

**Conversation between Dr. Christian Lengeler
(Swiss Tropical and Public Health Institute) and Elie Hassenfeld (GiveWell), August 21, 2012**

Note: This is a set of summary notes compiled by GiveWell in order to give an overview of the major points made by Dr. Lengeler in the conversation.

Summary

Because we were approached about the possibility of funding a research project on malaria resistance, we spoke with Dr. Lengeler for his view on the needs for funding all types of malaria research.

Dr. Lengeler described five major areas in malaria research (new drugs for treatment, diagnostic tools, a malaria vaccine, developing new insecticides and vector control tools, and research on insecticide resistance). In his view the first 4 are reasonably well funded but the last one – research on insecticide resistance – is underfunded.

He also mentioned that the Malaria Eradication Research Agenda (malERA) initiative focuses on the question of which malaria research questions are most pressing, and he recommended that GiveWell review its materials.

Among other things, Dr. Lengeler is an author of the Cochrane review of the effectiveness of long-lasting insecticide-treated bednets which GiveWell cites in our page on this program (<http://givewell.org/international/technical/programs/insecticide-treated-nets>).

Funding in different areas of malaria control research

There is significant funding in:

1. **The development of new drugs for malaria treatment and transmission control.** This is facilitated in large part by Medicines for Malaria Venture (MMV).
2. **The development of tools to diagnose malaria rapidly and accurately.** This is facilitated in large part by an organization called Foundation for Innovative New Diagnostics (FIND).
3. **The development of a vaccine to prevent malaria.** This is largely funded by the Gates Foundation and led by PATH's Malaria Vaccine Initiative.
4. **The development of new insecticides and vector control tools.** This is facilitated in large part by an organization called Innovative Vector Control Consortium (IVCC).

The private sector sometimes does work on malaria control product development even when there aren't good prospects for directly profiting off of it. GlaxoSmithKline's work on a malaria vaccine is a case in point.

In other cases, the private sector works on malaria control products with the expectation that they will be able to make a profit by selling their products in medium income countries. Bayer has done this.

There is some market for vector control tools that gives companies motivation to produce them. There is also a market for insecticides for agricultural use, and the insecticides made for this purpose can

sometimes be used for vector control.

While there's a need for research in the areas mentioned above, research in them is well funded. The area in malaria control research where there is the greatest need of additional funding is **insecticide resistance research**. While the private sector is already doing research on the creation of new insecticides and on chemicals that break down resistance mechanisms, the total amount of funding in this area is lower in absolute terms than in the other areas of malaria research.

Insecticide resistance research

The problem of insecticides becoming ineffective due to mosquito insecticide resistance is a large-scale and growing problem.

The main unanswered question in the study of insecticide resistance is that of describing all of the resistance mechanisms because of their great diversity. If this question were answered, then one could try to make new chemicals that are effective at killing mosquitoes in spite of their insecticide resistance mechanisms.

It is difficult to follow insecticide resistance patterns without a lot of researchers studying them because insects develop new resistance mechanisms very rapidly and following them requires the constant development of new diagnostic tests.

There is a need for both field research and laboratory research in this area. Field research involves collecting sample mosquitoes, and lab work involves analyzing the samples for their susceptibility to insecticide and their resistance mechanisms. Field research and lab research go hand in hand.

There are very few labs in the world that are expert in analyzing insect resistance. There is one in Liverpool (England) and one in Montpellier (France) and a couple of labs in Asia, but very few labs altogether.

Running a lab with staff and field experiments would cost a few hundred thousand dollars per year. Running four labs would require about \$1,000,000 per year.

Existing malaria control programs keep track of the degree of insecticide resistance to a given insecticide in the geographic areas where they work. They do this to determine whether and when to alter their malaria control efforts. If they use indoor residual spraying, they might choose to switch to another insecticide when resistance to the one that they're using emerges. There is no alternative to the pyrethroid insecticide for insecticide treated bed nets, so if mosquitoes in a geographic area become resistant to pyrethroids, it may not be worth it to continue to distribute nets in that area. It appears that bed nets work well even in areas with substantial resistance as long as they're physically intact, but it would be good to have more research on this topic.

Data on insecticide resistance

Usually, the organizations that monitor insecticide resistance are national malaria control programs and contractor research institutions. This sort of monitoring is done in many countries, though not everywhere.

It's not easy to get all known data about insecticide resistance trends, but for those working in a

particular country, getting the data for that country is straightforward, because they know the people who are doing the monitoring.

Some countries where there is good monitoring of resistance are:

1. South Africa
2. Bioko Island
3. Benin
4. Kenya

There is not very much monitoring of resistance in central Africa, for example, in:

1. Cameroon
2. Chad
3. Central African Republic
4. Congo

The Malaria Eradication Research Agenda (malERA) initiative

If GiveWell is interested in learning about funding opportunities in malaria research, it should look at an organization called malERA to learn more. malERA thinks about which areas in malaria control have the most pressing need for funding. They have multiple working groups in different areas of malaria control.