FACTS ABOUT MOSQUITOES.

*Mosquitoes are common vector insect that carry disease causing virus and parasites from person to person without necessarily infecting themselves.

*Mosquitoes go through four stages in their life circle. These include: **egg, larva, pupa** and **imago** (ADULT).The first three stages last 5-14 days. The **imago** emerges from the **pupa** and last about 2 - 4 weeks in nature.

*3500 species of mosquitoes are estimated to exist in the world.

*There are known to be three main type classifications of mosquito borne-diseases; **protozoa, helminthiasis** and **virus.**

***Those species from the **helminthiasis** class can carry **filariasis** worm that causes **elephantiasis** known to be affecting about 40 million world wide.

Aedes spp.* mosquitoes are of the virus class that carries **Yellow fever, Dengue,** and **Chikungunya**.

Culex spp.* mosquitoes are the main vectors of **West Nile** and **Rift Valley Fever**.

*In some species of mosquitoes, the female (**Anopheles**) feed on humans and thus acts as vector for a number of infectious disease affecting people annually.

The mosquito genus **Anopheles** is of **protozoa** type that carries the malaria parasite (**plasmodium**) when infected by previous blood meal.

*Worldwide, MALARIA causes an estimated one million deaths annually and 90% of these deaths occur among young children in Sub-Saharan Africa, which Ghana is included.

*Malaria affects 109 countries word wide , 30 in Sub-Saharan Africa.

*Kills one child in every 30 seconds and about 3000 children in every day in Africa.

*Puts 3.3 billion (half) of the world population at risk of death.

*In Ghana, Malaria is a hyper endemic disease accounting for over 40% of Out –Patients clinic .

For children under 5 years, malaria accounts for about 60% of admission and 18% of deaths. It is responsible for 13% of maternal admission and 9% of maternal deaths.

*Between 1-2 % of Gross Domestic Product is spent on malaria and also accounts for 9,7% of per capital government expenditure. The economic implication of malaria is , therefore , enormous.

GLOBAL ECONOMIC COST OF MOSQUITOES CAUSING MALARIA.

***Direct $ 12 billion per year in direct losses;**

***Lost 1,3% of GDP growth annually for Africa;**

***530 million GBP, direct loss to Nigeria economy alone;**

***About 40% of public health spending in Sub-Saharan Africa;**

***20-50% of inpatients admission;**

***Up to 50% of out-patients visits;**

***Over 10% of yearly spending in Africa in an average household;**

***Direct costs $ 0,41 in Malawi, $ 7,38 in Ghana to average household;**

***2010 estimated $ 6,180 billion to tackle malaria world wide;**

***2011-2020 $ 5,126 billion (average) to tackle malaria;**

CHEMICALS AND EQUIPMENT

CHEMICALS

Larvicide

***Temephos;**

***Diflubenzuron;**

***Bacillus thungeliensis iraeliensis (biological agent).**

Adulticide

***Cypermethrin;**

***Alpha-Cypermethrin;**

***Deltamethrin;**

***Lambda-Cyhalothrin;**

***Cyphenothrin;**

***Pyrethrum (natural extract of *Chrystanthemum cinearіaefolium*).**

EQUIPMENT USED

Larval control

***Manual pomp mod. Swissmex (18 liters);**

***Manual pomp mod. Flox 10 (10 liters);**

***Cart sprayer nebulizer mod. Minijet (70 - 100 liters).**

Indoor Residual Spraying and Insecticide Treatment Nets

***Manual pomp mod. Swissmex (7 liters);**

***Manual pomp mod. Gloria 410 T (10 liters).**

Adult control

***Spray nozzle mod. Copyrmate Silver;**

***Small nebulizer mod. Hurricane Ultra;**

***Shot spray machine mod. Super Jolly 2002 (13 liter);**

***Nebulizer installed on pick-up (Tifone Citizen mod. DA29 K-300).**

Others

***Runneling machine;**

***Attractive traps mod. BG Sentinel.**

Malaria: Past and Present

History of Malaria

Malaria parasites have been with us since the dawn of time. They probably originated in Africa (along with mankind), and fossils of mosquitoes up to 30 million years old, show that the malaria vector, the malaria mosquito, was present well before the earliest history. Hippocrates, a physician born in ancient Greece, today regarded as the "Father of Medicine", was the first to describe the manifestations of the disease, and relate them to the time of year and to where the patients lived. Before this, the supernatural was blamed. The association with stagnant waters (breeding grounds for the Anopheles mosquito) led the Romans to begin drainage programs, the first intervention against malaria.

The first recorded treatment dates back to 1600, when the bitter bark of the Cinchona tree in Peru was used by the native Peruvian Indians. By 1649, the bark was available in England, as "Jesuits powder," so that those suffering from "agues" might benefit from the chemical substance quinine, which it contained. Not until 1889 was the protozoal (single celled parasite) cause of malaria discovered by Alphonse Laveran working in Algeria, and only in 1897 was the Anopheles mosquito demonstrated to be the vector for the disease by Ronald Ross.

Discovery of Malaria Agent - Alphonse Laveran

When Alphonse Laveran, in 1879, began his research at the military hospital of Bône in Algeria, he only set himself the task of explaining the role of the particles of black pigment found in the blood of people suffering from malaria. After 1850, when these particles, called melanins, were discovered, methods had been discussed in determining whether they were only to be found in patients suffering from malaria, or were present in other diseases as well. Laveran first set about solving this problem, which was particularly important to the diagnosis of malaria. During his investigations, Laveran not only found the particles he had been looking for: he also found some entirely unknown bodies with certain characteristics which led him to suppose that parasites were involved. His initial investigations were carried out on fresh blood without using chemical reactions or any staining process. He was nonetheless successful, using this primitive method of examination, in distinguishing and describing most of the more important forms adopted by these new bodies, which varied so much in their appearance.

In 1882, he moved the scene of his investigations for a while to the dangerous marshy regions of Italy. There he again found the same bodies in the blood of people suffering from marsh fever, and his hope of having found the malarial parasite became a certainty. Laveran published his first great work on these parasites, *Traité des fièvres palustres*, in 1884. In this, he drew on 480 examined cases of malaria. This work is the foundation on which subsequent investigations of marsh fever are based. Laveran showed that the parasites, during their development in the red blood corpuscles, destroy them; and the red pigment in the corpuscles is changed into the melanin particles mentioned above. He described all the main forms, even those which have subsequently been found to be different developmental phases of the parasite.

Continuing his work, Laveran concerned himself in the first place with the important problem of the existence of these parasites outside the patient's body. To this end, he examined the water, soil, and air of the marshlands, hoping to find the parasite. His perseverance was unrewarded. We should not, however, fail to recognize the merit of this work, despite its negative outcome, since it has fundamentally aided subsequent research. As far as Laveran was concerned, these apparently fruitless investigations led him to the conclusions which he expressed in the book of 1884, and had also maintained on a number of occasions, such as the Congress of Hygiene at Budapest (1894): that the marsh fever parasite must undergo one phase of its development in mosquitoes, and be inoculated into humans by their bites. When Laveran was recalled from Algeria to Paris, and thus forced to interrupt his work on malaria, he had already clearly formulated the problems that had first to be solved in this field.

Malaria Transmission - Ronald Ross

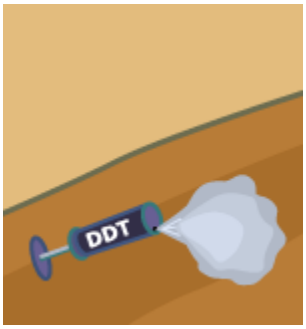
It was the army surgeon, Ronald Ross, who undertook the experimental testing of the mosquito-theory, proposed by both Laveran and the investigator, Patrick Manson. The solution came from India, while Ross was commissioned in the Indian Medical Service, and in the late 1890s the mosquito hypothesis could be established.

Critically arranging his experiments, he caused mosquitoes that were hatched from larvae in the laboratory, to bite malarious patients, and endeavored to follow the parasite in the body of the mosquitoes. The results of the first two years' labor, although assiduous and scrupulous, gave little promise of success. But in August 1897, all at once he made vast progress towards his aim. While experimenting with another, less common species of mosquito, in the wall of its stomach he found bodies that very probably were an evolutionary stage of the human malarial parasite.

Ross, being prevented by circumstances from pursuing his plan in studying the malarial parasite of man, continued his work with an allied malarial parasite of birds. The result was that not only could he confirm his discovery concerning human malaria, as he found corresponding facts for avian malaria, but he also, in a short time, succeeded in revealing the further development of the avian malarial parasite in the body of the mosquito.

Ross's discoveries into malaria were immediately followed by a series of important works. Giovanni Battista Grassi, Robert Koch - the Nobel Prize Laureate in Physiology or Medicine, 1905 and many others, issued many valuable works which not only enlarged the understanding of malaria, but also

supplied useful knowledge and understanding in the combat against and prevention of the malaria disease.



Malaria Control Operation

The discovery of the insecticide DDT in 1942, by Paul Müller the Nobel Prize Laureate in Physiology or Medicine, 1948, and its first use in Italy in 1944, made the idea of global eradication of malaria seem possible. Subsequently, widespread systematic control measures such as spraying with DDT, coating marshes with paraffin (to kill Anopheles mosquito larvae), draining stagnant water, and the widespread use of nets and cheap, effective drugs such as chloroquine were implemented - with impressive results. Despite initial success, there was a complete failure to eradicate malaria in many countries due to a number of factors. Although technical difficulties such as mosquito and parasite drug resistance have played a part, the main failure to reduce the disease is probably due to social and political factors preventing efficient application of control measures.

Despite the setbacks, up until 1969, when the global eradication policy was finally abandoned, the following European countries had managed to completely eradicate endemic malaria by interrupting transmission: Hungary, Bulgaria, Romania, Yugoslavia, Spain, Poland, Italy, Netherlands and Portugal.

From the early 1970s, the malaria situation has slowly and progressively deteriorated and reduced control measures between 1972 and 1976, due to financial constraints, led to a massive 2-3 fold increases in cases globally. Spraying never truly eradicated the mosquitoes anywhere, and the reduction in the more persistent *P. vivax* infections were much less than for *P. falciparum* - though the latter

returned in much greater strength as control measures waned. The growing interchange of populations between countries where malaria is prevalent and malaria free countries is responsible for the continuous increase in the number of imported malaria cases in European countries, and causes serious concern because of possible epidemic focal resurgence in receptive areas such as the Mediterranean. Since 1976, several new pockets of malaria transmission have evolved, and a WHO 1980 report recommended that countries which had become non-malarious should maintain at least one malaria vigilance unit.

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