



African Genetic
Biocontrol
Consortium

GenBioNews

African Genetic Biocontrol News

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The African Genetic Biocontrol Consortium's First Webinar was a Success!

On the 30th of September 2021 we were privileged to host our first webinar event titled **“What constitutes emerging genetic biocontrol technologies and what risks and benefits do they hold in Africa.”** This event was the first in a series of awareness-based webinars that we aim to have the objective of the event was to:

- Provide an overview of the differences between classical and genetic biocontrol
- Discuss gene editing as an emerging technology
- Discuss the potential of gene drives for mosquito control
- Discuss the risks and benefits emerging

genetic biocontrol holds for Africa

The event ran for two hours and featured five seasoned professionals in the biotechnology field who shared their insights and experiences with the genetic biocontrol as an emerging technology. This webinar had French language interpretation through out the duration of the event.

- Fredros Okumu
- Daniel Maeda
- Ivan Rwomushana
- Antonio Nkondjo
- Doucoure Hinda
- Adilson Jose de Pina

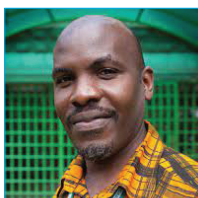
THE NEEDS AND REQUIREMENTS FOR TESTING GENETIC BIOCONTROL TECHNOLOGIES IN AFRICA

Webinar 1
Sep 30, 2021
04:00 pm Nairobi

What continues emerging genetic biocontrol technologies and what risks and benefits do they hold for Africa

What risks and benefits do they hold for Africa?

Speakers



Ivan Rwomushana
Senior Scientist,
Invasive Species
Management CABI



Daniel Maeda
University of Dar es
Salaam



Antonio Nkondjo
OCEAC, Cameroon



Fredros Okumu
Moderator

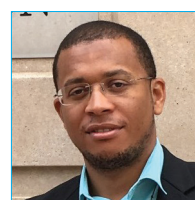
Modérateur

Discussants

Doucoure Hinda
(LBMA) LMI
DynPathos



Adilson Jose de pina
MOH, Cabo
Verde



Event Highlights

**01**

The first presentation by Daniel Maeda focused on the topic **“Gene Editing as an Emerging Technology.”** He began by a brief description of gene editing, which is a concise change in DNA achieved by insertion, deletion, and replacement. Maeda then gave a schematic representation of the central dogma, which shows transcription, translation, post-translational modification, and the formation of an active protein. Gene editing relies on cell’s DNA repair pathways,

which requires endonucleases to cut DNA. These include zinc finger nucleases (ZFNs), transcription activator like effector nucleases (TALENs), meganucleases, and CRISPR/Cas. Maeda emphasized on the importance of CRISPR/Cas system that originated from bacterial defenses against viruses. For instance, an application of the CRISPR/Cas system is on the elimination of vector-borne diseases through gene editing.



02



The second presentation by Ivan Rwomushana focused on **“Classical biological control and its applications versus gene drive.”** He gave a brief description of Center for Agriculture and Bioscience International (CABI), that provides information on the application of scientific expertise to solve problems in agriculture and the environment. He pointed out that biological control is an intentional release, and it is imperative to assess the risks beforehand. Some of the risk assessment parameters include host range, dispersal, non-target effects, and suitability of the environment. There are documented negative impacts of classical biocontrol, especially to non-target populations, for instance, there are 3 possible global extinctions. Ivan then gave the differences between classical

biocontrol and gene drive. Gene drives have an aspect of gene editing whereas classical biocontrol does not. Gene drives require open field trials prior to their release. There are other methods of genetic control namely sterile insect technique, which has been successful in the eradication of screw worms in USA and Mexico. The advantages of sterile insect technique include species specificity and minimal effect on the environment. The limitations include the need for building capacity, cost of production, and regulatory barriers. Some of the benefits of classical biocontrol are control of cassava mealybug, mango mealybug, papaya mealybug and water hyacinth. He concluded by stating that classical biocontrol is for the public good.



03



The third presentation by Antonio Nkondjio focused on current malaria control strategies in Africa: **“Why gene drive as a malaria eradication tool.”** The introduction of the presentation was on the malaria burden in Africa. Anopheline mosquitoes are the target for malaria vector control. There are 464 anopheles mosquitoes that have been identified of these, 68 are vectors. Antonio indicated that there are achievements in malaria elimination. Globally, 8 countries have been declared malaria free. A lesson to learn from past unsuccessful malaria elimination campaigns it is critical to have sustainable control interventions. The main strategies for malaria control include early and proper diagnostics, treatment, and prevention. Vector control measures include indoor residual spraying, insecticides treated nets, larval source management, and combination of control tools. Some of the strategies to manage insecticide resistance include rotation of insecticides, mixing insecticides, and combining interventions. Additional methods such as larval control

entail habitat modification, biological control by using predators, and larviciding. The limitations include short residual effects, toxicity for non-target species, labor, and financial constraints. Microbial control through the use of Wolbachia affects the reproduction capacities of mosquitoes but is only developed for Aedes. Entomopathogenic fungi works by penetrating the insect body and killing the insect. Improved housing is also recommended to reduce exposure to malaria mosquitoes. The advantages of gene drive include release of just small numbers, self-sustaining, species specific, cost effectiveness, and reduction of pesticide use. However, a disadvantage of the gene drive system is reluctance since its potential risks are still unknown. Gene drive is described as a genetic phenomenon that occurs in nature and causes a selected trait to spread rapidly through a species via sexual reproduction. Integrated control approach is advantageous owing to its efficacy, cost-effectiveness, and sustainability.



04



The presentation by Doucoure Hinda focused on the risks and benefits that emerging genetic biocontrol technologies hold for Africa. She started off by describing the use of TAL-effectors in disease resistance. Further, she gave the application of CRISPR in the case of rice to improve disease resistance and sustainability. For instance, gene editing can be used in simultaneous disruption of three disease susceptibility genes in rice. Also, gene editing of the ALS gene can be used to induce

pesticide tolerance. She went on to mention the applications of genetic biocontrol in human health, environmental health, and crop yield. However, there are some risks associated with CRISPR-mediated genome editing such as genetic transfer, off-target effect, emergence of pathogenic strains, and breeding of toxic chemicals. She proposed challenges that should be addressed such as intellectual property rights, national regulation, technical, and human resource issues.

The advantages of gene drive include release of just small numbers, self-sustaining, species specific, cost effectiveness, and reduction of pesticide use.



The final presentation was from Adilson De Pina focusing on the risks and benefits of emerging genetic biocontrol technologies and what risks and benefits they hold in Africa. Malaria is a parasitic infection transmitted by Anopheline mosquitoes. It causes an estimated 229 million cases globally, and results in more than 409,000 deaths every year. Most of the deaths occur in children under the age of 5 years. Many of vector-borne diseases are preventable, through protective measures, and community mobilization. Genetic biocontrol provides opportunities for the control and potential eradication of invasive species. The earliest applications of genetic biocontrol involved irradiation of the screw worm as a means of producing sterile individuals to suppress reproduction. As an alternative to sterile insect technique, genetic engineering has also been used to produce sterile insects for release to suppress a target population. He mentioned that gene drives are genetic elements with biased inheritance and have considerable potential for suppression of target pest populations. Some of the risks associated with the novel biotechnologies include human and animal health, loss of biodiversity, non-target organisms, and risk for horizontal gene transfer. The

biocontrol effects of an introduced biocontrol organism are permanent and cannot be reversed, risk assessments for classical biocontrol agents must carefully consider risks that the new organism may pose to the environment. Mosquitoes modified with gene drive systems are being proposed as new tools to complement the current arsenal available for the control and prevention of the transmission of vector-borne diseases such as malaria. Potential concerns of gene drive include mating fitness of released males, ecological uncertainty caused by eradication of a species, acceptability of the technology, ethical consideration, and planning. He concluded by saying gene drive, a genetic biocontrol method that is increasingly the focus of public attention, has the potential to spread without the need for sustained human intervention.

The event was a success with more than 30 participants in attendance. There was emphasis on creating awareness of the significance of giving biotechnologies a chance to potentially provide solutions to challenges within the African continent. As a consortium we anticipate that our future webinars will be as, if not more successful. We hope to see you in our next webinar scheduled for the 28th of September 2021.

05



The African Genetic Biocontrol Consortium Participates in the Africa Biennial Biosciences Communication Symposium 2021



The Africa Biennial Bioscience Communication Symposium (ABBC) is a forum that facilitates in-depth discussions on communication approaches with the aim of addressing gaps in the communication of bioscience technologies within the African continent. The ABBC symposium has been held in three countries: namely Kenya (2015), Uganda (2017), and South Africa (2019). The event has played a fundamental role in addressing key communication issues needed to propel bioscience innovations forward. This

year the ABBC Symposium successfully held its fourth series which ran from the 20th to the 24th of September 2021.

The theme of the event was **“Accelerating Africa’s Biotech Tipping Point: Taking Stock and Celebrating the Gains.”**

There have been significant strides made in the adoption of biotechnology especially in crops. This is a significant milestone and calls for a unified stakeholder celebration and consolidation of lessons needed to inspire and propel Africa forward.

The ABBC symposium was a hybrid event (in-person in each of the six countries; but internationally linked virtually), the event featured the case studies from Kenya, Malawi Ethiopia, Uganda, Ghana, and Nigeria. The event facilitated multi-faceted debates that highlighted experiences and strategies needed for furthering progress in other countries within the continent. In attendance were a wide range of stakeholder groups with an interest in investing in and, learning about Africa’s biotechnology sector. The

The theme of the event was “Accelerating Africa’s Biotech Tipping Point: Taking Stock and Celebrating the Gains.”



symposium’s objectives were to share experiences on agricultural biotechnology/ biosafety and inspire upcoming countries, to synthesize the best communication and policy advocacy strategies for accelerating the region’s momentum, to take stock of and amplify the successes made over the years and celebrate notable contributions from African scientists and, to launch the African Coalition on Communicating about genome editing, which was a key recommendation from the ABBC symposium event that

took place in 2019.

ABBC 2021 aimed to provide a coalition platform for entities to reflect on the progress made so far and celebrate Africa’s gains in Agri-biotechnology. The main category of participants in attendance were policy and decision makers, science communication experts, scientists, media practitioners, technology developers, regulators, professional associations representing various end-users like farmers as well as consumers and, development partners. By

focusing this event on Africa’s early adopting countries, the symposium’s objective was to contribute towards strengthening the foundation for agricultural biotechnology on the continent. The expected outcomes of the ABBC symposium were to work towards consolidating lessons and experiences that would be useful in inspiring countries, updating of communication and policy advocacy strategies using the most recent tools and innovative practices, appreciation of Africa’s capacity for biotechnology development by policy and decision makers and, launching the African Coalition on the Communication of Genome Editing.

The Africa Biennial Biosciences Communication Symposium (ABBC 2021) concluded with the launch of the African Coalition for Communicating about Genome Editing, a platform that will foster open and transparent dialogue on genome editing on the continent. The launch was presided over by Kenya’s Cabinet Secretary for Industrialization and Trade Hon. Betty Maina. Hon. Maina

joined a host of bioscience stakeholders in welcoming the Coalition exuding confidence that this initiative will be key in shaping the narrative and public perceptions on emerging gene technologies in Africa.

Leadership of six African universities expressed a strong commitment to support the Coalition saying it will serve a critical role in building scientists and policy makers' capacities in promoting informed decisions on genome editing. The universities represented were Nigeria's Ebonyi State University, Ethiopia's Addis Ababa University, and Kenyatta University, Masinde Muliro University of Science and

Technology, University of Embu, and South Eastern Kenya University all from Kenya. Vice-Chancellors of the six universities were excited to be part of the Coalition saying they look forward to hosting it in their universities.

The African Coalition for Communicating about Genome Editing will adopt a transdisciplinary approach to communication and public engagement. This will be done by enhancing soft skills for experts applying genome editing in Agriculture, Health and Environment to interact with those from Social Sciences researchers in the academia, policy leaders, private sector and the media in

Africa thus encourage dialogue rather than endless debates.

An African Genetic Biocontrol Consortium Secretariat representative attended the special session set for journalists and science communicators on the 21st of September at the Nairobi Safari Club Hotel, Lilian Towers. The session's objective was to share best practices that journalists and science communicators could adopt to increase public knowledge and understanding on biotech crops. At the end of the meeting the Consortium representative concluded that there is a critical role that science communicators and journalists play in ensuring that the public is aware and understands the influence that biotechnology has in Africa. As mentioned by a variety of biotech professionals present in the forum; there is need for African journalists and science communicators to ensure that there is more variety in reporting sources. In addition, communicators need to understand "the value chain" of communication. Understanding what role each party plays, would ensure that proper communication tools are utilized to bridge current knowledge gaps present in biotechnology.



The African Genetic Biocontrol Consortium Secretariat participates in the PAMCA Annual Conference & Exhibition

The PAMCA Annual Conference & Exhibition continue to provide a premier platform bringing together diverse actors in the disease control sphere including, public health entomologists, researchers, policy and decision makers and takers, health intervention and implementing agencies, health institutions, academics, NGOs and other actors to engage with the current scientific evidence on, and to share experiences and lessons on arthropod-borne diseases including, malaria, yellow fever, sleeping sickness among others, and to provide the necessary synergy towards

control and elimination of arthropod-borne diseases in Africa. The theme of this year's conference was, **“Empowering local institutions to set the agenda for the elimination of vector-borne diseases.”**

The African Genetic Biocontrol Consortium Secretariat in collaboration with the Outreach Network for Gene Drive Research participated in a presentation titled “Who keeps gene drive research safe? Engaging African researchers and experts in governance of gene drive research.” Gene drives have notable potential as an innovative



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Africa. The theme of this year's conference was, **“Empowering local institutions to set the agenda for the elimination of vector-borne diseases.”**

approach to controlling vector-borne diseases and invasive alien species. Recent policy developments, such as WHO's issuing of a position statement on genetically modified mosquitoes and discussions on synthetic biology under the Convention on Biological Diversity, will have significant effects on how research into these approaches is conducted, under what conditions, and by whom. Understanding these new public policy developments will therefore provide crucial context and insight into the medium-term development of new malaria

control technologies.

The symposium provided an accessible overview of relevant policy-making processes, explored how African stakeholders can be more involved, and help situate them with regards to the current state of gene drive research and ongoing debates about its potential impacts. It majored on insights of African scientists from local research institutions working to control vector-borne diseases, in accordance with the theme of the meeting. The objectives of the symposium included to introduce the current state of gene drive



research today, including potential applications of the technology and progress in developing them, to provide an overview of existing policy frameworks and ongoing policy processes and debates which will affect gene drive research, as well as the implications for combating malaria and other vector-borne diseases in Africa, and, to map out avenues for further engagement for those interested in this topic.

As the month of September draws to a close, as a consortium we reflect on the achievements and networks we have been able to form.

We anticipate that in the months to come we will be able to achieve so much more and as such, we are grateful for the opportunities we have had to either contribute and participate in activities related to biotechnology and more specifically, to the genetic biocontrol field.

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Gene drives have notable potential as an innovative approach to controlling vector-borne diseases and invasive alien species.





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