



WEBINAR Q&A

APMEN TECHTALKS

Hosted by the APMEN Vector Control Working Group (VCWG)

“More discussion on mosquito repellents and attractants”

9 February 2022, 2:00 PM Singapore Time

Panelists

Dr. Dani Lucas Barbosa

Researcher

University of Zurich

Dr. Chris Dae-Yun Kim

Postdoctoral research fellow

Kasetsart University Thailand

Thomas Putzer

Head

Base of the Pyramid Group, SC Johnson

Moderator

Dr Leo Braack

Co-Chair of APMEN Vector Control Working Group

Senior Vector Control Specialist, Malaria Consortium

Question:

Michael Macdonald	Can we distinguish what is "repellent" like PMD vs what is "masking" like DEET?
Daeyun Kim	As far as I know, repellent has two functions that contact and spatial irritancy as the chemical stimulates the insect's neurone by touching it on surface or air. It may cause knockdown or mortality.

	<p>Regarding masking, it covers the insect's outer sensory organs to block the odour molecule contact olfactory neurones inside the sensilar so that lost ability to find food or host for awhile.</p> <p>Differences between repellent and masking may can say that thr chemical harm the insects or not.</p>
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Duoquan Wang	How to use new products to improve LSM approach to reduce outdoor biting
Daeyun Kim	<p>Recently published paper gave us interesting fact that the mosquito larvae respiration is made by atmospheric gas exchange through siphon and dorsal tracheal trunks. In addition, the author newly found that there is another larval control potential using 'tracheal occlusion' to rupture inner organs. Please find this paper to get more information. It may provide another option to reduce outdoor transmission risk by reducing vector mosquito population.</p> <p>Nyberg and Muto 2020 Acoustic tracheal rupture provides insights into larval mosquito respiration</p>

Sudhakar Deshpande	Human blood groups play any role for human skin bacteria
	<p>Anjomruz, Mehdi, et al. "Preferential feeding success of laboratory reared <i>Anopheles stephensi</i> mosquitoes according to ABO blood group status." <i>Acta tropica</i> 140 (2014): 118-123.#</p> <p>https://doi.org/10.1016/j.actatropica.2014.08.012</p>

Tobgyel Tobgyel	Is there any comparable studies between human and animal on attractiveness of mosquitoes
Dani Lucas Barbosa	Yes, there a few also from Verhulst cited in Takken & Verhulst, <i>Ann. Rev. Ent.</i> 2013

Ferdinand Salazar	How about the effect of blood type on the attractiveness and on repellency to mosquito? Thanks
Dani Lucas Barbosa	No evidence that blood type matters as far as I know
Daeyun Kim	<p>Recently published paper</p> <p>Khan et al. 2021 Human blood type influences the host-seeking behavior and fecundity of the Asian malaria vector <i>Anopheles stephensi</i></p>

Lech Ignatowicz	To: Dani Lucas-Barbosa: How HA and PA results on landings/repel stack up against DEET?
Rinzin Namgay	Why researchers do not collaborate with perfume, beauty locations and incense stick manufacturer firms to share their active ingredients to incorporate in their products so that use of repellents will be wider in populations in malaria affected areas as well as avoiding biting nuisance.
	Some group of researchers did so, Rinzin Namgay. Please see this reference: Iikura, Hiroaki, et al. "Mosquito repellence induced by tarsal contact with hydrophobic liquids." <i>Scientific reports</i> 10.1 (2020): 1-12. https://doi.org/10.1038/s41598-020-71406-y

Emmanuel Forlack	What is the difference between body odour and body flavour?
Dani Lucas Barbosa	It has answered by Dr. Leo during the session.

Aulia Rahman	Apology if bit out of topic, but is it true that mosquito trap using UV light can attract mosquito over natural attractiveness to CO ₂ , body odors, or body heat? And do we have specific spectrum on it? Thank you.
Chris Dae-Yun Kim	<p>Thanks for your question. Commonly, 352nm (UV-A) is used for light traps, but quality of the light sources are vary depends on lamp production. My colleagues published scientific papers on the light sources recently. They compared various color and lamp types. Various wave lengths are also tested and soon will be published.</p> <p>Regarding your question that the efficacy of attraction, UV itself works well, but it calls non-target organisms as well. By adding CO₂, the UV light trap increased catching rate for <i>Anopheles</i> spp. And <i>Culex</i> spp. In the field outdoor. However, the heat and body odors may not that powerful than CO₂ as they have shorter distance to attract mosquitoes. However, the most important thing is location traps in right place to obtain numbers of mosquitoes.</p> <p>For more details, please see the papers below,</p> <p>Saeung et al. 2021 Transmitted light as attractant with mechanical traps for collecting nocturnal mosquitoes in urban Bangkok, Thailand</p> <p>Jhaiaun et al. 2021 Comparing light emitting diodes light traps for catching <i>Anopheles</i> mosquitoes in a forest setting, Western Thailand</p>

Jetsumon Sattabongkot Prachumsri	Do you expect to see different effect in different populations around the word to use your potential product?
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Dani Lucas Barbosa	It could be, there are some differences between rural and city populations when it comes to skin microbiota
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Tobgyel Tobgyel	This is very helpful to fight against border malaria??
Thomas Putzer	We believe so. We are leveraging personal repellents in the fight against cross-border transmission as part of the Great Lakes Malaria Initiative (GLMI) in East Africa.

jacques charlwood	Bacteria around the feet are especially attractive, why not test mosquitoes instead of hands in your tests?
Chris Dae-Yun Kim	Thanks for your suggestions, as far as I know, there are studies conducted using the feet, but again, species-specifically suitable blends with various proportions and ratios is the key. For that matter, we need to evaluate various candidates using various assays (e.g., HITSS, SFS, etc.).

Andre Laas	Can the bacteria that increase attractiveness somehow be used on "Targets" to attract mosquitoes to treated surfaces or traps etc?
Dani Lucas Barbosa	excellent idea, also a way to go

Mgeni Tambwe	What is exactly mean by body flavour?
Dani Lucas Barbosa	compounds that are perceived upon landing and confer taste; usually not volatile, so cannot be perceived from a distance

jacques charlwood	Are there differences between individual mosquitoes in their response to hosts that might be lost if you only use colonized insects?
Dani Lucas Barbosa	It may happened as there is

Aldillah Wulan	To Dr Dani: is there any effect between blood type and food consumption for skin microbiota composition that can repel mosquitoes?
Dani Lucas Barbosa	there are no evidence do far when it comes to blood type. Food yes, but our skin microbiota is very much conserved even with use of cosmetics. Our own skin microbiota remains as far we know

Jetsumon Sattabongkot Prachumsri	Then this will be a challenge to formulate any product in the future?? But the concept of your study is very interesting. Thank you for excellent talk.
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Chris Dae-Yun Kim	Thanks for your comments. As we have tools for the mosquito behavioural test assays in both laboratory and semi-field, we can test any kinds of lure candidates for each target mosquito species. However, as the process requires trials and errors, to develop effective lure, we need to invest long-term research plan on it. Once we successfully mixed the blends, it can be applied not only traps, but also baits for the non-blood fed females.,
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Jonathan Liew	Dr Kim, when the percent attraction is negative in value, does it mean it may have a repelling effect?
Chris Dae-Yun Kim	In semi-field assay, I compared two traps in a screened cell which are baited and unbaited. If the baited trap caught more number of mosquitoes compared to unbaited one, the percent attraction turns into positive value, vice-versa. In this case, the negative value may considered as less attractive or repelled but the lure would not show mosquito knockdown or mortality. However, I have observed knockdown and mortality or spatial repellency in smaller scaled HITSS assay with high dose of attractants. In other words, high concentration of attractant could repel mosquitoes and it results negative value of percent attraction in HITSS assay. It can be considered that CO ₂ with high flow rate also repel the mosquitoes.

Sudhakar Deshpande	Efficacy of these novel chemicals in the field condition and . how long it will last in the field condition.
Thomas Putzer	It primarily depends on the concentration of the active ingredient. For example 15% DEET lasts up to six hours, whereas 25% DEET lasts up to eight hours.

Dr. Roopa Rani Samal	Hello Dr. Kim, Myself Dr. Roopa Samal from India. I am working on ATSB technique. I wanted to know what kind of trap can be used for <i>Aedes aegypti</i> ?
Chris Dae-Yun Kim	Hi, Dr. Roopa. I have interested in ATSB as well. Hope that I can talk with you later by email, daeyun.k@ku.th As <i>Ae. aegypti</i> is diurnal species, BGS trap showed better performance than light traps.

shahid Majeed	Thanks Kim for sharing interesting results. would you elaborate which source did you sort out for the release of CO ₂ and which concentration is mosquito effective.
Chris Dae-Yun Kim	Thanks for your kind words. I used a CO ₂ gas tank with 250 ml/min. flow rate and it resulted significantly enhanced trap efficacy from semi-field study. The flow rate sourced from previous studies, for example, Mullens and Gerry 1998 which observed various CO ₂ release rates.

Amulya Prasad S R	To Dr Dani. Is there risk factor from the metabolites of microbes when increase the diversity of microbes on skin,
Dani Lucas Barbosa	Our own skin microbiota seems to be well conserved, veen with cosmetics our own skin microbiota seems to come back as it is in the lower epithelial layers. The metabolites themselves are naturally produced by the bacteria already present in our skin. When it comes to bioengineering bacteria, we plan to use compounds that are already naturally produced by skin bacteria or plants.

Lech Ignatowicz	To Thomas Putzer: How do you deal with the situation when only part of the community can afford repellents and mosquitoes are “pushed” to the other, non-protected members?
Thomas Putzer	live answered

Dahlia Lidia Silitonga	To Sir Thomas: What do you mean mosquitoes ingredient levels in repellents used? is it transfluthrin more effective in Baygon, Sir?
Thomas Putzer	I believe this was referencing the concentration of the active ingredient in personal repellents. For example 15% DEET lasts up to six hours, whereas 25% DEET lasts up to eight hours. We leverage transfluthrin in some of our spatial repellents, and the amount and rate of emanation impact efficacy and duration.

Aldillah Wulan	To Thomas Putzer: We sometimes don’t believe on some type of mosquito repellents can really repel mosquitoes even if a company advertised them well (because it's only advertisement). But some groups of people do need them to protect themselves (in forest for example). Some of them also don't have access to get the repellent (because it's costly). Do you have any comments on this?
Thomas Putzer	<p>You’re not alone – I’m often skeptical of many companies and advertisements in general. I will say that all of SC Johnson’s advertisements and claims (along with those of our industry peers) are typically substantiated by lab and/or clinical testing and data.</p> <p>We definitely recognize access and cost as primary barriers to repellent uptake. We are working with a number of partners on securing policy recommendation for spatial and personal repellents, which will help enable distribution and funding through global public health channels. And we are also doing our best to provide these at minimal to no cost, without disrupting the commercial markets of ourselves and our industry peers. Ultimately we want to take an approach that is economically sustainable for those in this space (distributors, community health workers, industry peers, etc.).</p>

Dr S N Sharma	Do we have any data on the repellent resistance being used earlier in the program?
Muhammad Ajmal Khan	it will be more feasible if we develop a common for Dengue, Malaria and leishmania

Sheila Ogoma	Great presentation Thomas: Do you see preferences for specific types perhaps a preference for topical repellents over spatial repellents?
Thomas Putzer	Personally, I think there is space for both personal and spatial repellents. Of course, I would say that. 😊 I think it just depends on the situation – if I am moving a lot as opposed to sitting in one space, I would go for personal repellents. If I'm relatively still, I would go for spatial repellents – the technology is advancing to the point where many people can be protected within one space over a long duration of time (6+ months), which improves the cost effectiveness greatly

Lisa Ismail	Hi Mr Thomas, is there effective period for the repellents if the packaging is not opened or used yet? any side effect if past certain manufacturing date? Thanks
Thomas Putzer	It depends – we typically conduct storage and stability testing in multiple temperature and humidity situations for up to two years. So officially as long as the product is within that two year period from the manufacturing date it should be ok. This all depends on environmental and other conditions of course.

Myint Oo	To Dr. Thomas; I would like to ask if repellents causing what extent of environmental contamination?
Thomas Putzer	This is difficult to truly quantify, but I can say that a key focus of SC Johnson is addressing plastic waste. For example, we use ocean-bound plastic in many of our products, and partner with Plastic Bank to repurpose plastic waste. You can read more about our efforts to address this here: A More Sustainable World (scjohnson.com)

Yangya Prasad Nathsharma	Dani..... is there any evidence of different skin colour and mosquito attraction?????
Dani Lucas Barbosa	

shahid Majeed	Thanks Dani, did you managed to examine the effect of reengineered biota on human skin?
Dani Lucas Barbosa	not yet, we are testing it in vitro at the moment

shahid Majeed	dani, are you planning to collect biota from different countries, if so let me know i am from Pakistan and i have insect chemical ecology laboratory working specifically on VOC, behaviour studies and electrophysiology.
Dani Lucas Barbosa	

Maude Meier	Would like all three speakers to comment/answer: What do all three of you think will be the next innovation (based on current research) in malaria and mosquito vectored diseases, will become available for consumer use? We really need innovations that work, to reach consumers. How soon, what will be next in your estimation?
Dani Lucas Barbosa	5 years at least I expect
Thomas Putzer	(Tom P) Completely agree, Maude. My hope is that the work you started to create a new class of intervention for global public health (spatial repellents) will become reality within the next three years.

Mohammad Oshaghi	Is there any ethical issue/s against using engineered bacteria as repellent?
Dani Lucas Barbosa	That depends on the country. We have been working on biosafety level 1 with the selected skin bacteria-

Winifrida Mponzi	did you test with aedes?
Daeyun Kim	Yes.

Dr. Deeparani Prabhu	Very interesting presentations by all the three speakers. Myself Dr. Deeparani Prabhu my question is to Dr. Thomas Sir how can we bridge the gap between the availability of repellents or protectants to the masses rather than limited few. Are any efforts towards low cost repellents in the pipeline?
Thomas Putzer	We definitely recognize access and cost as primary barriers to repellent uptake. We are working with a number of partners on securing policy recommendation for spatial and personal repellents, which will help enable distribution and funding through global public health channels. And we are also doing our best to provide these at minimal to no cost, without disrupting the commercial markets of ourselves and our industry peers. Ultimately we want to take an approach that is economically sustainable for those in this space (distributors, community health workers, industry peers, etc.).

jacques charlwood	Is there not a way that already available repellents can be available for long periods? Repellents are only needed for a few hours a day. Chris Curtis suggested producing treated anklets that could be used for a few hours and then put back in a container (tin) and then reused for several days. Something along these lines might be useful.
Dani Lucas Barbosa	There is a product that user can control highly volatile pyrethroids active ingredient emanating from impregnated film by closing cartridge.

shahid Majeed	Great. because in later stages a Biosafety issue will come up.

Win Han Oo	Actually, equity in repellent distribution is an issue. Currently, repellent is not in the WHO guideline. Therefore, international donors do not allow to procure repellent with their budget. So, people can't get repellent FOC. Actually, I have run an effectiveness trial in Myanmar for repellent in 2015 -16. It showed that using repellent reduced malaria cases approximately 1/3 at community level. https://pubmed.ncbi.nlm.nih.gov/32817632/
	Developing resistance to repellent with time is another factor.

Myo Min	Dear Dr Dani, do you think gametocytes can attract mosquito? Thanks
Dani Lucas Barbosa	Yes, please see A key malaria metabolite modulates vector blood seeking, feeding, and susceptibility to infection. Emami SN, Lindberg BG, Hua S, Hill SR, Mozuraitis R, Lehmann P, Birgersson G, Borg-Karlson AK, Ignell R, Faye I. Science. 2017 Mar 10;355(6329):1076-1080. doi: 10.1126/science.aah4563. Epub 2017 Feb 9. PMID: 28183997

Aldillah Wulan	To Dr Dani: (I joined late during your presentation, sorry). I saw that your study with 119 individuals used hand part only. Is there any different abundance and composition of microbiota on face, hands, and feet. While we usually use repellent on hands and feet then what if microbiome on face is not attractive for mosquitoes, what do you think?
Dani Lucas Barbosa	There are mostly quantitative differences. So some bacteria species that are more abundant in feet might less abundant in hands or face.

Dr Susanta Kumar Ghosh	I am in favour of lure and kill concept. Repellents actually drive the mosquitoes away. Which attractants are best for ovitraps?
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Chris Dae-Yun Kim	<p>One of my former lab. Mate in USM found that, 'caproic acid (at 1 ppm) extracted from <i>Ae. aegypti</i> eggs (oviposition pheromone) attracted significantly more egg-laying mosquitoes'.</p> <p>Ong and Jaal 2015 Investigation of mosquito oviposition pheromone as lethal lure for the control of <i>Aedes aegypti</i></p>
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Maxine Whittaker	<p>Outdoor biting of people working away/sleeping and outside homes and villages is the tricky one. As one moves towards elimination preventing one person from malaria - will break some transmission when they move into receptive but "eliminated" environs</p> <p>Thanks for your comment.</p>
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Chat Box

Duoquan Wang	<p>how to update or improve the LSM strategy to reduce outdoor biting</p> <p>Answered above.</p>
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Mgeni Tambwe	<p>What do you refer to "body flavour" as mosquitoes attractants?</p>
Dani Lucas Barbosa	<p>Flavour refers to taste, so compounds that can be perceived after landing or contact with skin</p>

shahid Majeed	<p>Thanks Dani, did you managed to examine the effect of reengineered biota on human skin?</p>
Dani Lucas Barbosa	<p>Not yet, we are testing them in vitro at the moment</p>

Michael Okal	<p>Nice presentation, Dani. Niels and I worked in Kenya many years ago looking at mosquito attractions to different odours. He focused on feet bacteria. It's nice to see this still going on!</p>
Dani Lucas Barbosa	<p>Very nice to read this! I sent a photo of your message to him</p>

Muhammad Ajmal Khan	<p>my Question regarding VBDs including Dengue , Lesihmana and malaria and CCHF we need one thing to repel vector which is too inexpensive for poor community</p> <p>Agree.</p>
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Mohammad Oshaghi	<p>We have tested ABO groups and found AB group is more attractive to <i>An. stephensi</i>. please see Acta Trop. 2014 Dec;140:118-23.</p>
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	doi: 10.1016/j.actatropica.2014.08.012. Epub 2014 Aug 21. Preferential feeding success of laboratory reared Anopheles stephensi mosquitoes according to ABO blood group status Mehdi Anjomruz 1 , Mohammad A Oshaghi 2 , Ali A Pourfatollah 3 , Mohammad M Sedaghat 1 , Ahmad Raeisi 1 , Hassan Vatandoost 1 , Ali Khamesipour 4 , Mohammad R Abai 1 , Fatemeh Mohtarami 1 , Kamran Akbarzadeh 1 , Fatemeh Rafie 1 , Mahdiyeh Besharati 1 Affiliations PMID: 25151045 DOI: 10.1016/j.actatropica.2014.08.012 Abstract: Recent epidemiological evidences revealed a higher rate of O blood group in the residents of malaria-endemic areas suggesting that groups A, B, and AB associated with a higher disease severity and fatality. Also recent data showed the low prevalence of AB group within the malaria-endemic residents in south of Iran and India. The aim of this study was to determine the ABO
	Great.

Gérard Niyondik	WHO recommended repellent more useful for people living out of their home like refugees immigrant and displaced families
	Yes.

Maude Meier	There is no silver bullet, no single magical method or product. We must take an integrated approach with all available tools puts to use. Community disease reduction, can only happen with a community approach to disease intervention. Many facets - bite prevention, vector elimination, access to medical services plus, plus, plus
Dani Lucas Barbosa	I agree

MICHAEL AUDU	My Question on repellent is about the development of resistance with usage overtime, how can this be addressed
Dani Lucas Barbosa	Using blends rather than single compounds in my view

Muhammad Ajmal Khan	through temperature, CO2 and 40 chemicals released from the body they attract the body.
	Yes.