressed as early and widely as possible. Firstly, safety data should be introduced in the awareness programmes. Most of the general public are afraid of the possible adverse effects of any vaccine. Including COVAXIN, all available vaccines against COVID-19 are developed fast and are issued an Emergency Use Authorization (EUA). This information creates a panic in public, and it results in unacceptance of vaccines even in health care workers (HCW).

Another major reason involves the activities of media and social sites. Though most of the print- and electronic media try to deliver the accurate information, insufficient scientific analysis in those news generate ill-informed public. Some of these people vomit those undigested bogus along with their own unrealistic speculations on social media platforms; thus, eventually destroying the efforts of the Government. Some examples of such 'social media information' for side effects of vaccination are as follows: lower sperm-count, decreased survival rate in normal people, infertility in women, increased risks for other diseases, risk of heart attacks after vaccination, etc.

The most threatening idea spreading in social media platforms is, any vaccine is useless and unnecessary at all. As the SARS-CoV-2 virus causing COVID-19 shows less 'killing effect' compared to some other viruses like Ebola and Lassa virus, those ill-informed public cannot understand the need of vaccination. They better like to wait for natural immunity after

getting a mild infection with SARS-CoV-2. Therefore, the Government should put some extra effort to design campaigns to make people understand that the virus does not ask the victim for 'mild' or 'major' attack.

In contrast to the other countries, India has designed its own vaccine using the inactivated viral agent; most of the other available vaccines use a SARS-CoV-2 protein, or viral mRNA, along with some vector from other virus. But using the whole virus particle, though inactivated, has some specific benefits that cannot be expected form other vaccine development strategies.

Before discussing the benefits of inactivated viral vaccine, it must be noted that 'inactivation' of a virus effectively ceases its growth inside the host body. Therefore, the 'inactivated virus' vaccine if prepared cautiously is safe and cannot generate active live viruses in the acceptor. This vaccine, brand name 'COVAXIN', is reported to show more than 80% efficacy; this means, if one hundred people are vaccinated with COVAXIN, more than eighty people will have effective immunity in them after the second dose. This efficacy rate is undoubtedly appreciable; thus making this vaccine acceptable and approvable by the World Health Organization (WHO) which despite its effectiveness and safety faced some initial rejections.

This efficacy rate is undoubtedly appreciable; thus making this vaccine acceptable and approvable by the World Health Organization (WHO) which despite its effectiveness and safety faced some initial rejections.

COVAXIN, made in India by Bharat Biotech, confers a wide range of immune responses in the vaccinated person. As the whole 'body' of the virus is used, all the viral proteins are available for generating immune responses. As a result, a polyclonal antibody titre is expected in each vaccinated person, and more effective protection is expected. Probably, this is the reason that COVAXIN shows effectivity against the Delta-variety of the SASR-CoV-2. Due to mutations, the initial SARS-CoV-2 virus has generated more infectious variants, and the Delta-variety is considered the most infective one. Mutations can change viral proteins; therefore, the other vaccines which used one or two viral proteins for generating antibody responses in the recipient, may not generate affective immunity if the mutation(s) changes that selected viral protein inside the virus. This problem is not expected in COVAXIN. Generation of antibodies against at least one (or even more) unaltered viral protein(s) is expected, even when a few other viral proteins become mutated. This can make COVAXIN the 'vaccine of choice' for its broad-spectrum protection.

In conclusion, to combat the onset of the third wave of COVID, the Government of India should emphasize the campaigning strategies; so that, the afore-mentioned hesitancy for vaccination can be cured. The scientific phenomenon should also be used for generating public awareness, in a simple layman's language, to reduce hesitancy for vaccination and increase the choice for COVAXIN. In this way, we all should stand for India, by using vaccine from India, for developing a better India set aside foreign counterparts if they are not willing to accept Indian sciences.

Editorial

by Seema Pavgi Upadhye

The reasons behind COVID vaccine hesitancy

The World Health Organization defines vaccine hesitancy as a "delay in acceptance or refusal of safe vaccines despite availability of vaccine services. Vaccine hesitancy has identified as a leading global health threat which has increased in the times of COVID-19.

A survey in Israel indicated that the percentage of people who intended to obtain a COVID-19 vaccine was 78% among physicians, 61% among nurses, and 75% in the general population. Low acceptance rates were also observed among Hong Kong nurses in two studies, and in late 2020, only 36% of U.S. HCWs said they were willing to take the vaccine as soon as it became available (56% said they were not sure and would wait to review more data).

Though none of the COVID-19 vaccines yet fully approved for commercial use by the WHO, FDA, EU or any other healthcare organization, many have been granted emergency use approval and thus are inoculated like they were commercialized. These drugs/therapies including vaccines were approved based on the scientific studies on thousands of patients and many of these studies have been challenged and counteracted which is why people are reluctant to the decisions of these bodies.

Factors associated with intention to delay or refuse to take COVID-19 vaccines are influenced by many issues. In this article, we are discussing how covid vaccine hesitancy grew to maximum limits under the following points:

Safety and efficacy concerns

The first thing which comes in minds of people is safety of vaccine because many vaccines studies have reported serious side effects like blood clots, anaphylaxis, infertility problems etc. and even death. The people believe though regulatory processes were relieved but these vaccines are produced in a rush and long term results can be too dangerous because technologies like mRNA technology which is used for the first two COVID-19 vaccines authorized in the U.S. — is entirely new. The trust could build among people but it goes down when COVID-19 vaccine makers have all declined to accept any compensation liability in case of any severe side effects and death. On the top of that they were asked for indemnity from governments- a kind of legal immunity against side effects and death.

Distrust in government organizations and political leaders

From the very start of the pandemic governments have been seen to make decision in favour of their country for kits, vaccines, lockdown measures etc. and it was evident from some statements from leaders like Trump who criticized China, warned WHO to cut funding etc. in the middle of pandemic when so many were dying as per figures.

And when whole world was forced to wear masks and otherwise penalized, the leaders were seen to flout COVID protocols; US President Donald Trump was criticised on social media after he posed outside the White House without a mask despite testing COVID-19 positive and having just returned from a hospital. Similarly, Indian PM Modi and HM Shah were heavily criticized for not wearing mask at a public events.

Menstruation, Pregnancy and Fertility Issues

Again, media has reported serious side effects in males and females after vaccination which can lead to Menstruation, pregnancy and fertility issues, though health organizations like GAVI and others declared that "There is absolutely no scientific evidence or truth behind this concern that vaccines somehow interfere with fertility, either in men or in women" but because people do not trust health organizations so they are not willing to take chances. In general the HPV (human papillomavirus) vaccine and the flu vaccine have been known to affect menstrual cycles temporarily so it is equally possible in COVID-19 vaccines too, according to some researchers.

Anthropologist Dr Kathryn Clancy at the University of Illinois spoke on Twitter about how her period arrived early and was heavier than usual one week after her first dose of the Moderna vaccine. The Medicines and Healthcare products Regulatory Agency (MHRA-UK) has so far received more than 13,000 reports from women across the country who have experienced changes to their period after having the vaccine.

Distrust in health organizations

Big organizations like WHO and FDA were questioned many a times for approval of unproven therapies for COVID-19, based on the studies published in Lancet NEJM etc. Later these studies were retracted and so the approved therapies were also unapproved subsequently. Now also, health organizations face criticism for doing the same in different parts of the world when they approve therapies without making data available to public for scrutiny.

It is also in mind of people that health organizations have exagger-

ated COVID-19's lethality for pharmaceutical and political gain. For example, many fraud diagnostic kits manufacturers were caught red handed for bribing and providing bogus kits. Masks, sanitizers, PPE kits, manufacturers were seen to provide low quality and high price material and the material for free public distribution by govt bodies had come in black market. Similarly, reports came of oxygen, drugs black marketing in India where things which normally cost around 1000 Rs. were sold at 35000-1 lakh Rs in emergency situations.

Two Chinese companies — Livzon Diagnostic Inc and Wondfo — which supplied 6.0 lakh kits to India on April 16 2020, say that they were validated by NIV, Pune and then cleared by ICMR for supply.
According to details provided in the Delhi High Court, the kits procured from China, whose delivered cost was ₹245 a test, were sold to ICMR for ₹600 a test — a mark up of 145%. The matter came to light when Rare Metabolics Life Sciences Pvt Ltd and Aark Pharmaceuticals, distributors of Chinese Wondfo Biotech's kits imported by Matrix Labs, approached the High Court recently to get delivery/payment disputes cleared.

Some antibody tests, which check for prior Covid-19 infection, had high rates of false positives in screenings performed by a consortium of California laboratories, according to a recently released report.

Media Misinformation

Media misinformation is a major concern for vaccine hesitancy because the data (infections, deaths etc.) they have shown has ben challenged several times. People believe that these media organizations have exaggerated the severity of COVID-19 to increase their TRPs. The doubts about disease spread, prevention, lethality, and vaccine safety etc. were judged without any scientific calibre and thus perception of the information provided become inconsistent and contradictory. These all information has led government, policymakers, health authorities, and pharmaceutical companies to change their strategies as per information.

False Statistics about infection and deaths

On April 17, 2020 China's death toll from the coronavirus has jumped sharply in the city of Wuhan, where the virus emerged last year, added another 1,300 fatalities to its official count in a single day when its death rate was challenged. The revision raises the death toll in the 11-million-person city by 50% to 3,869, and brings the China's overall death toll to more than 4,600.

Various reports and news have also came of fake cov dashboards. According to Shai Alfasi, a security researcher at Reason Labs, hackers have developed a fake version of online dashboards which were shown to use tracking of the coronavirus impact in real-time but they were not taking data from genuine sources and were just advertisement platforms.

Preference for Natural Immunity

Current evidence suggests that antibody concentrations in the blood of people who have been infected by SARS-CoV-2 can persist in some people for at least 8 months, and possibly longer, after infection which is natural immunity and thus do not need vaccine to attain immunity. People in US and other countries have started believing that COVID-19 is harmless and they have achieved natural immunity against the virus and need not to get vaccinated. Individuals who believe the seriousness of COVID-19 has been exaggerated perceive the risk of vaccination to be greater than the risk of infection.

Rallies and Gatherings of Celebrities

between June 20 and September 30, About 18 election rallies by President Donald Trump are estimated to have lead to more than 30,000 confirmed cases of coronavirus and likely led to more than 700 deaths, a new study by Stanford University researchers said. In India, the holy festival Kumbh Mela has long run alarm bells among the health experts who said it could turn into a super-spreader as pilgrims return home to their towns and villages across India after attending the huge gathering. Similarly, a steep rise in COVID-19 cases and fatalities in West Bengal was seen when many health experts said that month-long political extravaganzas responsible for the spread of the coronavirus in urban as well as rural regions of the state of India.

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Editorial

Is Baba Ramdev against whole allopathy or few western pharma company's profiteering?

by Kamal Pratap Singh

Experts from the medical fraternity of India have disapproved Ramdev's comments about the inefficacy of allopathic medicines in fighting COVID-19. Neither Baba Ramdev nor IMA chief have described which medicine has been the reason of disrespect & deaths. If we talk about of allopathic medicine then Yes they do have failed miserably, not only jeopardized lives as well as the precious money. Remedisivir, HCQ and several other drugs were granted EUA by FDA/WHO/DCGI and other regulatory agencies which were failed subsequently. Of course there are other allopathic drugs too that are working.

As analyzed Patanjali as an ayurveda organization has some medicinal solutions through Ayurveda and Yoga that are effective against viral infections and have shown positive results w.r.t boosting immunity. It is also established that Ayurveda is science and Ayurveda does not produce side-effects (including severe adverse reactions) or kill people like allopathic medicines does. Ayurvedic medicines are not tailored made within weeks or months but have traditional experience of thousands of years. Ayurveda is an ancient Hindu system of medicine as well as a general philosophy of health and wellness. It includes advice on diet, exercise, sleep, and hygiene, as well as the use of herbal preparations.

Baba Ramdev accused allopathic medicine system to be profit seeker and it has been found that the profiteering and lobbying is not restricted through govt organization but publishing houses too plays an important role. As we can see there are more than 120 retracted articles on Retraction watch, some of which were published in highly respected journals but later their positions were scratched abruptly when the popular drugs reported and retracted in The Lancet, Journal of Computational Biology; New England Journal of Medicine, The Scientist, The Journal of Allergy and Clinical Immunology and many others. It led to the dismissal of several drugs like Calcifediol, Ivermectin, Hydroxychloroquine, Lopinavir/Ritonavir, etc.

Remdesivir and other three drugs, part of UK's COVID19 Solidarity trial drug candidates failed to achieve results and then whole trial was terminated. Similarly US trial failed miserably. Israel Institute of Biological Research (IIBR) developed an antibody to COVID-19 but is nowhere in current race. Takis in Italy announced that they have successfully developed a vaccine that can help contain the novel coronavirus that causes COVID-19 but is nowhere. In India, Serum Institute of India is enjoying benefits because it is backed up by a UK giant Astrazeneca and enjoying international privileges. Plasma theory was advocated by FDA in a timely manner for approval and disapproval without any concrete stand. US drugmaker Gilead's antiviral drug Remdesivir undergone large trials in China, it was developed by CanSino Biological Inc. and Beijing Institute of Biotechnology. The role of Remdesivir now we know has been painted black in COVID-19 after objections on several clinical studies. Companies and individuals in USA have been seen to sell 'Miracle Mineral Solution' on the internet in the name of CoV, putting people's lives at danger.

The China's Sinopharm and Sinovac vaccines are extreme

examples which have been approved by the World Health Organisation for emergency use, while there have been questions about the efficacy of the vaccines, most significantly, the trial found the vaccines to be fully effective in preventing severe infections with the trial reporting zero severe cases among the vaccinated group. It is possible that countries who got inoculated by China will be contending with rolling lockdowns on day-to-day life for months or years to come. According to a news source, one month after receiving second dose of Sinopharm, Otgonjargal Baatar fell ill and tested positive for COVID-19 this 31-year-old miner spent nine days in a hospital in Ulaanbaatar, the capital of Mongolia. He said he was now questioning the usefulness of the shot.

There was a huge flow of money too for vaccines and drugs which were later terminated, according to sources, the international organizations have accumulated more than 40 billion US$. WHO, CEPI, GAVI, World bank and other international organizations have accumulated fund for vaccination of people of countries that could not afford vaccine R&D and manufacturing but these organizations are preferring only US, UK and Chinese vaccines and the ignorance of the safest vaccine of Indian Bharat Biotech is a good example to prove how profitable is this business for them.

Patanjali has had started to make formulations in the month of May 2020 and Ashwagandha was the first ingredient that would go for the permission of Indian Govt. to conduct randomised controlled clinical trial in COVID-19 cases. This was a joint initiative of the ministries of AYUSH, health, and science and technology through CSIR with technical support from the Indian Council of Medical Research (ICMR) under the supervision of Union Health Minister HarshVardhan.

Following the controversial statement on allopathy, , the Secretary-General of the IMA, Dr. Jayesh Lele's offensive stance against Swami Ramdev continues. After complaints from the PMM and defamation case of 1000 crores, a complaint has been lodged against them in Delhi and in Chhattisgarh as well.

But in response he asked if allopathy offered permanent relief from hypertension (BP) and type-1 and 2 diabetes. "Does the pharma industry have permanent treatment for thyroid, arthritis, colitis and asthma?" he asked. Ramdev went on to ask if allopathy had medicines for fatty liver and liver cirrhosis. "Like you found a cure for TB and chicken pox, look for treatments for liver ailments. After All, allopathy is now 200 years old."

Baba Ramdev was also seen to say that why and how these foreign companies which are selling food and healthcare products were allowed to sell products in the name of coronavirus. CCPA had issued notice to 14 companies for running misleading advertisement on Indian televisions but IMA and Dr. Jayesh Lele said nothing at that time. These 14 companies comes from various sectors such as water purifier, paints, floor cleaner, apparel, disinfectant, furniture for resorting to misleading claims such as immunity, COVID-19 virus protection etc.

Baba Ramdev is not alone who went against multinational allopathy companies and drugs, there are many people and groups who are trying to put facts about the profiteering and lack of transparency in Pharma practices in health pandemics. Late last year, a semi-retired British scientist Michael Yeadon co-authored a petition to Europe's medicines regulator. Michael Yeadon was a scientific researcher and vice president at drugs giant Pfizer Inc.

Recently, Transparency International (TI) the world's leading non-governmental anticorruption organisation which is addressing corruption in its many forms through a network of more than 100 national chapters worldwide found that there is a lack of huge transparency in clinical trials of COVID-19 drugs.

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Guest Article

Arbuscular Mycorrhizal Fungi – Down To Earth Friends of Plants

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Summary

At present, agriculture is challenged with meeting the global food demands for the growing population, while maintaining environmental quality and reducing the input of chemical fertilizers and pesticides. In this context, the article gives insights on the beneficial soil microorganisms "arbuscular mycorrhizal fungi" that play key roles in sustainable agriculture and promote plant nutrition and produce safe and high-quality food.

Introduction

Microbes are ubiquitous tiny organisms that are too small to be seen with the unaided eye. Both plants and animals are closely linked with microbes that make nutrients more available, provide protection from diseases, and contribute to development of immune/defense system. Furthermore, microbes are indispensable for making various foods that people enjoy such as cheese, bread, and wine. It is also worth mentioning that without the microbial decomposers, life on earth would have been smothered by dead organisms. Unfortunately, microorganisms are often brought into limelight in negative terms. The recent COVID pandemic has woken awareness to microbes in people from all walks of life, and are considered synonym to organisms that cause diseases. Although reduction of disease transmission is important for maintaining individual as well as community health, it is equally imperative for people to understand the constructive contributions provided by microbes. They are much more than their repute as causal agents of diseases.

Microbes display an enormous amount of diversity and complexity too. They are largely of five types namely; bacteria, virus, algae, fungi, and protozoa. They are present almost everywhere, from oceans on coral reefs to permafrost at high altitudes. Of all the living organisms that exist in soil, microorganisms are the most abundant and are essential for life on earth. They are responsible for driving organic matter and nutrient cycling and bring about soil fertility and restoration, maintaining plants' health, and modulating primary productivity of the ecosystem. Although a lot of these organisms are present naturally in the soil, in some conditions it is favorable to surge their populations either through direct introduction of the microbes or by adopting agricultural management techniques that enrich their abundance as well as their activities, to harness more benefits. Such beneficial microorganisms encompass those that build mutually beneficial associations (called symbiosis) with plant roots, such as mycorrhizal fungi that essentially aid in acquisition of mineral nutrients from soil andbacteria

that convert atmospheric free nitrogen gas into ammonia; a biological functional form.

Mycorrhizal Fungi - What they are and why they're important

The word 'Mycorrhiza' means fungus-root in the Greek language and is characterized as the nutrient transferring association that exists between plant roots and a group of soil fungi. There are several forms of mycorrhizal interactions; among them, the most recognized and conceivably the most common mycorrhizal symbioses include arbuscular mycorrhiza (association with vast majority of agricultural and horticultural crops) and ectomycorrhizae (association with only woody species; mostly shrub and tree species). These are the two economically and ecologically significant ones. The fungi make essential mineral nutrients and water from the soil available to the host plant, in-return of sugar that plant synthesizes as a result of photosynthesis.

Arbuscular mycorrhiza (AM) is the most widespread and successful symbiotic association of terrestrial plants with fungi displaying fascinating relationships with approximately 80% of terrestrial plants. Interestingly, they have been existing together with plants for more than 500 millions of years (much before Dinosaurs!!). A group of fungi belonging to Glomeromycotina only, take part in this association. It is known that plants first originated in water and this symbiotic association helped plants to successfully establish in land, and since then has been serving their host plants with various benefits.

In arbuscular mycorrhiza, the thin tubular hyphae of fungi enter the root cells and form highly branched tree-like structures called as arbuscules in root cells

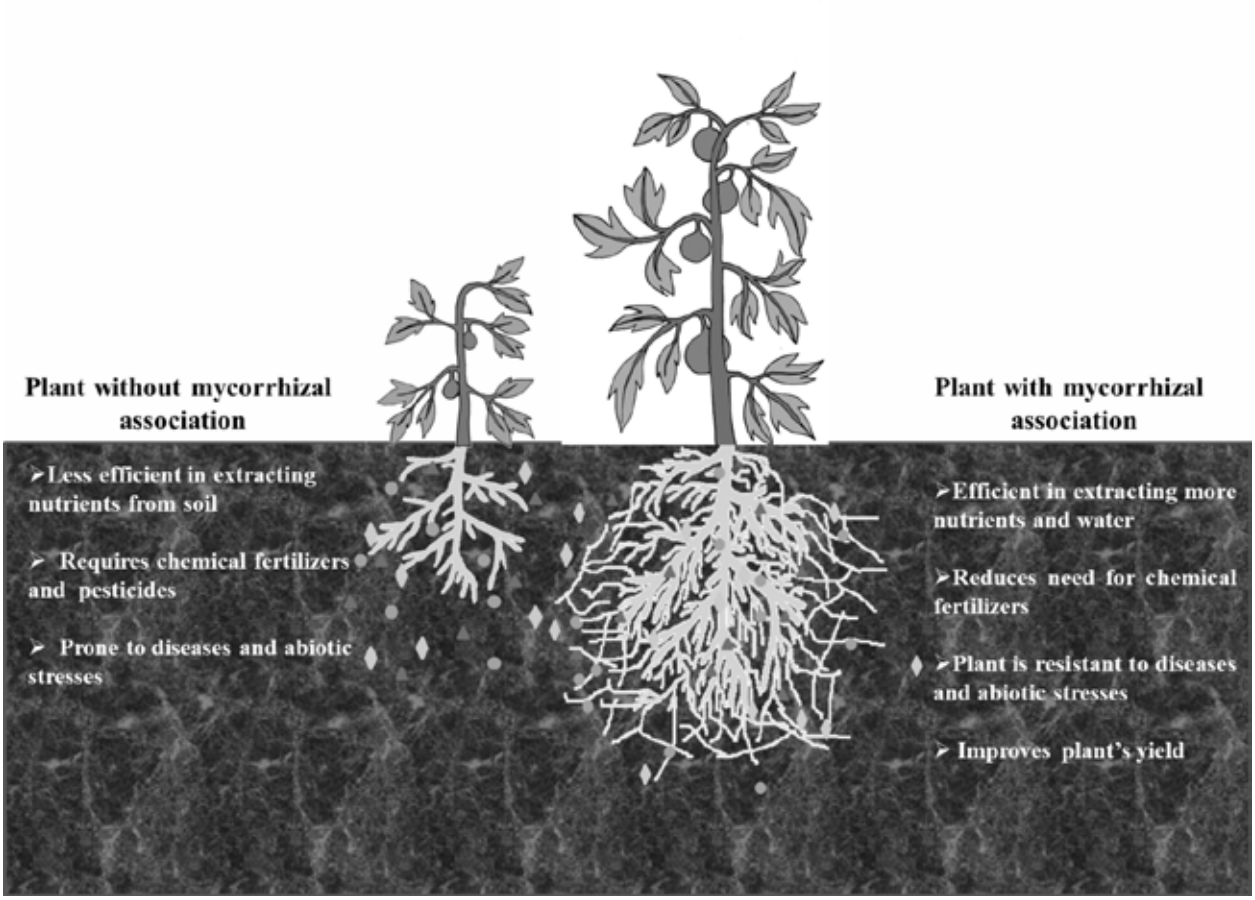

Figure 1: Comparative illustration of non-mycorrhizal and mycorrhizal plant

(cortex). The tubular external hyphae of AM fungi facilitates uptake of mineral nutrients that is present in soil in unavailable form or physically inaccessible to plant roots. Arbuscules are essentially the sites where the give-and-take of nutrients takes place and the repeated branching in arbuscules facilitate larger surface area for exchange between the roots and fungi. In later stage of life, they produce other membrane-bound sac-like structures called vesicles that have different color, shape, and diameter exterior to or within the root cells. The main function of vesicles is to provide facility for material storage and they can act as multiplication organ when fully developed. These vesicles develop thick walls and are released in to the soil with decay of the roots, and are then called as spores. Vesicles, arbuscules, and spores are the characteristic features of arbuscular mycorrhiza.

The world is on the edge of a new agriculture that requires the amalgamation of agroecology with plant biology under the umbrella of biotechnology and improvement of propagating agent (genetic resources such as seeds or other tissues). Developing countries such as India face tremendous problems with respect to food shortage. Hence, food security becomes a basic issue in the developing countries, at local, regional, and global levels. As a result, the urgency is to counter balance the problems linked with food inadequacy, for which maintaining or increasing productivity of agriculture and soil resources management is required. Agro-ecosystems should practice sustainable agriculture, both from environmental and economic view point. Hence, better awareness of the system and factors governing soil nutrients bioavailability to plants, that include root-soil interactions and understanding of microorganisms in their soil habitat is a requisite.

Arbuscular Mycorrhiza and Sustainable Agriculture

From the biological view point, AM fungi shape sustainable agriculture in two ways; soil quality and plant productivity. Their beneficial effects on soil physical conditions and plants performances are vital for sustainably managing agricultural ecosystems. AM fungi are considered natural bio-fertilizers as they provide host plants with nutrients, water, and pathogen protection. They represent a key link between plants and soil mineral nutrients by allowing effective utilization of mineral elements such as phosphorus and nitrogen by plants. Plants require phosphorus in significant amount and its deficiency leads to reduced plant development. This symbiotic relation is primarily important for plants that grow in phosphorus deficit environments as it increases plant growth and phosphorus level in plants.

Stresses (both biotic and abiotic) have negative impact on plant productivity. Abiotic stresses such as drought, salinity, and pollutants (for instance heavy metal, trace elements, petroleum, and crude oil) have pernicious effects on plant growth and productivity at a time when there is a constant increase in food needs globally. Mycorrhizal plants (that have AMF in their roots) abate abiotic stresses through mechanisms such as improved plant nutrition, tolerance to induced oxidative stress, modification in plant physiology, and entrapment of pollutants in roots and fungal cells and inactivation of pollutants/contaminants. In addition, AMF exert control against biotic stresses (pests and pathogens) directly by competing with the pests/pathogens for nutrients and space. Indirectly, they bring about boosted tolerance by enhancing production of antimicrobial compounds and chemicals that contribute to plant immunity. The competition for nutrients and space suggests that higher colonization of the root by AMF results in higher level of bio-control.

Besides their role in improving plant productivity, their role in improving soil quality is also well recognized. They improve soil structure and aggregation and thereby drive plant communities and regulate their productivity. For years humans have tilted the soil so much that it is actually drained off of everything that is required to make it the perfect womb to nurture a young seed that germinates. A germinating seed fights the odds in the soil, and emerges as a seedling. The fibrous roots of plants and the mycorrhizae appear to be like a “sticky-string bag” that holds the soil particles together and builds macroaggregates that form the basis of soil structure. Glomalin, a compound produced by AMF, also acts as glue and binds soil particles together to form aggregates. Later, these soil aggregates facilitate diffusion of water and

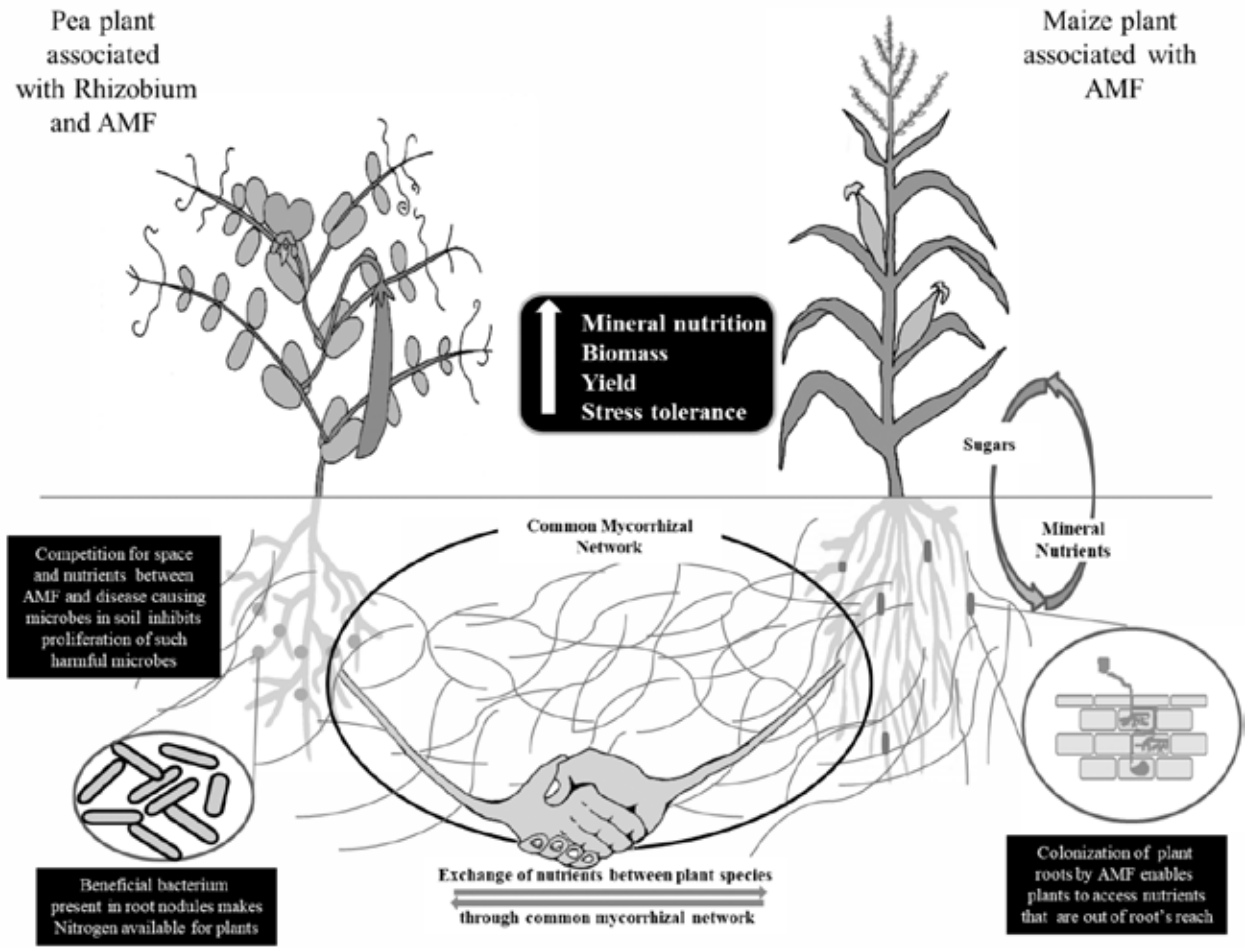

Figure 2: Common mycorrhizal network: a means of social networking of plants at belowground level

air that provide conducive environment for the plant roots to breathe.

Arbuscular mycorrhizal fungi mediated social-networking underneath the soil

Extent of fungal hyphae in soil is enormous and the mutualism between host plants and fungal species usually disperse, thereby resulting in the establishment of mycorrhizal networks. These networks comprise of extended fungal hyphae connecting two or more plants belonging to same or different species. Thus, the network integrates numerous plant species with various fungal species and promotes their interaction and provides feedbacks to one another, thereby forming a complex adaptive social network. Different plant species benefit differently from this network, depending on the AMF species involved, and these differences affect plant co-existence significantly. The network is regarded as evolutionarily and ecologically significant because due to its constructive effects on the fitness of the member fungi and plants. Communication among the members of these networks takes place through biochemical signaling (release of compounds) and resource transfers. For instance, interconnecting legumes with cereal crops through the network in mixed cropping benefits the cereals with nitrogen supply from legumes (capable of fixing atmospheric nitrogen). Nitrogen translocation mediated by the fungal network from legumes to cereals prevents the loss of nitrogen, for which nitrogen is generally applied to a field before cultivation of cereal crops. It is worth mentioning that this network renders the same nitrogen benefit from less legume plants in comparison with rotating cereals like corn

and legume crops in field, thus providing maximum benefits in less time and space. Also, less utilization of nitrogen fertilizers impact groundwater quality and soil health as well, thereby rendering the farmers an economic benefit that is ecologically sound too.

Future Prospects and Challenges of AMF

At present, it is anticipated that by 2050 world's population will exceed nine billion. As a result, global agriculture will take charge of nearly doubling food production and also face the task of reducing the dependence on agrochemicals by the producers, so as to safeguard human as well as environmental health. Thus, now more than ever, there is need to execute or invigorate eco-friendly practices, such as use of mycorrhizae based biofertilization. Regardless of its colossal potential, farmers have not flatteringly embraced AMF application so far, owing to challenges that come together with AMF usage.

The extensive exploitation of mycorrhizal inoculants in agro-ecosystems has been held back, however, by the complexity in propagation of arbuscular mycorrhiza and producing adequate and efficient inocula at affordable prices. Nevertheless, enrichment of naturally-occurring mycorrhizal population in agricultural fields is likely and beneficial effects can arise via the implementation of several management practices that enhance mycorrhizal populations and activity such as reduced tillage, crop rotations and lower nitrogen and phosphorus applications.

Arbuscular mycorrhiza promotes many aspects of plants' life; particularly by improving nutrition, promote growth, and mediates stress tolerance, and disease resistance. Furthermore, their hyphal networks improve characteristics of soil, such as soil aggregation, thereby improving soil resistance towards erosion by water and wind. In addition, AMF reduce leaching of nutrients from the soil, thereby contributing to nutrient retention in the soil, and subside the risks of groundwater contamination. Thus, the multiple benefits AMF render translate into significant ecological services.

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Featured Biotech News

Mansukh Laxman Mandaviya will be the country's new health minister

July 8, 2021

Union minister Dr Harsh Vardhan resigned from the post of health minister ahead of Prime Minister Narendra Modi's big Cabinet reshuffle. Whether he will stay on as the science and technology minister is not immediately clear.

Why Modi Govt has removed Dr Vardhan is not clear but his absent from press conference and accountability, futile contradictions with opposition and blunt statement about science (chocolate and covid), alliance with Baba Ramdev etc. have been highly criticized by masses. Many people on twitter were asking for his resignation from a very long time.

Mansukh Mandavaiya was born in a small village named Hanol in Palitana Taluka of Bhavnagar district of Gujarat State. After completion of HSC, he did a certificate course in Veterinary Live Stock Inspector and has been educated at Songadh Gurukul and Gujarat Agriculture University, Gujarat. He later completed his MA in Political Science from Bhavnagar University.

Mandaviya joined politics in 2002 where he contested the Palitana Constituency and became the youngest MLA in Gujarat. Mansukh Mandaviya is the Minister of State for Ports, Shipping & Waterways (Independent Charge) and Chemicals & Fertilisers in Government of India. Mandaviya is well known for his intellectual analysis and thought leadership, which he also exhibited in his speech on "2030 Agenda for Sustainable Development" at the United Nations. He has travelled to lot many countries to explore their policies & management to help India grow at the fastest pace.

On 5th July 2016, he sworn in as a Minister of State for Road Transport & Highways, Shipping and Chemical & Fertilizers in Government of India. Serving as a minister, he has implemented a lot of plans and thoughts to get the work done quickly and efficiently.

He was re-selected for the Second Term of Member of Parliament, Rajya Sabha during March, 2018.

Harsh Vardhan step down from the chair of Health, Science and Earth Sciences Minister

Minister of Ayush Kiren Rijiju launched five Portals on Ayush sector

July 5, 2021

At a virtual event, the Minister launched CTRI portal pertinent to Ayurveda Dataset along with AMAR, RMIS, SAHI and e-Medha portals. He also released four publications related to the Traditional Indian Medicine System of India and lauded the collaborative efforts of ICMR and Archaeological Survey of India for these initiatives.

Ayurveda Dataset on Clinical Trial Registry of India- CTRI is a primary Register of Clinical Trials under the world health Organization's International Clinical Trials Registry Platform. Creation of Ayurveda Data Set in CTRI facilitates the usage of Ayurveda Terminologies to record clinical study based on Ayurveda interventions. This is a great step towards a worldwide visibility for Ayurveda based Clinical Trials.

After the inclusion of dataset pertinent to Ayurveda in CTRI portal, the Ayurveda Clinical Trials would have worldwide visibility and will further the cause of strengthening Ayurvedic Research. Similarly, SHAHI portal incorporates authentic resources and will be of immense help in showcasing historical veracity of Ayurveda. With the help of e- Medha portal anyone can have online access to more than 12 thousand books. These books are related to Indian Medical Heritage and can be accessed through NIC's e- granthalaya platform.

AMAR portal, which was also launched, is a repository for Ayurveda, Yoga, Unani, Siddha and Sowa- Rigpa Manuscripts and catalogues.

Another Portal CCRAS- Research Management Information System or RMIS in short, is a research guidance platform.

At a virtual event, the Minister launched CTRI portal pertinent to Ayurveda Dataset along with AMAR, RMIS, SAHI and e-Medha portals.

Despite Questinable Data, Sinovac's COVID-19 Vaccine 'CoronaVac' is Second Most Used vaccine Globally

July 08, 2021

While several countries are relying on Sinovac Biotech's coronavirus disease 2019 (COVID-19) vaccine to end the pandemic once and for all, concerns regarding the shot's efficacy continue to shroud the vaccine, which is currently the second most used COVID-19 vaccine product across the globe.

although the Beijing-based biotech's vaccine has demonstrated success in clinical trials, efficacy rates have ranged from 50% to as high as 90% across clinical trials conducted in Turkey, Brazil and Indonesia. Sinovac has since kept mum on these data and hasn't provided explanations or further details on why protection rates vary from study to study.

A report also came in light about scores of Indonesian health workers getting infected despite having received Coronavac injections had drawn concern among countries relying on the Chinese vaccine.

Singapore's top health officials also cast doubt on effectiveness of China's Sinovac vaccines for coronavirus.

WHO approves Sinovac coronavirus vaccine for emergency use on May 31st 2021.

COVID-19 Origin Story Plot Thickens after 200 Early Virus Sequences Deleted

June 24, 2021

While the Fred Hutchison Cancer Center researcher, Jesse Bloom, clarifies that the sequences themselves do not definitively answer the question of origin, it does show that the samples being used to investigate may not be complete.

The files had been uploaded to a U.S. National Institutes of Health database in March 2020. But the NIH received a request from the investigator who submitted to delete the sequences three months later. It is standard practice to allow this, so the NIH complied.

Although Bloom's find neither strengthens nor discounts the theory that the COVID-19 virus was leaked from a lab in Wuhan, it certainly raises the question as to why those original sequences were deleted. It also has researchers asking themselves what other important information might be tucked away on the internet to recover. Bloom finds the deletion suspicious, writing it "seems likely the sequences were deleted to obscure their existence."

While Bloom was reviewing genetic data from multiple research groups, a March 2020 study came up with a spreadsheet indicating 241 sequences collected at Wuhan University were uploaded to the Sequence Read Archive, an online database managed by the U.S.' National Library of Medicine. Yet when he looked for the sequences, the search came back with "no item found."

Genetic sequences from more than 200 virus samples of early Covid-19 cases mysteriously disappeared from an online scientific database. A researcher in Seattle reported the recovery of 13 of those original sequences.

Buying Off an Academic Journal? That is how pharmas can promotes their products

July 13, 2021

The e-cigarette company Juul Labs funded a special issue of the American Journal of Health Behavior, which dedicated its entire May/June issue to 11 articles authored by Juul scientists or contractors that on the whole found reductions in adult smoking rates as smokers switched to electronic nicotine products.

The New York Times reported last week that the company paid $51,000 to sponsor the special edition of the journal, including a $6,500 open-access fee to make it freely available to the public. Three editorial board members resigned over the arrangement.

The 11 research articles published in the American Journal of Health Behavior's "special issue on JUUL use" were authored by researchers who at the time the studies were conducted were employed by Juul laboratories or consulting or research groups that contract with the company. All the studies were funded by Juul Labs Inc.

The scientist -- who was not named -- shared an email with the Inquirer that the journal's editor in chief, Elbert Glover, sent to potential reviewers that did not note Juul's sponsorship and that offered $75 to reviewers if they could turn a review around in one week. The manuscripts themselves redacted the sponsor's name.

The New York Times reported last week that the company paid $51,000 to sponsor the special edition of the journal, including a $6,500 open-access fee to make it freely available to the public.

Some EU countries approve India's Covishield but none approve Covaxin after political turmoil

June 30, 2021

Covishield is now eligible for travel to Austria, Germany, Slovenia, Greece, Ireland and Spain. Iceland and Switzerland too have made the jab eligible for travel to the countries, sources said.

The exclusion of Covishield, which is produced by India's Serum Institute using methods analogous to the EU-approved Oxford-AstraZeneca vaccine Vaxzevria but does not have EU market authorisation, stoked anger and the threat of retaliatory measures by India against travellers from Europe.

The pass will help do away with the need for quarantines or further testing for travellers between the EU's 27 countries and four associated European nations – Iceland, Norway, Switzerland and Liechtenstein.

India has so far overwhelmingly administered Covishield jabs – they account for more than 290 million of the 350 or so million vaccinations given so far.

A source in India's external affairs ministry earlier said India had requested EU states to individually consider extending the exemption to people who had taken Covid-19 vaccines in India – Covishield and Covaxin – and "accept the vaccination certificate" issued by the government.

Europe has created a two-tier vaccination system that will hit poorer countries, the Guardian wrote in a special article.

Indian FM Announces additional Rs 23,220 Crore for building pediatrics facilities

June 29, 2021

Finance Minister Nirmala Sitharaman on Monday announced ₹23,220 crore for public health sector for setting up paediatric beds and facilities in hospitals. She announced this for the public health sector, earmarked for this financial year, which will focus on emergency preparedness with a special emphasis on children and paediatric care.

It will also focus on funding of medical HR augmentation through nurses and staff and doctors, equipment and ambulances, oxygen plants.

Nirmala Sitharaman announced a credit guarantee scheme of Rs 1.1 lakh crore for the COVID-affected sectors, which includes Rs 50,000 crore for scaling up medical infrastructure in non-metro cities and Rs 60,000 crore for other sectors.

The monetary support to upgrade public health infrastructure with a special focus on children comes ahead of an impending COVID-19 third wave, which is said to affect children more.

The funding would, " enhance testing capacity and supportive diagnostic, strengthen capacity for surveillance and genome sequencing," the finance minister added.

IIT Delhi launches rapid COVID diagnostic kit, priced at Rs 50

June 25, 2021

The Indian Institute of Technology in Delhi (IIT Delhi) on Friday launched a rapid diagnostic kit for conducting Covid-19 test at a price point of Rs 50 a piece.

Authorities and researchers claimed that this will boost testing in rural India given its affordability, easy to use and effectiveness in temperature as high as 35 degree to 37 degree Celsius.

The kit developed by centre for biomedical engineering at the IIT Delhi has been approved by the Indian Council of Medial Research (ICMR). The test kit has been licensed to Delhi-based Dia Sure Immunodiagnostic LLP for mass manufacturing and marketing.

The kit, perhaps the cheapest in the market, is a "colloidal gold enhanced double antibody sandwich immunoassay for the qualitative determination of SARS-CoV-2 antigen in human nasal swabs, throat swabs and deep sputum samples. It is suitable for general population screening and diagnosis of COVID-19."

Minister of State for Education Sanjay Dhotre, who launched the 'Rapid Antigen Test' kit, said the kit will boost testing across the country, especially in rural India.

The kit developed by centre for biomedical engineering at the IIT Delhi has been approved by the Indian Council of Medial Research (ICMR).

Pfizer, BioNTech to seek authorization for COVID booster shot as Delta variant spreads

July 9, 2021

Pfizer and partner BioNTech plan to ask U.S. and European regulators within weeks to authorize a booster dose of its COVID-19 vaccine, based on evidence of greater risk of infection six months after inoculation and the spread of the highly contagious Delta variant.

The U.S. Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) said, however, in a joint statement that Americans who have been fully vaccinated do not need a booster COVID-19 shot at this time.

The European Medicines Agency (EMA) said it was too early to determine whether more than the two shots that are currently required would be called for, saying it was confident for now that the established regimen was sufficient.

The Pfizer-BioNTech vaccine is predominant in many parts of the world. In the European Union, the Pfizer-Vaccine accounts for two-thirds of doses, and in Israel, it is the only vaccine used. In the U.S., it makes up more than half of COVID-19 vaccinations.

Some experts are skeptical about the need for a booster, even in light of the more contagious Delta variant. The Delta variant is believed to be approximately 60% more contagious than the Alpha variant, which originated in the UK, estimated to be twice as contagious as the Wuhan wildtype variant. And there are questions about Pfizer and BioNTech's seeming conflict of interest on the subject, given their financial benefit from a third dose.

"Pfizer looks opportunistic by hanging an announcement on the back of very early and undigested data from Israel," John Moore, a virologist at Weill Cornell Medicine in New York, told The New York Times. "When the time is right for using boosters here, the decision isn't theirs to make."

Another issue is whether discussing the need for boosters in the U.S. is appropriate when there are still billions worldwide who have yet to receive a single dose.

The EMA COVID-19 data leak, and what it tells us about mRNA instability

July 07, 2021

According to The BMJ's recent news investigation, the documents revealed that regulators reviewing vaccine candidates had concerns about truncated messenger RNA (mRNA) in early batches of Pfizer-BioNTech's COVID-19 vaccine. These early batches developed for commercial production had about 55% intact mRNA, a lower percentage than in clinical trial batches, with uncertain implications.

According to the news story's author, journalist Serena Tinari, Pfizer, the EMA, and Health Canada, as well as the US Food and Drug Administration and COVID-19 vaccine developers Moderna and CureVac, did not provide specifics about the percentage of mRNA integrity acceptable for a vaccine.

After a cyberattack late last year against the European Medicines Agency (EMA), anonymous emails dispatched a trove of classified documents to academics and journalists. In a January 25 statement, the EMA said some of the hacked documents—which mainly concerned COVID-19 medicines and vaccines—were altered in a way that "could undermine trust in vaccines."

More than 40 megabytes of classified information from the agency's review were published on the dark web, and several journalists—including from The BMJ—and academics worldwide were sent copies of the leaks. They came from anonymous email accounts and most efforts to interact with the senders were unsuccessful. The email identified "a significant difference in % RNA integrity/truncated species" between the clinical batches and proposed commercial batches—from around 78% to 55%. The root cause was unknown and the impact of this loss of RNA integrity on safety and efficacy of the vaccine was "yet to be defined," the email said.

Ultimately, on 21 December, EMA authorised Pfizer-BioNTech's vaccine. The agency's public assessment report, a technical document published on its website, noted, "the quality of this medicinal product, submitted in the emergency context of the current (covid-19) pandemic, is considered to be sufficiently consistent and acceptable." It's unclear how the agency's concerns were satisfied. According to one of the leaked emails dated 25 November, positive news had come from an undisclosed source in the US: "The latest lots indicate that % intact RNA are back at around 70-75%, which leaves us cautiously optimistic that additional data could address the issue," the email said.

The BMJ asked Pfizer, Moderna, and CureVac, as well as several regulators, what percentage mRNA integrity they consider acceptable for vaccines against covid-19. None offered any specifics.

The Medicines and Healthcare products Regulatory Agency, the UK's medicines regulator, acknowledged the lack of a specified percentage RNA integrity, but declined to provide further detail. "The specification limit acceptance criteria are commercially confidential," the agency said in an email.

The US Food and Drug Administration (FDA) directed The BMJ to read its guidance documents78 and its review of Pfizer's vaccine, but none of these specify the percentage RNA the agency is requiring. Asked to comment, the regulator pointed to Pfizer: "information that you seek that is not addressed in the FDA Review Memorandum should be directed to Pfizer."

Leaked documents show that some early commercial batches of Pfizer-BioNTech's covid-19 vaccine had lower than expected levels of intact mRNA, prompting wider questions about how to assess this novel vaccine platform.

Time to assume that health research is fraudulent until proven otherwise?

July 05, 2021

Health research is based on trust. Health professionals and journal editors reading the results of a clinical trial assume that the trial happened and that the results were honestly reported. But about 20% of the time, said Ben Mol, professor of obstetrics and gynaecology at Monash Health, they would be wrong.

As I've been concerned about research fraud for 40 years, I wasn't that surprised as many would be by this figure, but it led me to think that the time may have come to stop assuming that research actually happened and is honestly reported, and assume that the research is fraudulent until there is some evidence to support it having happened and been honestly reported.

As he described in a webinar, Ian Roberts, professor of epidemiology at the London School of Hygiene & Tropical Medicine, began to have doubts about the honest reporting of trials after a colleague asked if he knew that his systematic review showing the mannitol halved death from head injury was based on trials that had never happened. He didn't, but he set about investigating the trials and confirmed that they hadn't ever happened. They all had a lead author who purported to come from an institution that didn't exist and who killed himself a few years later. The trials were all published in prestigious neurosurgery journals and had multiple co-authors. None of the co-authors had contributed patients to the trials, and some didn't know that they were co-authors until after the trials were published. When Roberts contacted one of the journals the editor responded that "I wouldn't trust the data." Why, Roberts wondered, did he publish the trial? None of the trials have been retracted.

We have now reached a point where those doing systematic reviews must start by assuming that a study is fraudulent until they can have some evidence to the contrary.

Some supporting evidence comes from the trial having been registered and having ethics committee approval. Andrew Grey, an associate professor of medicine at the University of Auckland, and others have developed a checklist with around 40 items that can be used as a screening tool for fraud.

Everybody gains from the publication game, concluded Roberts, apart from the patients who suffer from being given treatments based on fraudulent data.

Zydus' COVID-19 vaccine ZyCoV-D seeks EUA by DCGI-CDSCO

July 01, 2021

Zydus Cadila today announced that the company has applied for Emergency Use Authorization (EUA) to the office of Drug Controller General of India (DCGI) for ZyCoV-D – its Plasmid DNA vaccine against COVID-19. Zydus Cadila said the world's first Plasmid DNA vaccine for COVID-19 demonstrated safety and efficacy in the interim data of the largest vaccine trial so far in India for COVID-19.

"The primary efficacy of the three doses vaccine was at 66.6 percent for symptomatic RT-PCR positive cases in the interim analysis," the company said. "Whereas no moderate case of COVID-19 disease was observed in the vaccine arm post administration of the third dose suggesting 100 percent efficacy for moderate disease," it added.

Zydus said it has found no severe cases or deaths due to COVID-19 occurred in the vaccine arm after administration of the second dose of the vaccine.

If approved, ZyCoV-D will be the world's first DNA vaccine, Zydus said, as it makes use of a portion of the genetic code – DNA or RNA – in the SARS-CoV-2 virus to stimulate an immune response against its spike protein.

"We expect to produce 1 crore vaccine doses per month from August onwards and 5 crore doses by December this year. Our target is to produce 10 crore vaccine doses in a year," Sharvil Patel said on its Covid vaccine candidate 'ZyCoV-D' production.

"The primary efficacy of the three doses vaccine was at 66.6 percent for symptomatic RT-PCR positive cases in the interim analysis," the company said.

Latest Biotech News

Dr. Reddy's announces commercial launch of DRDO's 2-DG

June 28, 2021

Drugmaker Dr. Reddy's Laboratories has announced the commercial launch of 2-deoxy-D-glucose (2-DG), an oral drug, found to help speed up recovery and reduce oxygen dependence.

The oral drug has been developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), a lab of Defence Research and Development Organisation (DRDO), in collaboration with Dr Reddy's Laboratories (DRL), Hyderabad.

The drug comes in a powder form in a sachet and is taken orally by dissolving it in water. The drug accumulates in the virus-infected cells and prevents virus growth by stopping viral synthesis and energy production. The drug will stop the virus from multiplying.

The maximum retail price (MRP) of each sachet has been fixed at Rs. 990, with a subsidised rate offered to Government institutions. For now, the drug will available in hospitals across metros and Tier 1 cities, and subsequently expand coverage to the rest of India.

Award-winning Purple Tomato soon to be Released in China

June 23, 2021

Purple tomato known as Yoom, which won as Fruit Logistica Innovation Award in Berlin in February 2020, will be distributed in China in packaging featuring well-loved Disney characters. Aside from Yoom, Nebula tomato, which has sweet and full of flavor, will also be packaged in with Disney characters.

The Yoom tomato is unique because of its purplish to black color. It has a crisp, refreshing flavor with a great balance of sweet and tart and at the same time rich in vitamins, minerals, and antioxidants.

The amino acids naturally contained within the tomato combine with their own distinctive taste to produce a rich umami flavor. Yoom and Nebula tomatoes, developed by Syngenta Seeds, are being grown at Beijing HortiPolaris planting base in the Miyun District of Beijing, China.

Dole China and Syngenta Group China signed an exclusive retail agreement for the distribution of two tomato varieties in China, including an IP deal with Disney for packaging featuring Mickey and friends and Disney princesses. The tomatoes are expected to be in Chinese supermarkets by mid-November 2021.

Pradaxa is the first FDA-approved blood thinning medication that children can take by mouth; the only other approved blood thinning medication for children is given by injection. Pradaxa was originally approved in 2010 to reduce the risk of stroke and systemic embolism in adult patients with non-valvular atrial fibrillation.

FDA Approves First Oral Blood Thinning Medication for Children

June 21, 2021

U.S. Food and Drug Administration approved Pradaxa (dabigatran etexilate) oral pellets to treat children 3 months to less than 12 years old with venous thromboembolism (a condition where blood clots form in the veins) directly after they have been treated with a blood thinner given by injection for at least five days.

The FDA also approved Pradaxa oral pellets to prevent recurrent clots among patients 3 months to less than 12 years old who completed treatment for their first venous thromboembolism.

In addition, Pradaxa was approved in capsule form to treat blood clots in patients eight years and older with venous thromboembolism directly after they have been treated with a blood thinner given by injection for at least five days, and to prevent recurrent clots in patients eight years and older who completed treatment for their first venous thromboembolism.

Multiple Indian pharma majors collaborate for clinical trial of Molnupiravir for COVID-19

June 29, 2021

Five major pharmaceutical companies--Cipla Limited, Dr. Reddy's Laboratories Ltd, Emcure Pharmaceuticals Limited, Sun Pharmaceutical Industries Limited and Torrent Pharmaceuticals Limited on Tuesday announced collaboration for the clinical trial of the investigational oral anti-viral drug Molnupiravir for the treatment of mild covid-19 in an outpatient setting in India.

Between March and April this year, these five pharma companies had individually entered into a non-exclusive voluntary licensing agreement with Merck Sharpe Dohme (MSD) to manufacture and supply Molnupiravir to India and over 100 low and middle-income countries (LMICs). Molnupiravir is an oral anti-viral that inhibits the replication of multiple RNA viruses including SARS-CoV-2. It is presently being studied by MSD, through a collaboration with Ridgeback Biotherapeutics, in a Phase III trial for the treatment of non-hospitalized patients with confirmed covid-19 globally.

The FDA Is Under Fire for Approving an Alzheimer's Drug Biogen's Aduhelm

June 25, 2021

More details are emerging over the U.S. Food and Drug Administration (FDA)'s controversial approval of Biogen's Aduhelm (aducanumab) for Alzheimer's disease. The drug was approved on June 7 under the agency's accelerated approval pathway, despite the agency's Peripheral and Central Nervous System Drugs Advisory Committee voting against the drug in November 2020 and having been assured at that time the agency was not considering an accelerated approval.

An accelerated approval allows for surrogate endpoints—in the case of Aduhelm, removal of amyloid plaques—instead of clinical evidence of improvement in cognition and memory. It also requires post-marketing studies to be conducted, although Biogen has nine years to run those studies. Three members of the advisory committee have resigned over the approval.

Numerous researchers are pushing back on the decision to approve the drug based on decrease of amyloid, arguing that a number of studies show that drugs that target and successfully clear amyloid don't result in clinical improvements.

Janet Woodcock, acting FDA commissioner, says she was not involved in the approval, but defended it, saying she was "fairly confident" that clearing amyloid helps patients' cognition. "I feel it is a very solid accelerated approval," she said.

Matthew Schrag, a researcher into Alzheimer's at Vanderbilt University Medical System, does not believe the FDA has produced good new data showing that cutting amyloid benefits patients. "The arguments are well-trodden and don't account for the fact that the trials have not demonstrated a reproducible clinical benefit," he told The Washington Post.

DIVOC Health receives import licence for Gene-Drive COVID testing kits in India

June 25, 2021

DIVOC Health has received an import license from the Central Drugs Standard Control Organisation (CDSCO) for Genedrive 96 SARS-CoV-2 testing kits in India, the startup said in a statement.

It also said that the Genedrive 96 SARS-CoV-2 Kit has been designed by molecular diagnostics Genedrive located in the United Kingdom, and has also received formal approval from the Indian Council of Medical Research (ICMR).

On receiving the approval, Dr Kanav Kahol, founder and CEO, DIVOC Health, said, "We thank the diagnostic division of the Ministry of Health for considering our proposal and allowing us to deliver quality results to the consumers.

The kit is in a ready-to-go solid PCR-bead format that eliminates the need for reagent preparation or cold temperature storage, which makes it a more suitable solution for high-temperature countries such as India.

Government Decisions Influence Consumer Perceptions towards GM Foods, Study

July 14, 2021

Researchers from India and Canada documented the trends linked to genetically modified (GM) foods, policies, and consumer acceptance after analyzing hundreds of publications in the past 20 years. Their analyses led to the conclusion that consumer perception is affected by factors such as government decisions, how benefits are communicated, and the media.

A total of 543 journal articles from 1981 to 2021 were bibliographically analyzed using the Web of Science database and BibExcel and VOSviewer visualization software tools to utilize the topic basis search of phrases related to GM food preference and perception. The objective was to map the trends on consumer perception and preference for GM foods and policies that regulate their approval and consumption. The key findings were:

There is an increasing trend in publications on consumers' responses towards GM foods;
There is a strong linkage of GM research with agriculture and food science technology;
Consumer response is greatly influenced by a government's decision to ban or approve GM crops;
Public support increases when potential benefits are well-articulated;
Consumption increases with price discounts; and
Positive influence by the media increases trusts in the government and belief in science.

The researchers also noted that the majority of the sampled publications came from developed countries and that developing countries need to carry out more research to produce a successful GM food product. They then recommended that policies should be research-, agrifood industries- and society-oriented to ensure food safety, consumer acceptance, and public awareness about GM foods.

Mankind Pharma Gets DRDO Nod to Manufacture, Sell COVID-19 Drug 2-DG

July 8, 2021

Mankind Pharma has received the licence to manufacture and market oral 2-deoxy-D-glucose (2-DG) from Defence Research and Development Organisation (DRDO), the company said on Thursday. The drug is used for the treatment of COVID-19.

It will manufacture the product at its facilities in Visakhapatnam and Himachal Pradesh, it added.

The office of the Drugs Controller General of India (DCGI) on May 1 had permitted the emergency use of 2-DG as an adjunct treatment for moderate to severe COVID-19 patients, Mankind Pharma said.

Bajaj Healthcare Limited (BHL) also announced that it has received license from DRDO to manufacture 2-DG drug used in control and treatment of Covid-19.

Recently, a new study has claimed that DRDO's anti-COVID drug 2-DG is effective against all variants of COVID-19 and the drug reduces virus multiplication.

The study, published on June 15, has not yet been peer-reviewed. It was conducted by Annat Narayan Bhatt, Abhishek Kumar, Yogesh Rai, Dhiviya Vedagiri and others.

Moderna's Covid vaccine becomes 4th jab to get emergency use approval in India: Govt

June 29, 2021

The Drugs Controller General of India (DCGI), on Tuesday, granted permission to Mumbai-based pharmaceutical firm Cipla to import Moderna's COVID-19 vaccine.

Details of a rollout plan are not out yet. It is not clear how many doses will be available in India and when. Sources say for now, Cipla is only looking at receiving donated vaccines; commercial agreements are still being processed.

"Cipla Limited is supporting Moderna Inc with the regulatory approval and importation of vaccines to be donated to India. At this stage, there is no definitive agreement on commercial supplies," Cipla said in a statement. Both Pfizer and Moderna have asked for an important concession - they want indemnity from liability in case of any adverse effect of the vaccine. India has, so far, not granted indemnity to any vaccine-maker.

Cipla received clearance to import Moderna vaccines within 24 hours of its application, due to the government's revised policy on accelerated approvals for foreign vaccines. It had taken Sputnik two months for the same approval.

Cipla, in its application to the drug regulator, had referred to the government's decision to waive bridging trials for foreign vaccines if it is cleared for emergency use in countries like the US and if the safety assessment data of the first 100 beneficiaries is submitted before mass rollout.

Hong Kong traditional medicine hospital just the tonic

June 30, 2021

From acupuncture to herbal tea, Chinese medicine has long been an integral part of Hong Kong society. The city's background of East meets West gives it a unique edge in raising the discipline to a higher level,

as shown in the use of traditional treatment methods for Covid-19 patients.

The industry and the wider community stand to benefit from efforts to further institutionalise the practice. The government's launch of the first Chinese medicine hospital project is an important milestone. With a capacity of 400 beds and an annual 310,000 outpatient services, the HK$8.62 billion (US$1.1 billion) facility being built in Tseung Kwan O is set to be ready for use by 2025.

It will diagnose and treat specific diseases through the collaboration of Chinese and Western medicine practitioners, with the former playing a predominant role. A clinical trial and research centre will also be set up to help in the development of new proprietary Chinese medicines and widening of the existing medicines' clinical applications.

The new facility may account for just a fraction of the millions who attend outpatient services at the city's public hospitals and clinics, but it will offer another option. Some local people with chronic pain and other health issues will indeed opt for traditional Chinese medicine.

Preparation for regulating Chinese medicine began as early as the 1980s under the British colonial administration. Article 138 of the Basic Law says the government shall formulate policies to develop Western and traditional Chinese medicine and to improve medical and health services.

Panacea Bio receives license from DCGI to produce Sputnik V vaccine

July 5, 2021

The Drugs Controller General of India (DCGI) on Sunday (July 4, 2021) granted a licence to Panacea Biotec for manufacturing the Russian COVID-19 vaccine, Sputnik V, in India.

Sputnik V has been registered in 54 countries globally with a total population of over 1.4 billion people. The efficacy of Sputnik V is 91.6 percent as confirmed by the data published in the Lancet.

The pharma company tied up with Russian Direct Investment Fund (RDIF) to produce the COVID-19 vaccine in the country. The Russian vaccine, Sputnik V, has been part of India's fight against COVID-19 since 14 May.

Batches of the vaccine produced at its facilities in Baddi, Himachal Pradesh, were shipped earlier to the Gamaleya Center in Russia for quality control. The batches "successfully passed all the checks for quality parameters both at the Gamaleya Center and at the Central Drug Laboratory, Kasauli, Himachal Pradesh," the company said on Sunday.

Sanofi, GSK get nod for phase 3 trial of covid-19 vaccine in India

08 Jul 2021

French pharmaceutical Sanofi and its British partner GlaxoSmithKline (GSK) on Thursday said they have received the approval of the drugs controller general of India to conduct part of the global phase-3 efficacy trial of their jointly developed covid-19 vaccine in India.

This will be the first such global trial for a foreign covid-19 vaccine to be conducted in India.

We believe our covid-19 adjuvanted, recombinant vaccine can make a significant contribution to the ongoing fight against covid-19 and are committed to initiating our clinical programme in India, at the earliest," said Annapurna Das, country head of Sanofi Pasteur India.

In total, the companies plan to globally enrol around 35,000 participants in the age group of 18-55 years for the trial. In India, they plan to recruit 3,000 participants across three trial sites—Aartham Multi Super Speciality Hospital in Ahmedabad, Maharaja Agrasen Super Speciality Hospital in Jaipur and Nizam's Institute of Medical Sciences (NIMS) in Hyderabad—according to the government's clinical trial registry.

The phase 3 trial will be conducted in two stages—one will look at the efficacy of the vaccine targeting the original coronavirus strain D.614, while the second will evaluate a second formulation targeting the beta variant B.1.351.

Strand Life Sciences Partner with Celemics on Integrated Platform for NGS Analysis

June 25, 2021

Celemics, a Korean manufacturer of targeted capture kits for next-generation sequencing, is combining its bioinformatics pipeline with analytics technology from Strand Life Sciences to help researchers go from sample to report using a single technology platform.

Under terms of the partnership, Bengaluru, India-based Strand Life Sciences will integrate the Celemics pipeline into its StrandOmics tertiary analysis platform. This integrated offering will include assay-specific variant filters to provide "guaranteed" clinical-grade data compliance for researchers in cancer and rare diseases, according to the companies.

Strand Life Sciences is a global bioinformatics and genomic profiling company established in 2000. Strand Life Sciences, formed from the business combination of Strand and Triesta, the diagnostics unit of HCG, is India's leading specialized diagnostics company. Its expertise spans strong global bioinformatics and clinical research capabilities with a pan-India presence in specialised and routine diagnostics services.

Eli Lilly to acquire Protomer Technologies in a deal worth over $1bn

July 14, 2021

Indianapolis-based Eli Lilly and Company is acquiring Pasadena, Calif.-based Protomer Technologies in a deal that may exceed $1 billion.

Protomer has a drug technology platform made up of proteins that can sense concentrations of specific molecules and adjust to create variable doses. This pipeline includes an insulin product that adjusts to different glucose levels in diabetic patients. The company was founded in 2014 by Caltech researchers led by Alborz Mahdavi. In November 2020, Lilly led an investment round that was supported by the JDRF T1D Fund. Early funding by JDRF T1D also included Paris-based Sanofi. The November 2020 round led to Lilly owning 14% of the company. Under the new deal, it is acquiring the rest of the stock.

In November 2020, Katie Ellias, managing director of the JDRF T1D Fund, said, "Protomer's novel mechanism for glucose-responsive insulin is extremely promising and has the potential to be a game changer for people with type 1 diabetes."

No specific financial details were disclosed other than to say the $1 billion figure was linked to various development and commercial milestones.

Policy

Kenya National Biosafety Authority Approved GMO Cassava

June 23, 2021

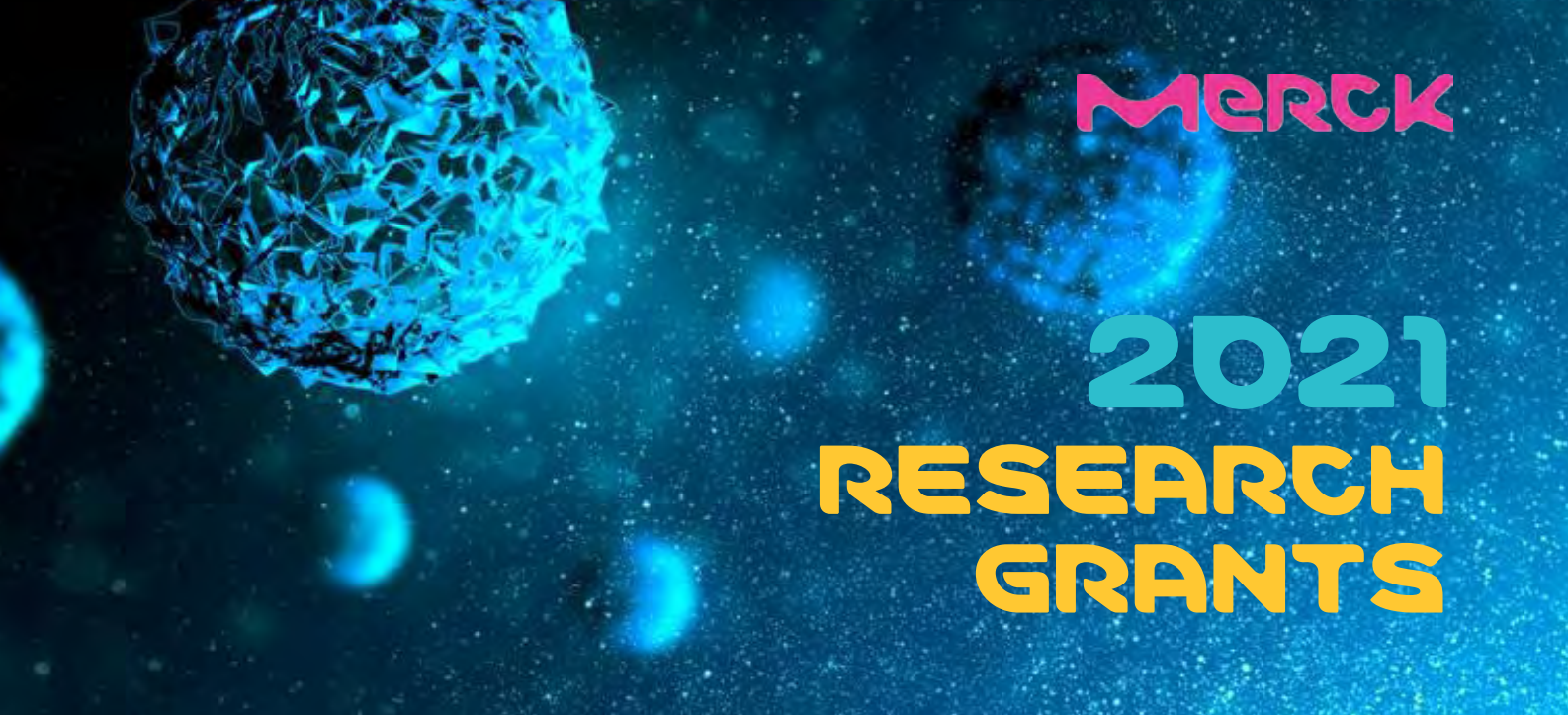
On June 22, 2021, the Kenya National Biosafety Authority (NBA) approved the environmental release of genetically modified (GM) cassava event 4046, resistant to cassava brown streak disease (CBSD) developed by the Kenya Agricultural and Livestock Research Organization (KALRO).

KALRO scientists have been developing CBSD-resistant cassava varieties using event 4046 under regulated confined field trial conditions authorized by NBA. The approval paves way for conducting national performance trials of these varieties before registration and release to farmers. The approval is valid for five (5) years from the date of authorization.

Cassava event 4046 was developed using modern biotechnology and was evaluated over a period of five years in confined field trials in three different locations in Kenya – Mtwapa (Kilifi), Kandara (Murang'a), and Alupe (Busia). It has shown high and stable resistance against CBSD, a disease that can result in a 100 percent loss of usable storage roots due to severe infection. The extensive review conducted by NBA confirms that GM cassava is as safe as conventional varieties for food, feed, and the environment.

The NBA Board approved the application as stated in the decision document dated June 16, 2021, following the necessary review in accordance with the country's Biosafety Act.

The disease-resistant cassava was developed under the Virus Resistant Cassava for Africa Plus (VIRCA Plus) project, a collaborative program between KALRO, the National Crops Resources Research Institute of Uganda, and the Donald Danforth Plant Science Center.



2021 RESEARCH GRANTS

Merck is all about science and technology. In 2021, we offer a series of research grants to stimulate innovative research in challenging areas of future importance.

We intend to provide research grants in several areas of up to **45**0,000**€** per year for **up to** 3 years with the option of extension or expansion.

Drug Discovery

Next game-changing technology / molecule to cure cancer or autoimmune disease.
Three grants of €350,000/year for 3 years.

Real time testing and sensors

State-of-the-art of in-line or at-line monitoring during the production of biopharmaceuticals.
Grant of $100,000 - $500,000/year for 2 years.

Nanoparticle for nucleic acid delivery

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Grant of $100,000 - $300,000/year for 2 years.

Digital Innovation

Digital pathology image analysis, Single-Cell RNASeq analysis pipelines and AI-driven solutions using research and clinical data.
Three grants of €40,000 - €100,000 for 1 year.

Bioelectronics

Novel solutions and biosensor technologies for remote patient monitoring in chronic inflammatory disorders
Grant of €150,000/year for 3 years.

Sustainability

New sustainable products, technologies, sources, processes, business models.

Media recycling for cultured meat

Conceptual designs, deployment strategies and equipment for low cost and efficient systems.

Organoids

3D cell culture solutions with focus on pre-clinical drug discovery and personalized medicine.

We are looking for innovative research proposals from scientists worldwide. Top submitters will be invited to a deep dive workshop to further advance the proposals together with our scientists. The deep dive workshop will include decision on grant recipients. Merck will then enter into bilateral collaboration agreements with the winning recipients to enable pay-out of the research grant and project start in 2022. Detailed description of the challenges, the application process and timing of the deep dive workshops are available at:

researchgrants.**merck**group.com

Applications deadline Aug**. 31st**, 20**21.**

Biotech Research

COVID-19 is worsening antibiotic misuse in India

July 6, 2021

Research published in PLOS Medicine led by Washington University School of Medicine in St. Louis, US, has found that sales of antibiotics skyrocketed during India's first wave of coronavirus, suggesting that they were being used to treat Covid-19 patients.

Such use is not only ineffective – antibiotics target bacterial infections, not viral ones – but dangerous; needless or excessive antibiotic use contributes to the growing threat of drug-resistant infections worldwide.

"Antibiotic resistance is one of the greatest threats to global public health," said the study's senior author and infectious diseases specialist Sumanth Gandra. "Overuse of antibiotics lessens their ability to effectively treat minor injuries and common infections such as pneumonia, which means that these conditions can become serious and deadly.

India has the second-highest population in the world, with nearly 1.4 billion people. As the world's largest consumer of antibiotics, Gandra said, the country was "essential to study".

Journal Reference:
Sales of antibiotics and hydroxychloroquine in India during the COVID-19 epidemic: An interrupted time series analysis. PLOS Medicine, July 1, 2021; DOI: 10.1371/journal.pmed.1003682

Even Lottery-based incentives does not decreasing COVID-19 vaccine hesitancy in USA

July 3, 2021

Prior reports in the media had suggested that the Ohio lottery increased COVID-19 vaccinations, leading other states to use COVID-19 vaccine incentive lotteries in an attempt to increase slowing vaccination rates. "However, prior evaluations of the Ohio vaccine incentive lottery did not account for other changes

in COVID-19 vaccination rates in the United States, such as those that may have been due to expansion of vaccination to ages 12-15," explained corresponding author Allan J. Walkey, MD, MSc, professor of medicine at BUSM. "Our results suggest that state-based lotteries are of limited value in increasing vaccine uptake. Therefore, the resources devoted to vaccine lotteries may be more successfully invested in programs that target underlying reasons for vaccine hesitancy and low vaccine uptake," said Walkey, a physician at Boston Medical Center.

The researchers believe identifying interventions that can successfully increase COVID-19 vaccination rates is a critical public health issue necessary to curb the pandemic. "It is important to rigorously evaluate strategies designed to increase vaccine uptake, rapidly deploy successful strategies, and phase out those that do not work," Walkey said.

Journal Reference:
Allan J. Walkey, Anica Law, Nicholas A. Bosch. Lottery-Based Incentive in Ohio and COVID-19 Vaccination Rates. JAMA, 2021; DOI: 10.1001/jama.2021.11048

Inhaled COVID-19 vaccine shows good results in animals studies

July 8, 2021

In a new study assessing the potential of a single-dose, intranasal COVID-19 vaccine, a team from the University of Iowa and the University of Georgia found that the vaccine fully protects mice against lethal COVID-19 infection. The vaccine also blocks animal-to-animal transmission of the virus. The findings were published July 2 in the journal Science Advances.

Unlike traditional vaccines that require an injection, this vaccine is administered through a nasal spray similar to those commonly used to vaccinate against

influenza. The vaccine used in the study only requires a single dose and it may be stored at normal refrigerator temperatures for up to at least three months. Because it is given intranasally, the vaccine may also be easier to administer, especially for those who have a fear of needles.

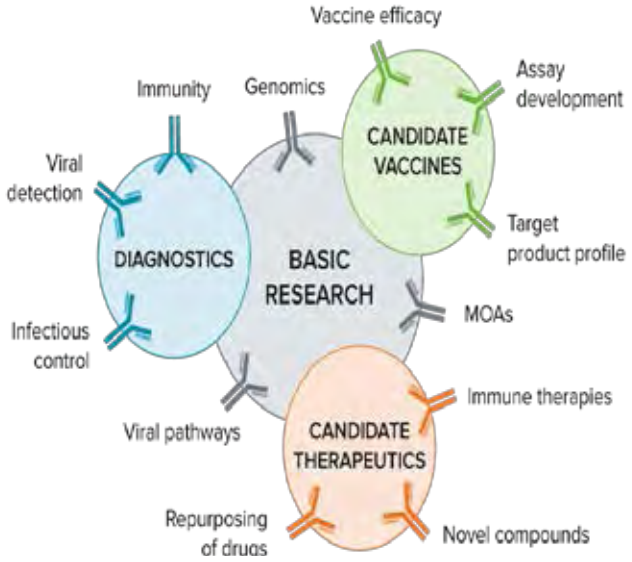
The experimental vaccine uses a harmless parainfluenza virus 5 (PIV5) to deliver the SARS-CoV-2 spike protein into cells where it prompts an immune response that protects against COVID-19 infection. PIV5 is related to common cold viruses and easily infects different mammals, including humans, without causing significant disease. The research team has previously shown that this vaccine platform can completely protect experimental animals from another dangerous coronavirus disease called Middle Eastern Respiratory Syndrome (MERS).

The study showed that the vaccine produced a localized immune response, involving antibodies and cellular immunity, that completely protected mice from fatal doses of SARS-CoV-2. The vaccine also prevented infection and disease in ferrets and, importantly, appeared to block transmission of COVID-19 from infected ferrets to their unprotected and uninfected cage-mates.

Journal Reference:
Protection of K18-hACE2 mice and ferrets against SARS-CoV-2 challenge by a single-dose mucosal immunization with a parainfluenza virus 5–based COVID-19 vaccine. Science Advances, 2021; 7 (27): eabi5246 DOI: 10.1126/sciadv.abi5246

New protein engineering method discovered for COVID-19 therapeutics

June 24, 2021



Researchers have found a simple method for identifying nanobodies with drug-like properties suitable for preventing SARS-CoV-2 infections. They demonstrated the approach by generating nanobodies that neutralized the SARS-CoV-2 virus more potently than an antibody isolated from an infected patient and a nanobody isolated from an immunized animal.

"A key advantage to this method, both in terms of addressing pandemics and nanobody development more generally, is the ability to select nanobodies that bind strongly more rapidly than with current methods," said Zupancic. "This process of CDR swapping resulted in substantial changes to the nanobodies we initially started out to modify," she said. "It was surprising to us that such large changes not only did not hinder the nanobodies' ability to bind and neutralize the SARS-CoV-2 virus, but actually greatly improved it."

Journal Reference:
Directed evolution of potent neutralizing nanobodies against SARS-CoV-2 using CDR-swapping mutagenesis. Cell Chemical Biology, 2021; DOI: 10.1016/j.chembiol.2021.05.019

Playing wind instruments generates less aerosol than vocalization, COVID-19 study finds

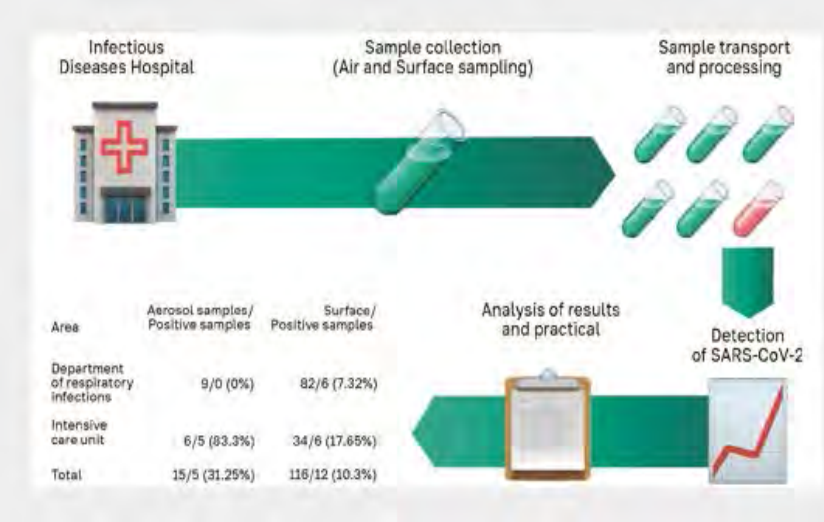
June 29, 2021

Though it is not sure how much this research will be useful when people are fearful from other reasons but aerosol generated by playing woodwind and brass instruments is less than that produced when vocalising (speaking and singing) and is no different than a person breathing, new research has found. The findings, published online in the journal Aerosol Science and Technology, could be crucial to developing a roadmap for lifting COVID-19 restrictions in the performing arts, which have been significantly restricted since the start of the pandemic.

Jonathan Reid, Director of Bristol Aerosol Research Centre and Professor of Physical Chemistry in the School of Chemistry at the University of Bristol, added: "This study confirms that the risks of transmission of SARS-CoV-2 are likely elevated during vocalisation at loud volume in poorly ventilated spaces. By com-

parison, playing wind instruments, like breathing, generates less particles that could carry the virus than speaking or singing."

Journal Reference:
Aerosol and Droplet Generation from Performing with Woodwind and Brass Instruments. Aerosol Science and Technology, June 29, 2021; DOI: 10.1080/02786826.2021.1947470



Study confirms the low likelihood of infection by SARS-CoV-2 on hospital surfaces

June 25, 2021

A new study by UC Davis researchers confirms the low likelihood that SARS-CoV-2 contamination on hospital surfaces is infectious. The study, published June 24 in PLOS ONE, is the original report on recovering near-complete SARS-CoV-2 genome sequences directly from surface swabs. The researchers analyzed the surface swabs for SARS-CoV-2 RNA and infectivity and assessed the suitability of the RNA for sequencing.

Despite a significant increase in the number of hospital patients with COVID-19 during the second surge, the team found that only 2% of swabs tested positive in August, compared to 11% of samples collected in April.

"The reduction in the virus contamination was likely due to improved ICU patient management and cleaning protocols," Haczku said. Haczku is a professor of medicine, director at the UC Davis Lung Center and associate dean for translational research at the UC Davis School of Medicine.

Journal Reference:
SARS-CoV-2 detection and genomic sequencing from hospital surface samples collected at UC Davis. PLOS ONE, 2021; 16 (6): e0253578 DOI: 10.1371/journal.pone.0253578

Birthdays and COVID-19 spread during the height of the pandemic

June 25, 2021

Though it is understood now that gathering increase transmission but a futile recent study again found that

the risk of SARS-CoV-2 infection increased 30 percent for households with a recent birthday in counties with high rates of COVID-19, but no such jumps were seen in areas with low rates of infection. The findings suggest informal social gatherings such as birthday parties played role in infection spread at the height of the coronavirus pandemic. The researchers point out that they did not count actual birthday parties in their analysis. Instead, they used birth dates of household members as a proxy for social gatherings and in-person festivities.

The researchers analyzed a nationwide sample of nearly 3 million U.S. households with employer-based insurance provided by Castlight Health. Over the first 45 weeks of 2020 the researchers found that in counties with high COVID-19 transmission, households with recent birthdays averaged 8.6 more cases per 10,000 individuals than households in the same counties without a birthday.

Journal Reference:
Assessing the Association Between Social Gatherings and COVID-19 Risk Using Birthdays. JAMA Internal Medicine, 2021; DOI: 10.1001/jamainternmed.2021.2915

Recent study identifies 11 candidate genetic variants for Alzheimer's disease

July 13, 2021

A recently published study co-authored by University of Kentucky Sanders-Brown Center on Aging researcher Justin Miller, Ph.D., identifies 11 rare candidate variants for Alzheimer's disease. Researchers found 19 different families in Utah that suffered from Alzheimer's disease more frequently than what is considered normal.

For the study, genetic sequencing was conducted on two cousins from each of the 19 families. Miller says they then identified genetic variants that were shared between both cousins.

Journal Reference:
Analysis of high-risk pedigrees identifies 12 candidate variants for Alzheimer's disease. Alzheimer's & Dementia, 2021; DOI: 10.1002/alz.12397

Some blood pressure-lowering meds linked to less memory decline in older adults

June 25, 2021

Older adults taking blood pressure-lowering medications known to cross the blood-brain barrier had better memory recall over time compared to those taking other types of medicines to treat high blood pressure,

according to new research published today in the American Heart Association journal Hypertension.

ACE inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers and diuretics are different classes of blood pressure-lowering medicines. Each class acts in a different way to reduce blood pressure, and some cross the blood-brain barrier, thereby impacting cognitive function.

Researchers gathered information from 14 studies of nearly 12,900 adults ages 50 years and older. These included studies done in the United States, Australia, Canada, Germany, Ireland and Japan. The meta-analysis found:

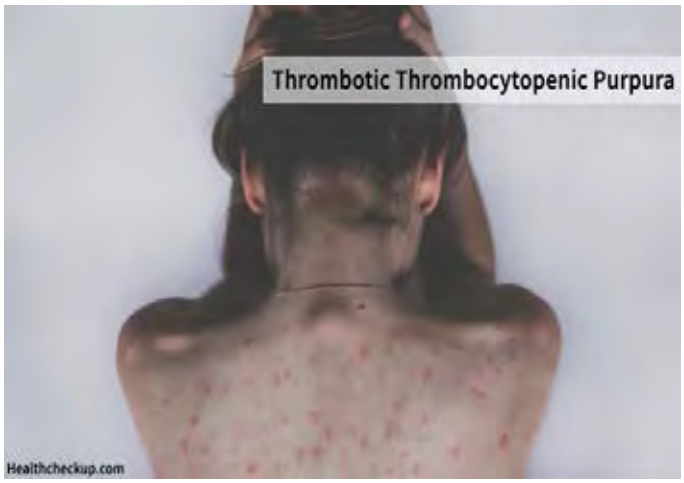
Older adults taking blood pressure-lowering medicines that cross the blood-brain barrier had better memory recall for up to 3 years of follow-up compared to those taking medicines that do not cross the blood-brain barrier even though they had a higher level of vascular risk.
Adults taking hypertension medications that did not cross the blood-brain barrier had better attention for up to 3 years of follow-up.

Journal Reference:
Blood-Brain Barrier Crossing Renin-Angiotensin Drugs and Cognition in the Elderly: A Meta-Analysis. Hypertension, 2021; DOI: 10.1161/HYPERTENSIONAHA.121.17049

How vaccine-induced immune thrombotic thrombocytopenia (VITT) happens

July 7, 2021

A McMaster University team of researchers recently discovered how, exactly, the COVID-19 vaccines that use adenovirus vectors trigger a rare but sometimes fatal blood clotting reaction called vaccine-induced



immune thrombotic thrombocytopenia or VITT.

The study shows, at a molecular level, how those unusual antibodies stick to components from blood platelets causing them to trigger clot formation.

"The antibodies stick to the platelet protein called platelet factor 4 (PF4) in a very unique and specific orientation, which allows them to align with other antibodies and platelets in the precise formation that leads to a self-perpetuating vicious cycle of clotting events," said Nazy.

"These disease-causing aggregates quickly activate platelets, creating a highly intense clotting environment in patients," he added.

The dangerous reaction to the adenovirus vector vaccines has been found to occur in one in 60,000 of people receiving the vaccine in Canada.

Journal Reference:
Angela Huynh, John G Kelton, Donald M Arnold, Mercy Daka, Ishac Nazy. Antibody epitopes in vaccine-induced immune thrombotic thrombocytopenia. Nature, 2021; DOI: 10.1038/s41586-021-03744-4

Bio Controversies

After HCQ and many others now Paper from company claiming phototherapy for COVID-19 is retracted

June 14, 2021

A study that touted phototherapy as a way to combat the COVID-19 pandemic has been retracted after Elisabeth Bik noted a litany of concerns about the article, from duplications in the figures to the authors' failure to disclose conflicts of interest.

The article, "Methylene blue photochemical treatment as a reliable SARS-CoV-2 plasma virus inactivation method for blood safety and convalescent plasma therapy for COVID-19," appeared in mid-April in BMC Infectious Diseases, a Springer Nature title. The authors listed affiliations with various institutions in China, including a company called Boxin (Beijing) Biotechnology Development LTD, which helped fund the study — more on that in a moment.

According to the paper, methylene blue (a versatile medical product that serves as a drug and a dye) when used with something called the "BX-1 AIDS treatment instrument," could be a wonder therapy for the SARS-CoV-2 infection.

Apparently in response to Bik, the journal issued an editor's note on May 6 stating: Readers are alerted that concerns have been raised regarding the reliability of this article.

Now the article has been retracted, with the following statement:

— The Light 0 min panel for Virus Control appears to

partially overlap with the Light 0 min panel for 1uM MB No light.
— The Light 0 min panel for 1um MB No light appears to partially overlap with the Light 40 Min panel of the same row, and partially overlap with the Light 0 Min panel for No MB.
— In addition, the authors Bin Yu, Jie Zhang, Hao Wu, Xipeng Zhou and Miao Jiang did not appropriately declare a competing interest regarding their affiliation with Boxin (Beijing) Biotechnology Development LTD and its product 'BX-1 AIDS treatment instrument' as described in this article.

Finally the journal wrote - The editor no longer has confidence in the reliability of the data reported in the article.

University terminates affiliation with researcher who had paper on COVID-19 vaccines retracted

July 6, 2021

Dr Harald Walachwho co-authored a now-retracted paper claiming that two vaccinated people died of COVID-19 for every three deaths prevented has had an affiliation with a Polish university terminated. The retracted manuscript "The Safety of COVID-19 Vaccinations – We Should Rethink the Policy" (Vaccines, Publisher MDPI) is based on the wrong assumptions.

A number of experts had serious concerns about the use of Lareb data. Moreover, data extracted by the authors from the observational study by Dagan et al. concern short-term mortality after the first dose, which is not at all representative of mortality prevention in the long term after the second dose. In our opinion, the study misleadingly used data to yield conclusions that are wrong and may lead to public harm.

Another paper by Walach and colleagues in JAMA Pediatrics which claimed that masks trap concentrations of carbon dioxide higher than allowable standards in Germany has also come under serious scrutiny.

More than half of Dutch scientists regularly engage in research malpractices

July 08, 2021

More than half of Dutch scientists regularly engage in questionable research practices, such as hiding flaws in their research design or selectively citing literature, according to a new study. And one in 12 admitted to

committing a more serious form of research misconduct within the past 3 years: the fabrication or falsification of research results.

This rate of 8% for outright fraud was more than double that reported in previous studies. Organizers of the Dutch National Survey on Research Integrity, the largest of its kind to date, took special precautions to guarantee the anonymity of respondents for these sensitive questions, says Gowri Gopalakrishna, the survey's leader and an epidemiologist at Amsterdam University Medical Center (AUMC). "That method increases the honesty of the answers," she says. "So we have good reason to believe that our outcome is closer to reality than that of previous studies." The survey team published results on 6 July in two preprint articles, which also examine factors that contribute to research misconduct, on MetaArxiv.

When the survey began last year, organizers invited more than 60,000 researchers to take part—those working across all fields of research, both science and the humanities, at some 22 Dutch universities and research centers. However, many institutions refused to cooperate for fear of negative publicity, and responses fell short of expectations: Only about 6800 completed surveys were received. Still, that's more responses than any previous research integrity survey, and the response rate at the participating universities was 21%—in line with previous surveys.

The survey found Ph.D. students had the hardest time meeting the standards of responsible research. Some 53% of them admitted to frequently engaging in one of the 11 questionable research behaviors within the past 3 years, compared to 49% of associate and full professors.

Ten journals denied 2020 Impact Factors because of excessive self-citation or "citation stacking"

June 30, 2021

Clarivate, the company behind the Impact Factor, a closely watched — and controversial — metric, is calling out more than 20 journals for unusual citation patterns.

The 21 journals — 10 of which were suppressed, meaning they will not receive an Impact Factor in 2020, and 11 of which received an expression of concern — are fewer than half of the nearly 50 that the company suppressed or subjected to an expression of concern last year from its Journal Citation Report (JCR). The suppressions, the company notes, represent .05% of the journals listed — a total that increased dramatically this year from about 12,000 to about 20,000.

Clarivate suppressed 10 journals for excessive self-citation which inflates the Impact Factor, or for "citation-stacking," sometimes referred to as taking part in "citation cartels" or "citation rings:"

The journals on the lists include those published by Elsevier, Sage, Taylor & Francis, Wiley, and Wolters Kluwer.

BRSI Upcoming Event

18th BRSI Convention

The 18th Convention of the Society will be held as the International Conference on Biotechnology for Resource Efficiency, Energy, Environment, Chemicals and Health (BREEECH-2021) during December 1-4, 2021 at Dehradun.

The event will be jointly organized by the CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand, India in association with the International Bioprocessing Association, France; the Centre for Energy and Environmental Sustainability (CEES)-India; CDC Jaipur and International Solid Waste Association (India chapter).

The event will be held at IIP, Dehradun. Prof Sudhir Sopory, President of the BRSI is the conference chair and Prof Huu Hao Ngo, University of Technology Sydney, Australia; Prof Claude Gilles Dussap, Universite Clermont Auvergne, France and Prof Samir Khanal, University of Hawaii, USA are conference international chairs. Dr Debashish Ghosh is the convener of the conference, Dr T Bhaskar is the Chairman of the local organizing committee, and Dr P Binod, COE, BRSI, Dr Bhavya Balahurumurthy, CSIR-IIP, Dehradun and Dr Kamlesh Choure, AKS University, Satna are its co-convener.

Details can be found at https://www.bre3ch2021.in/

Important Dates

01 July, 2021
Abstract Submission Opens
31August, 2021
Abstract Submission Closes
10 September, 2021
Acceptance Notification
15 October, 2021
Registration at Normal Rates
31 October, 2021
Registration Cancellation

Booking of Accomodation Registration may close earlier if maximum numbers of participants have been reached

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BE's Strengths

- BE holds distinctive competitive positions in India, UNICEF/PAHO and other semiregulated markets
- BE ranks among the Top-5 pure play vaccine manufacturers globally, and among the Top-3 from emerging markets
- BE is actively addressing other middleincome markets through tie-ups with government agencies and distributors
- BE ranks among the 6 globally prequalified suppliers of the liquid pentavalent vaccine, and among the two globally prequalified suppliers of the Japanese Encephalitis vaccine to UNICEF
- BE has successfully developed and commercialized 6 vaccine products in the last decade, and has built up a robust pipeline

BEING THE CHANGE

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