FIVE QUESTIONS

ABOUT GENETICALLY MODIFIED MOSQUITOES

FOR ELENA LEVASHINA

Ms. Levashina, in May the British biotech company Oxitec released genetically modified mosquitoes in the U.S. for the first time. Males of the species *Aedes aegypti* have had a gene inserted into their genome that prevents their female offspring from developing. In this way, the population should shrink as the number of females decreases from generation to generation, the population is intended to shrink, thus reducing the risk of being infected with Aedes-borne diseases such as dengue fever or the Zika virus. In Florida, concerned citizens protested the field trial. Do you think the experiment is safe?

ELENA LEVASHINA I think this mechanism is very safe. The inserted gene only stops the development of half of the offspring. So we are not talking about mosquitoes with altered characteristics. In Florida, the intent is to shrink this mosquito population or make it disappear completely, and with it the inserted gene. Moreover, only transgenic males are released; they do not suck blood. This means that it is impossible for anybody to be bitten by a genetically modified mosquito. In my opinion, there are also no ecological consequences to fear. *Aedes aegypti* is an invasive species in Florida, so a few years ago it didn't even exist there. Currently, it makes up about four percent of the mosquito population there. So it wouldn't be a loss if the species were to vanish from the ecosystem again. In addition, islands like the Florida Keys are very well suited to such a field trial, because they limit the spread of mosquitoes in any case.

What could happen in the worst case?

Basically, nothing more than failing to reach the goal and not decreasing the number of mosquitoes. This is because the inserted gene has a kind of safety switch: it can be switched off with tetracycline For example, it would be theoretically conceivable that mosquitoes in the vicinity of farms that use the antibiotic tetracycline in animal husbandry would not be affected by the gene modification. However, since that antibiotic is hardly in use today, this is very unlikely to happen and has certainly been tested in advance.

Resistance to insecticides occurs time and again. Is that to be expected here as well?

The researchers deliberately inserted the gene into a region of the mosquito genome that is essential for survival. A mutation in this region is lethal in virtually every case and would therefore not spread. In addition, the time span for a mutation to appear and spread is extremely short. Laboratory experiments show that populations collapse after only a few generations – in the field, that means within one reproductive season.

With insecticides, mosquito nets and vaccinations against at least some of the mosquito-borne diseases, there are already several strategies in place to fight infectious diseases. Why do we need another one?

It is always good not to put all eggs into the same basket. Past history has shown that a single weapon can always become blunt – for example, pesticides to which mosquitoes become resistant. We should get to the point where we know exactly which method to use for each location and infectious mosquito species. With targeted use, we can minimize the risk of resistance development and reduce the impact on the environment.

What should be considered before attempting any future release trials?

The protests in Florida show that we have to take people's fears seriously. The best way to counteract those fears is to demonstrate transparency – in the trials, when publishing the data, and in engaging early in public debates and education. Those who know the benefits and risks of the technology can make up their own minds.

Interview: Harald Rösch

Dr. Elena Levashina is a Group Leader at the Max Planck Institute for Infection Biology.

ILLUSTRATION: SOPHIE KETTERER FOR MPG