

THIS WEEK

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A three-step plan for antibiotics

If the threat of antibiotic resistance is to be managed, existing drugs must be marshalled more effectively and new medicines must get to market fast.

If the first step towards solving a problem is to acknowledge its existence, then some important progress has been made on the thorny issue of antibiotic resistance. Last July, *Nature* noted approvingly a “notable rise in awareness among policy-makers and the public” on the issue and credited the advocacy of scientists for the surge (see *Nature* **499**, 379; 2013). That rise has continued, but with increased public and political awareness comes a greater demand for action. Much of that heavy expectation will fall on scientists. So, after the advocacy, how can the antibiotic-resistance threat be countered?

The first step, and one that must be pursued with urgency, is better stewardship of existing antibiotics. This demands fresh research and discoveries, but significant gains are also possible if officials and policy-makers can crank up the funds and willpower to match their rhetoric. Doctors and others who routinely overprescribe antibiotics for everything from sore throats to bronchitis need clear and explicit instructions from the top to stop. Medical schools that do not drum into their trainees the importance of prudence must start to do so.

It is not enough for doctors to urge their patients to finish the prescribed course when they are dishing out the pills with such abandon. A study published in the *Journal of the American Medical Association* last week showed that despite guidelines that veto such use of antibiotics for acute bronchitis and decades of research showing no benefit, the number of antibiotic prescriptions for this indication rose in the United States from 1996 to 2010 (M. L. Barnett & J. A. Linder *J. Am. Med. Assoc.* **311**, 2020–2022; 2014).

Over-the-counter sales of antibiotics must be banned. The countries that allow it are squandering a precious resource as surely as if they were tipping oil down the toilet. Regional regulations that limit the use of antibiotics to speed up the growth of livestock should extend worldwide. Public education — both to restrict the waste of antibiotics and to build support for measures to restrict unnecessary use — is vital. These are low-hanging fruit and they must be picked with all possible urgency. They need top-down political action, and that means governments. Cross-party consensus should be explicitly hammered out and publicized — there is no equivalent of Big Oil or Big Tobacco in this debate to delay and obfuscate.

The second step, and this is the one in which scientists have the biggest role, is to find ways to maximize the impact of our existing stocks. Researchers in the public and private sectors must re-examine all compound libraries for drugs that could couple with rapid diagnostic tests to offer new, narrow-spectrum therapies. Other compounds could be used in combination to reverse resistance to existing medicines and so extend their useful life — similar cocktails of drugs have been successful in treating HIV, after all.

Research can improve diagnosis too, to both speed up treatment of patients and minimize the waste of ineffective drugs. As a Comment article on page 557 points out, genome sequencing of infectious bacteria can rapidly identify resistance genes. So samples from an infected

patient — analysed in clinical microbiology labs as close to point of care as possible — could steer drug treatment, at least in the developed world. Mass spectrometry was introduced for clinical use in this way a few years ago, it notes, and is now commonly used to identify pathogens from signature microbial peptides. Such a rapid front-line diagnostic kit to improve antibiotic use is one of the six major challenges identified by the UK government in its new Longitude Prize, intended to boost innovation.

The third step must be to boost the number of antibiotic drugs that are reaching the market. Between 1983 and 1992, the US Food and Drug Administration approved 30 new antibiotics; between 2003 to 2012, it approved just seven.

Reversing this trend is less about research and more about restructuring the financial incentives for firms to do that work. In 2012, for instance, the United States passed the Generating Antibiotic Incentives Now Act, which gives companies an extra five years of exclusive use for new antibiotics that they develop.

Others, including the World Health Organization (WHO), are considering more radical changes to the drug-development model itself. Last week, WHO members met to discuss a draft global action plan on antimicrobial resistance that floated “new business models” driven by public need rather than market forces. Such action would demand global consensus on the problem, and a Comment piece on page 555 argues that the globe needs a new body to help to achieve that and to drive action — an intergovernmental panel on antimicrobial resistance.

We have come a long way in a year. But the real work starts now. ■

Clean break

Improved biomass stoves are not popular, people everywhere deserve modern cooking methods.

For the billions of people who rely on food cooked over smoky open fires, a less-polluting stove seems like a clear solution. The devices allow people who have limited resources to use the same fuels — wood, charcoal, animal dung and agricultural waste — but generate less toxic fumes and therefore save millions of lives.

For decades, that apparent win-win strategy has held great appeal for big international donors, non-governmental organizations and engineers. This week, for example, the US Environmental Protection Agency announced grants to six universities for more research into clean-cooking stoves.