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## REPORT

### on the Science Session

## “Green Medicines: Plant Molecular Farming and a New Collaboration Model for Addressing Global Health Challenges”

held at the Science Summit on the occasion of the 77<sup>th</sup> General Assembly of the United Nations at the Permanent Mission of Austria to the United Nations in New York

Science Session convened by the "Medicines for Future (M4F)" initiative, the University of Natural Resources and Life Sciences, Vienna (BOKU), Austria, and Cape Bio Pharms, South Africa, in cooperation with the International Society for Plant Molecular Farming

- Venue:** Hybrid; Video Conference and in-person at Permanent Mission of Austria to the United Nations in New York
- Date:** Tuesday, September 27th, 2022, 10:00 am - 12:30 pm EDT
- Host:** Permanent Mission of Austria to the United Nations in New York  
Contact: Mr. Christian Ebner
- Organizers:** Medicines for Future (M4F), represented by Josef Glössl, University of Natural Resources and Life Sciences, Vienna, Austria; Declan Kिरrane, ISC Intelligence; and Kurt Zatloukal, Medical University of Graz, Austria; in cooperation with Cape Bio Pharms, Cape Town, South Africa, represented by Belinda Shaw
- Participation:** Participation was possible [online](#) and in person. In person participation required a personal invitation by the organizers

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## Agenda

**Mr Declan Kirrane** *ISC Intelligence, Moderator*  
**Prof Josef Glössl** *M4F and BOKU, Co-Moderator*

- 10:00 *Welcome*  
**Ambassador Dr. Alexander Marschik** (Host), Permanent Representative of Austria to the United Nations in New York
- 10:10 *Introductory Remarks*  
**Prof. Intisar Soghayroun** President of Khartoum University, former Minister of Science, Sudan  
**Dr Danjuma Usman Shiddi** Member of the Nigerian Parliament; Member of the Science and Technology Committee, Nigeria  
**Dr Cynthia Asare Bediako** Chief Director, Ministry of Environment, Science, Technology and Innovation, Ghana
- 10:20 *Setting the Scene: Infectious Diseases as Global Health Challenges*  
**Prof. Florian Kramer** Department Microbiology, Icahn School of Medicine at Mount Sinai, New York, NY, USA  
*New Collaboration Model for Addressing Global Health Challenges*  
**Prof. Kurt Zatloukal** M4F and Diagnostic and Research Center for Molecular BioMedicine, Medical University of Graz, Austria
- 10:40 *Plant Molecular Farming (PMF) as Key Enabling Technology*  
**Prof. Julian Ma** Institute for Infection and Immunity, St George's University of London, UK  
**Prof. Inge Broer** International Society for Plant Molecular Farming (ISPMF)
- 11:00 *The Versatility of PMF as Demonstrated by Case Studies*  
**Prof. Waranyoo Phoolcharoen** Chulalongkorn University in Bangkok and Baiya Phytopharm, Thailand  
**Dr. Martín Salinas** Moolec Science, BIOCERES, Argentina  
**Dr. Ofra Chen** Transalgae, Weizmann Science Park, Rehovot, Israel  
**Belinda Shaw** Cape Bio Pharms, South Africa  
**Prof. Edwin Scott Asemota** Collaborative Malaria Plant Vaccine Development Initiative, Nigeria and Germany
- 11:25 *The Future Perspectives of PMF*  
**Prof. Ed Rybicki** Department of Molecular and Cell Biology, University of Cape Town, South Africa
- 11:35 *Moderated Panel Discussion: Policy Framework for Stimulating Cooperative Capacity Building for Better Access to Medicines and Vaccines*  
**Panelists** **Speakers** from above  
**Additional Panelists** (invited for input statements):  
**Ben Durham** Department of Science and Innovation, Pretoria, South Africa  
**Dr Juan Miguel González-Aranda** LifeWatch ERIC, Madrid, Spain  
**Dr. Hermann Garden** Policy Advisor Health Innovation, OECD
- 12:25 *Outlook and next steps*  
**Declan Kirrane**
- 12:30 End



## **DESCRIPTION of the UNGA77 Science Session** **(REF 27214) Green Medicines: Plant Molecular Farming and a New Collaboration Model for Addressing Global Health Challenges**

Equal access to affordable medicines and vaccines is a key goal in SDG 3b, Good Health and Well-Being. However, the COVID-19 pandemic demonstrated how disparate infectious diseases affect global health systems and highlighted global inequality for R&D, manufacturing and ultimately vaccine accessibility. Specifically, as a result of widespread economic inequities millions of people in low- and middle-income countries (LMIC) lacked appropriate access to medicines because the domestic biopharmaceutical production capacity was limited. High global demand of biopharmaceuticals (vaccines or medicines) further aggravated the supply shortage, with detrimental consequences for the health of LMIC populations. A route forward to improve the resilience of LMIC against similar global pandemics in the future is to build local medical infrastructure and to educate skilled people capable of managing emergency situations in public health.

### **Creating an enabling policy, regulatory and funding environment for Plant Molecular Farming**

The Session will examine the global approach to developing the necessary policy approaches at the level of the UN and its member states in order to deliver the benefits of Plant Molecular Farming (PMF) to excluded sectors of the global population, in particular those in nations currently without the capacity above. How will the alignment between policy and funding bodies at global level be achieved? Who are the stakeholders that need to be on board; how long can this take? In many cases the lack of collaboration is down to bureaucratic impediments in one form or another. These need to be identified and eliminated.

### **Closing gaps for better pandemic and endemic preparedness**

Implementing this route will require to close these gaps to enable more countries to respond rapidly and efficiently to local and global health emergencies. The current COVID-19 pandemic clearly showed that centralized approaches to vaccine development, manufacture and distribution were inefficient and unequal. Therefore, we would like to present a new model for global collaboration and capacity building in the context of the Science Summit in association with UNGA77. This model envisages collaborative capacity building aiming at (1) enabling more countries to perform their own R&D, (2) setting up manufacturing infrastructure with rapid response capability and low/different global supply chain dependence, and (3) building collaborative networks to facilitate concerted multinational responses by using a synchronized two-tiered approach:

- (a) *Developing partnerships for boosting manufacturing capacity for medicines and vaccines in LMIC where better access to medicines is urgently needed:*

LMIC currently depend on biopharmaceutical suppliers located in few developed countries. Diversifying biopharmaceutical production into technologies that are less depended on expert staff and specialized infrastructure can reduce production costs and improve regional independence of LMIC from global supply chains. At the UNGA77 science session, Plant Molecular Farming (PMF) will be highlighted as one such diversifying options because it is an innovative and versatile technology platform to achieve a simple, scalable and low-cost yet versatile and reliable production of biopharmaceuticals. For example, proteins for the treatment of infectious and non-communicable diseases as well as diagnostic agents can be produced within a month. Based on a number of case



studies the potential and challenges of PMF will be reviewed, emphasizing future opportunities to utilize PMF for de-centralized emergency response for the rapid production of biopharmaceuticals, but also as an innovative platform with low entry barriers to complement currently existing production systems for biopharmaceuticals.

(b) *Building partnerships for training of skilled people, complementary to boosting manufacturing infrastructure:*

According to SDG 3c “training and retention of health workforce in developing countries” are important goals. Therefore, international partnerships for jointly developing manufacturing infrastructure will require accompanying collaborations aiming at the training of skilled people for qualifying them as workforce for PMF production facilities in LMIC.

Taken together, this concerted approach will result in training of skilled people and establishment of PMF manufacturing capacities in various countries to sustainably develop and provide medicines to people. The advantages of such an approach are as follows:

- Establishment of PMF manufacturing capacities in LMIC to facilitate the production in those countries where the medicines are most urgently needed, at affordable prices
- Training of a new generation of skilled people
- Creation of qualified jobs, particularly in LMIC
- Reduced risk of disrupted supply chains, as experienced during the COVID-19 pandemic
- Building equal partnerships between developed and developing countries

In the moderated discussion key bottlenecks in local and global public health will be addressed as well as potential contributions of PMF to reduce some of these bottlenecks.

In the context of the UNGA77 Science Summit, the collaboration between the initiative Medicines for Future (M4F), the International Society of Plant Molecular Farming (ISPMF) and the further participating organizations aims to contribute to increasing the accessibility of essential medicines to people in low- and middle-income countries.

A further expected outcome of the session will be an agreement to prepare joint input for the United Nations [Summit of the Future](#), which will take place in 2024, aiming at further developing the collaboration model and to increase awareness for PMF as an affordable, innovative and versatile manufacturing platform for biopharmaceuticals and beyond at high-level decision makers globally.



## RESUMÉ of the UNGA77 Science Session (REF 27214) Green Medicines: Plant Molecular Farming and a New Collaboration Model for Addressing Global Health Challenges

**On the occasion of the 77th General Assembly of the United Nations in New York, a Science Summit session highlighted Plant Molecular Farming (PMF), using plants to manufacture important pharmaceutical proteins, as a promising and reliable option for better future pandemic preparedness. PMF provides a well-established versatile, scalable and affordable technology platform to develop manufacturing independence. To efficiently implement PMF in countries where medicines and vaccines are most urgently needed a new model for global collaboration and capacity building was presented at a hybrid event hosted by the Permanent Representation of Austria to the United Nations in New York.**

Equal access to affordable medicines and vaccines is a key goal in SDG 3, Good Health and Well-Being. The COVID-19 pandemic demonstrates how disparate infectious diseases affect global health systems and highlight global inequality for R&D, manufacturing and ultimately vaccine accessibility. For example, in January 2022, over 60 per cent of the world's population have received at least one dose of COVID-19 vaccination, but this figure drops to just under 10 per cent for low-income countries. According to the global vaccine tracker, high-income countries have now administered over 179 vaccination doses per 100 capita of population, that is over 13 times the number of doses administered in low-income countries, standing at 13.5 per 100 capita. Similar calls have also been made for test kits, which are virtually non-existent in many low-income countries.

Specifically, as a result of widespread economic inequities millions of people in low- and middle-income countries (LMIC) lack appropriate access to medicines due to limited capacity in the domestic biopharmaceutical production, and high prices imposed by pharmaceutical companies in the global north put many treatments out of reach, causing millions of unnecessary deaths. High global demand of biopharmaceuticals - vaccines or medicines - further aggravate the supply shortage, with detrimental consequences for the health of LMIC populations, in particular.

It is imperative to improve the resilience of LIMCs against similar global pandemics in the future. We need to build local medical infrastructure and to educate skilled people capable of managing emergency situations in public health. Against this background, at the UNGA77 science session, presented by the Austrian initiative Medicines for Future (M4F), together with Cape Bio Pharms, South Africa, in cooperation with the International Society of Plant Molecular Farming (ISPMF), Plant Molecular Farming was highlighted as one such diversifying options as it is an innovative, enabling and versatile technology platform that can provide a simple, highly scalable and low-cost yet versatile and reliable production of biopharmaceuticals. For example, proteins for the treatment of infectious and non-communicable diseases as well as diagnostic reagents can be produced in quantity within a month of a new target being identified, at far cheaper costs, in small or large volumes and with no potential risk for the transfer of animal pathogens. Based on a number of case studies presented by start-up companies the potential and challenges of implementing PMF is already demonstrating commercial potential and future opportunities to utilize PMF for de-centralized emergency response for the rapid production of biopharmaceuticals.



To increase the accessibility of essential medicines to people in low- and middle-income countries through developing local manufacturing capacity and technology development, a new model for global collaboration and capacity building envisages a synchronized two-tiered approach by developing partnerships for boosting manufacturing capacity for medicines and vaccines together with training of skilled people.

Alexander Marschik, Austria's Permanent Representative and Ambassador to the United Nations emphasized in his welcome remarks that, “empowering developing countries to manufacture and distribute cost-effective, high-quality vaccines and medicines in an innovative and sustainable way, by bringing together scientists, policy-makers, and the industry,” and that this was an international prototype model to tackle future pandemics.”

Florian Krammer, Professor of Vaccinology at the Ichan School of Medicine at Mount Sinai, New York highlighted the need to develop countermeasures to current and preparedness to future pandemics.

Kurt Zatloukal, Professor of Pathology at the Medical University of Graz, Austria, and co-initiator of M4F, explained that “cooperative establishment of PMF manufacturing capacities in LMICs together with training of a new generation of skilled people facilitates the production in those countries where the medicines are most urgently needed, at prices affordable for these countries” and illustrated this on the example of an innovative COVID-19 therapeutic approach. M4F co-initiator Josef Glössl, Professor of Genetics and Cell Biology at the University of Natural Resources and Life Sciences, Vienna (BOKU), Austria, added “that this creates new and qualified jobs and reduces risks of disrupted supply chains, as experienced during the COVID-19 pandemic”.

Julian Ma, Professor at the St George's University of London, UK highlighted that “Molecular Farming offers an unprecedented opportunity to change global access to modern medicines”. Ed Rybicki, Director of the Biopharming Research Unit at the University of Cape Town, said that “PMF could be the gateway technology that allows LMICs to participate in all levels of the One Health Initiative: making reagents for use as diagnostics but also proteins to be used as therapeutics or vaccines for diseases of animals, and even humans”. Belinda Shaw, founder of Cape Bio Pharms argues that “we have already commercialized the plant-based expression platform that can produce not only simple proteins but complex molecular structures and fusion proteins”. She went on to say “it is a versatile alternative and ideally suited to contribute to secure supply for Africa but the development of home-grown IP, replacing much of the 70 to 90 per cent of pharmaceutical proteins that currently have to be imported”.

High level representatives from several countries, among them Professor Intisar Soghayroun, President of Khartoum University and former Minister of Science of Sudan, Dr. Cynthia Asare Bediako, Chief Director of the Ministry of Environment, Science, Technology and Innovation, Ghana, and Ben Durham, Chief Director of Bio-innovation at the Department of Science and Innovation in Pretoria, South Africa, emphasized the importance of partnerships in science, technology and innovations and specifically in capacity building in infrastructure, education and skills development for establishing manufacturing facilities to gain better access to medicines and vaccines.

Among the participants present at the Austrian Permanent Mission at the UN, Mr Danjuma Usman Shiddi, member of the Science and Technology Committee of the Nigerian Parliament expressed great interest in the PMF technology and establishing collaboration with the M4F initiative. This was further



discussed at a follow-up meeting on the next day at the Nigerian Permanent Representation to the UN with His Excellency, Ambassador George Ehidiemen Edokpa, resulting in an agreement to setting up a path to develop future collaboration.

#### **Additional background information:**

Links to statistics of vaccine inequality across the world – not just Covid-linked:

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(22\)00793-0/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(22)00793-0/fulltext)

<https://www.unicef.org/coronavirus/g20-africa-equity-open-letter>

<https://news.un.org/en/story/2022/03/1114762>

#### **About Medicines for Future**

Medicines for Future (M4F) is a newly founded international biotechnological initiative from Austria which is also based on research by high-ranking research teams from the Medical University of Graz (MUG) and the University of Natural Resources and Life Sciences, Vienna (BOKU). The mission of M4F is to produce efficient and affordable drugs for people around the globe by innovating drug discovery and scalable manufacturing of drugs by Plant Molecular Pharming.

#### **About Cape Bio Pharms**

Cape Bio Pharms from Cape Town, South Africa was conceptualised in 2015 to develop the commercial potential of the plant-based transient expression platform developed over many years by Professor Ed Rybicki's Biopharming Research Unit of the University of Cape Town. Cape Bio Pharm's manufacturing subsidiary, Cape Biologix South Africa has produced commercial-scale volumes of a range of plant-based SARS-CoV-2 recombinant proteins for diagnostics and research applications. The company is currently producing a wide variety of research reagents and increasing its catalogue in diagnostic reagents for use on test kits for Ebola, Malaria, HIV, Yellow Fever to name a few. R&D is now expanding into animal diagnostic and vaccines against several critical diseases.

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