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# Malaria's watershed

Malaria's moment has come, but success in control, let alone eradication, demands a renewed commitment to basic research.

A Global Malaria Action Plan, announced at the UN Millennium Development Goals Malaria Summit in New York on 25 September, has the ambitious goals of both reducing the malaria burden and eradicating the disease entirely.

Eradication any time soon might seem hopelessly optimistic, given the failure so far to make a serious dent in the number of malaria deaths. But much of the 274-page plan makes good sense. It calls for scaling up the use of existing tools, such as bednets, drugs and spraying, to near universal coverage, and then sustaining this effort for decades. True, this won't come cheaply. Funds for control have already grown from US$250 million annually in 2004 to an estimated US$1.1 billion this year; the plan calls for increasing that to $5 billion annually until at least 2020. Likewise, total spending on malaria-related research has risen from $265 million in 2003 to $422 million in 2007; the plan would see that figure double to between $750 million and $900 million annually until 2018. Whether donors will rise to the challenge is a big question, given current economic woes. Still, it is heartening that at the summit, donors from governments, industry and philanthropic organizations pledged US$3 billion.

Striking the right balance between basic and applied research is also critical. For example, the sequencing in 2002 of the genome of *Plasmodium falciparum*, the main parasite that causes malaria, has stimulated the hunt for new drug and vaccine candidates. This week's issue of *Nature* sees the addition of two more parasite sequences: *P. vivax*, which is less deadly than *P. falciparum*, and *P. knowlesi*, which mainly infects monkeys (pages 751, 757 and 799). These new sequences show how much more there is to learn: more than half of *P. falciparum*'s encoding genes still have no known function.

Basic research is also needed to stay ahead of drug resistance in the parasite and insecticide resistance in mosquitoes, and to get a better understanding of natural infection in humans. One surprise from *P. falciparum*'s genome is evidence that it evades the human immune system mainly by genomic and gene-expression diversity. *Plasmodium* seems to have different metabolic and physiological states, and can reprogram its gene expression. These findings could alter the way researchers think about both drug and vaccine development.

The malaria drug and vaccine pipelines are healthier now than they have been for decades, but they are in urgent need of new candidates and approaches. So it was welcome news when the Bill & Melinda Gates Foundation, already the largest donor in malaria research, announced at the UN summit that it would spend US$168 million to develop next-generation malaria vaccines. Moreover, this initiative will include early-stage laboratory research — most of the Gates Foundation's funding has so far focused on translational and clinical research.

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Many scientists would like to see the foundation fund even more basic research, but this cannot be the foundation's responsibility alone. Its support of translational work has rejuvenated the field over the past decade, and has helped get tools into the field. In the process, the malaria research community has become excessively and undesirably dependent on this one entity. Other research organizations would do well to step up to the plate and match the Gates Foundation's spending with their own basic-research funds. That would also go some way to addressing what scientists say is an unfortunate consequence of the emphasis on translational research: that scientists entering malaria research are less likely to choose basic science.

Any massive increase in research funding means that the malaria community must think about how to coordinate research across funding agencies. It is encouraging that the main research funders and scientists are to sit down as a group — called MalERA — over the next year to thrash out a research agenda for eradication. One lesson of the malaria and human genome projects is that consortia are a key route to delivery, focusing resources wisely, and avoiding duplication and excessive bureaucracy. It is also essential that international research recognizes the maturity of the malaria research community in the poorer countries where the disease is endemic — they should be on board as equals and not, as is too often the case, afterthoughts. ■

# The Red List still matters

And the IUCN has more to offer than just data on the nearly extinct.

The International Union for Conservation of Nature, better known as the IUCN, is officially venerable. At 60, it is the oldest global conservation organization. Indeed, its best-known product — the Red List, a compendium of species threatened with extinction — may seem a bit outdated in 2008. After all, the lesson of ecology is that species don't exist in isolation. They evolve and persist because of their relationships with all the other species around them. Conservationists these days usually talk about ecosystems as the units of interest, rather than species.

This trend towards broader thinking has not been lost on the IUCN. This week in Barcelona, Spain, the union is holding one of its four-yearly meetings. On the agenda is the release of the latest version of the Red List, which the union has been keeping since 1963, and which now covers nearly 45,000 species. But the union has also

authored an assessment of mammals that looks for larger patterns. For example, it turns out that marine mammals, and land mammals of south and southeast Asia, are in the worst shape — precisely the kind of knowledge that could help scarce conservation dollars go further (see page 717).

The IUCN is even getting into the business of predicting which species will one day become threatened as a result of climate change. Species with specific environmental needs or that have problems dispersing are likely to be most affected. The union is beginning similar work on other threats in collaboration with the Zoological Society of London.

This week, the union announced a new Global Mediterranean Action Network to help coordinate research on various Mediterranean-like biomes (including California and the Cape of South Africa). And IUCN president, Valli Moosa, was set to announce his vision for how the extraterritorial ocean should be managed so that the ecosystems of the high seas do not remain a conservation-free zone. Meanwhile, the IUCN's various programmes are working on issues ranging from making hotels more environmentally friendly to researching what an effective 'payments for environmental services' legal regime would look like.

Still, the heart of the organization is the Red List. Whatever its flaws, most people agree that the list is an irreplaceable indicator of global environmental health, using a metric that feels intuitive to most of us: how many extinctions have we caused in the past four years? It is no surprise that the drafters of the Millennium Development Goals chose the Red List to be an indicator of progress towards reducing biodiversity loss.

Of course, the number of species explicitly studied and measured is dwarfed by the number of species yet to be discovered. To address this, the IUCN is beginning to use a sampling method to estimate the state of play in less-well-studied groups of organisms, such as invertebrates, taking its mammal survey as a calibration point.

**"In these tumultuous economic times, the emotional force of extinction is nothing to sniff at."**

The IUCN deserves credit for continuing to invest in the list, even though it clearly understands that conserving biodiversity requires much more than the list alone. Yes, ecosystems are more than just the sum of their parts — but there may be no more visceral way to convince people that conservation is worthwhile than to point to a species that has nearly died out due to human fumbling. The fishing cat (*Prionailurus viverrinus*) of southeast Asia has almost vanished. If reading that causes a pang, good. In these tumultuous economic times, when people are still trying to work out how to value 'ecosystem services', and when a full understanding of ecosystems is still decades away, the emotional force of extinction is nothing to sniff at. ■

# Beta blockers?

## Proprietary data formats may be legally defensible but open standards can be a better spur for innovation.

A historian of science and computing, and a scholar whose PhD thesis was on "professionalization of cooking among domestic servants in eighteenth-century France", might seem unlikely characters to find at the centre of a multimillion-dollar lawsuit. But that is exactly what has happened in the suit brought against George Mason University (GMU) in Fairfax, Virginia, by Thomson Reuters, the company probably best known for its ISI science indicators.

Dan Cohen, director of GMU's Center for History and New Media, and Sean Takats, a GMU history professor, are also directors of Zotero: open-source software developed by the history centre that lets researchers organize and share their digital information iTunes style, whether it is in the form of citations, documents or web pages. Zotero is free and popular, and has attracted some 1 million downloads since its launch in October 2006.

Thomson makes the proprietary bibliography software EndNote, and claims that Zotero is causing its commercial business "irreparable harm" and is wilfully and intentionally destroying Thomson's customer base. In particular, Thomson is demanding that GMU stop distributing the newer beta-version of Zotero that allegedly allows EndNote's proprietary data format for storing journal citation styles to be converted into an open-standard format readable by Zotero and other software. Thomson claims that Zotero "reverse engineered or decompiled" not only the format, but also the EndNote software itself.

The company is seeking a minimum of US$10 million in damages annually until GMU halts distribution of Zotero's new feature. It also demands that GMU "terminate" the ability of each Zotero user to use or distribute any open-source files converted from EndNote's own data format. GMU seems ready to fight the suit; a spokesperson told *Nature* that the university believes it is "well within its rights", but declined to go into further detail given the ongoing litigation. Thomson was contacted but declined to comment, saying: "It is the policy of Thomson Reuters that we do not comment on pending litigation."

Thomson is claiming on the grounds that GMU has a site licence to EndNote, and that Zotero's actions breach the terms of the licensing contract. Thomson did not challenge GMU on grounds of copyright law, in which certain protections are in place to allow for creating interoperability. Thomson also claims that Zotero is infringing on the trademark 'EndNote' to induce Zotero users to convert EndNote's proprietary style files.

Litigation, which may go to a jury trial, is pending, so judging this case on its legal merits would be premature. But on a more general level, the virtues of interoperability and easy data-sharing among researchers are worth restating. Imagine if Microsoft Word or Excel files could be opened and saved only in these proprietary formats, for example. It would be impossible for OpenOffice and other such software to read and save these files using open standards — as they can legally do.

Competition between open-source and proprietary software is long-running, as personified by the struggle between Windows and Linux for desktop and server operating systems, but also in many branches of software used by scientists. Researchers tend to lean towards open sharing, but they will also pay for added-value features, and it's important that the playing field is level. Ultimately, the customer is king. ■