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Study shows malaria parasites can adapt to harsh conditions

By Shipra Prakash

10 June 2008 [MEDIAGLOBAL]: A study published by the journal Nature reveals that malaria parasites are more sophisticated than originally thought because they can adapt to harsh conditions.

According to the World Health Organization (WHO), 40 percent of the world's population, most of which live in developing countries, are at risk of malaria. Although most cases of malaria are in sub-Saharan Africa, much of the world, including Asia, Latin America, the Middle East and parts of Europe are also affected.

In order to transmit malaria, the parasites that cause it have to produce offspring. While a mosquito bites, parasites pass into the mosquito through infected blood and then have 20 minutes to reproduce.

"Parasites make their males and females during their infections in hosts such as humans and mice, and these sexual parasites can only mate when they are taken up by a mosquito," Dr. Sarah Reece, from the University of Edinburgh's School of Biological Sciences and the leading author of the study, said in an interview with **MediaGlobal**.

The parasite offspring then moves to the mouth of the mosquito and gets injected into a person through its saliva when the mosquito takes its next meal.

The Edinburgh University scientists who authored the study found that malaria parasites ensure their survival by producing more males than females in certain situations, which shows that they are able to respond to changes in their environment.

Usually malaria parasites produce more female babies because the females are expected to find a mate. However, in harsh conditions, parasites produce more male offspring because then there is more chance that their genes will be passed on.

"We looked at how parasites should adjust the ratio of male to female parasites to maximize their chances of successful matings. Parasites make more males when they are likely to be able to mate with unrelated females, and when their mating environment is likely to be unfavorable due to harsh conditions," Reece explained.

One such harsh condition is when parasites are under attack by a human's immune system. In this circumstance, more males are produced.

"Some immune factors will reduce the ability of males to mate but not really affect the ability of females to be mated. So, if males are suffering more than females, the best plan for parasites is to produce extra males to compensate," Reece said.

According to WHO, malaria and HIV are among the world's biggest health problems and those who are infected with HIV are at increased risk of malaria.

Yazoume Ye, an Associate Research Scientist at the African Population and Health Research Center Inc., echoed this fact. "An adult with HIV has their immune system depressed, so can get malaria," he told MediaGlobal.

The Roll Back Malaria Partnership (RBM) was launched in 1998 by WHO, the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP) and the World Bank.

RBM's aim is to achieve the malaria-related Millennium Development Goals (MDGs) by 2015. But the findings of the Edinburgh University scientists' study suggest that the initiative may face unforeseen challenges.

The fact that parasites can respond to changes in their environment "means that they are making decisions when living in their hosts to maximize their ability to infect mosquitoes," Reece said. "And this level of sophisticated behavior is the sort of thing we normally associate with 'big' animals like birds, mammals, and insects."

This may account for the limited effectiveness of malaria medication.

“The continued existence of malaria is not due to a single process but is due to developing resistance to vaccines, a lack of an effective vaccine, decreased use of insecticides, and resistance to insecticides,” Stephen Gluckman, Professor of Medicine and Director of Infectious Disease Clinical Services at the University of Pennsylvania, told **MediaGlobal**.

But Pru Smith, a spokesperson for RBM, maintains that the problem is not medicine-related.

“Artemisinin-based Combination Therapies (ACT’s) is the most effective medicine against malaria. Because it has a combination of different elements, it is more difficult for parasites to resist,” she told **MediaGlobal**.

Getting ACT’s to the people who need them is the challenge. “The problem is how to get ACT’s to people, as they can be expensive,” Smith said. “There should be funding and assistance on the ground.”

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