ISSN 2376-9343

OPEN ACCESS

Jacobs Journal of Microbiology & Pathology

Review Article

A Novel Transgenic Approach to Combat Malaria

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Received Date: 07-03-2019

Accepted Date: 07-15-2019

Published Date: 07-20-2019

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Introduction

A Fungal Species Metarhizium anisopliae is a genetically engineered fungus who carries a human anti malaria antibody which is highly effective for killing malaria. This is natural malaria killer species.

To make this species more effective for killing malaria researchers engineered a gene which derived from a spider. This trail is designed to reduce the population of malaria spreading mosquito.

According to a research published in 31st May 2019 by a group of scientist from Mary Land University they have a study regarding the approach of a transgenic killing malaria out side of the laboratory and they have observed that that the transgenic fungus delivered its toxin substance to kill malaria mosquito reduced its 90% of population in West Africa village.

Brian Lovett, a graduate student in UMD's Department of Entomology they demonstrate that fungus is a natural killing pathogen which kills the insects very slowly, this procedure already has been used for killing insects and pests. They use a strain specific to the mosquito and engineered it make more toxin which kill mosquito more rapidly they can breed. They have observed that they have reduces their population with in two generation.

The toxin which is engineered is derived from venom of the Australian Blue Mountains funnel-web spider and it has been approved by Environmental Protection Agency (EPA) for directly used on agricultural farm for killing the insects and pests. They applied the transgenic fungus to the wall in mosquito populated area to kill mosquito within 45 days.

According to a researcher Lovett, only few species of malaria are response to this treatment but not all the species. They modified and hybrid the species Metarhizium pingshaense.

They used a standard method, they employs a bacterium to intentionally transfer DNA into fungi. They design and introduced the DNA to fungi provided with blue print for making it hybrid with a controlling switch capacity of toxins.

The control switch is a copy of a DNA code of the modified fungus. It build a defence shell and hide it self from insects immune system. It only makes the effort to build the shell when it detects any proper surrounding.

The scientist are ensure that the fungus are only produces toxin inside the body of a fungus and it was not harmful to the beneficial species like honey bee [1-8].

A Trial in West Africa

According to Rich Haridy et al the genetically modified fungus are designed for safely reduce the population of malaria mosquito. The trail was made 1st Time in out side of the laboratory in a village environment in Burkina Faso, West Africa the aim of this trial is to reduce the population of malaria mosquito with in few days.

A New trail test in malaria epidemic area of West Africa A structure in (Figure 1)

- 3 Huts with 3 different simulated scenarios. 1st Hut Contain no Fungi, 2nd Hut Contain non engineered Fungi, and 3rd One contains genetically engineered fungi.
- Each hut 1000 adult and 500 female mosquitoes were released and they continuously count the no of mosquitoes in the hut .and after45 days they observed that only 13 adult mosquitoes are alive with transgenic fungus which is not sufficient to breed ,and 455 mosquitoes in the hut when the no of mosquitoes in non fungus is 1396 [9,10].

Figure 1: A Trail in West Africa.

Interaction of Transgenic Fungus Killed Malaria Mosquito

A current research is going on preventing malaria by killing the mosquito or they will make the immune system prevent from the diseases [6]. Metarhizium anisopliae infects through their cuticle and enter the immune system; they took the DNA from Metarhizium an isopliae add several genes like SM1, to make a protein which prevents protests from entering mosquito salivary gland .at time of mosquito bite the malarial causing cell transfer from the salivary gland of mosquito. Another gene expressed the protein scorpine which is antimicrobial which is naturally produced from Venom .The genetically altered fungi carrying (SM1)8.

Weiguo Fang et .al. infects mosquito through the cuticle and proliferate in the hem lymph ,to allow the strain to combat malaria in mosquitoes with advance malaria infection the produced a recombinant strain expressing molecules that targeted sporozoites and they travel through the hemolymph to the salivary glands.

After 11 days plasmodium infected with blood meal ,mosquito were treated with Manisopliae expressing salivary gland and a Mid gut peptide 1(SM1)which blocks attachment of sporozites to salivary glands and a single chain peptide antibody that agglutinate of sporozoites or scorpion which is antimicrobial toxin .

These reduced sporozite counts by 71%, 85%, and 90% respectively Manisopliae expressing scorpine and (SM1)8, scorpine fusion protein reduced sporozoite counts by 98% suggesting that Metarhizum –mediated inhibition of plasmodium development could be a powerful weapon for combating malaria

Preventive Measures to Combat Malaria

Malaria occur mostly in poor tropical areas Africa is most affected area because of

- Efficient no of mosquitoes are responsible for transmission.

- Presence of predominant species Plasmodium falciparum, which is main cause of malaria and people death.
- Local weather which is suitable transmission of diseases.
- Lack of sources for malaria control activity and lack of fund for malaria cure.

According to Mamie T Coats the name malaria was already coined at earliest time but in this 21st Centurie rename and only the reason for morbidity and mortality. According to the statistics of WHO there were 214 million cases of malaria 438000 in 2015 [8].

Malaria is transmitted by Anopheles mosquito, its efficiency and population increase in a favourable climate like sub-Saharan Africa, this is the reason in which most of the people are suffer from malaria due the lack of adequate infrastructure to protect the disease and protect the mortality rate [9-12].

Vector control is main reason for prevention of malaria particularly in South Africa where the cause of infant death very high.

Use of insecticide for different methods and used of bed nets is the best procedure to reduce the rate of child morbidity and mortality.

Vector control is capable because of use of insecticides and bed nets, and residual spraying. A gropu survey for examine the benefit of National Malaria Control Program in Angola. They observed that after using the bed nets it control the predominant method of mosquito.

Causes of Malaria

According to Darla Burke Malaria is a life threatening disease transmitted by Anopheles mosquito. It carry the plasmodium parasite, it enters to the blood stream while mosquito bites .it directly enters to the Liver to mature their cell and the mature cell enters to the blood stream and infected the Red blood Cells. Within 48 to 72 hrs. The infected parasite multiply itself increases the no of cells and it brust and come out side.it infected the Red Blood Cells to cause malaria.

According World Health Organization (who) malaria most probably found in sub topical climate where the parasite can survive [12-14].

According to NHS malaria caused by plasmodium parasite .it spread through by the bite of mosquitoes. There are 5 types of parasite which causes malaria i.e Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, Plasmodium knowlesi [15].

The plasmodium parasite spread by female Anopheles mosquitoes which is also known as night biting they mostly bite Dusk and Down, if the mosquito bite a person which is already infected with malaria it can also infected and spread the parasite by a person to another person [16].

Once mosquito bite a person it enters the parasite to the blood stream and travels to the liver. The infection develops in the liver and re-enter to the Red Blood Cells. And it occupies the Red Blood Cells. The parasite grows and multiply itself and the infected cell burst and release more parasites in to the blood, they used to brust each and Every 48 to 72 hrs. So each time the cells brust the patient causes chills and Sweating. Malaria also caused by the blood transfusion by sharing the needles but in very rare case.

Symptoms of Malaria

Symptoms of Malaria developed with in after 7 days a person is bitten by an infected mosquito. The time between when the parasite stared infected to shows the symptoms cause incubation period it will take 7 -8 days depending on the parasite. Some time it will take to occur the symptoms [17].

Initial symptoms of Malaria:

- Body Temperature increases up to 38C.
- Headache
- Vomiting
- Muscle Pain
- Diarrhoea
- Generally Feeling Unwell

The most serious type of malaria is caused by plasmodium Plasmodium falciparum parasite, without proper treatment it may causes so many complications [18].

Darla Burke et al the symptoms of malaria develop within 10 days to 4 week depend upon the infection. Some malaria parasite can enter the body and dormant for a long period of time. According to Peter Lam doctor deliver 2 type o malaria Uncomplicated and Complicated malaria.

Complication on Malaria

According to NHS malaria is serious illness it may cause death the person in improper diagnosis and Treatment. The parasite causes the sever malaria symptoms and death.in some rare case the malaria can affect the brain which is called cerebral malaria and it causes brain damage and some time it cause for coma [19].

According to **Darla Burke et.al. Malaria has life** threatening complications:

- Cerebral malaria
- Breathing Problem
- Kidney and Liver Disease
- Low Blood Sugar

Treatment of Malaria

According to Francesco C et al. malaria still claims as most threating and is the main cause for increases the mortality rate in rural area.

The in proper sequential use of drug mono therapy in the past facilitated the spread of drug resistance P.falciparum, and to a lesser extend P. vivax.

The diagnosis and treatment of Plasmodium vivax and P.falciparumi is different from their fundamentally important ways.

According to Katharine A et.al Plasmodium vivax and P.falciparumi infection causes malaria A rapid diagnostic tests need to distinguish which species is causing the symptoms in patients. The technique RTD_S incorporated to distinguish malaria is causing by P.falciparumi or other plasmodium species. These RDTS are distinguish as antibodies wise Type 2 RDTS use HRP-2 which is for P.falciparumi and aldolase for all species ,Type 3RTDS use HRP-2for P.falciparumi, and pLDH for all the species. Type 4 use pLDH is for plasmodium species and pLDH for all the species.

The Treatment of malaria depends on many factors like severity, depends upon the species or malaria parasite which cause the infection and the locality and environmental condition in which the infection occur.

And it also depends on the other factor like age, weight, and Pregnancy factor of that particular infected person.

Prevention

"Prevention is better than cure"

There is a risk if some one traveling on a malaria affected are, then we must be have take some precautions to prevent the disease. It can be prevented by approach ABCD.

- Awareness of risk: Need to check if you are at risk or malaria or not.
- Bit Prevention: Avoid mosquito bite, Use spray, Cover Your arm and legs, use mosquito Coils and mosquito nets.

- Check whether: You need to take malaria prevention tablets. Make sure that you have the right antimalarial capsules and right dose and finish the dose with in its limited time.
- Diagnosis: If you feel seek any time then immediate take a doctor advice

Conclusion

The article concluded that suggest that the introduction of one transgene beneath the management of a native flora promoter considerably will increase each the efficaciousness and therefore the relevance of flora entomopathogens for protozoal infection vector management, justifying more development of transgenic entomopathogenic fungi for open field application.

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