**Antibiotic resistance has a language problem**

A failure to use words clearly and consistently threatens to undermine the global response to antibiotic resistance. Standardize terminology, urge **Marc Mendelson** and colleagues.

Most clinicians treating patients have long known that microbes, such as bacteria, viruses and fungi, are becoming alarmingly resistant to medicines used to treat them -- commonly termed antimicrobials. But a global response to this complex health threat will require engagement from a much broader array of players -- from governments, regulators and the public to experts in economics, trade and industry.

People from disparate domains – civil society, governments, the financial, health, environmental and food-production sectors – are currently talking past each other. Many of the terms routinely used are misunderstood, interpreted differently by different people or loaded with unhelpful connotations.

On 16 March, a United Nations Interagency Group was formed to coordinate the fight against drug resistance1. We believe that a first step for this group should be coordinating a review of terminology by key actors that improves understanding for non-specialists and engenders a consistent and focused global response.

**Blinded by Science**

A 2015, a World Health Organization (WHO) survey highlighted people’s unfamiliarity with terminology relating to antibiotic resistance across 12 countries2. Less than half of the some **10,000** respondents understood ‘antimicrobial resistance’. Only one fifth understood its abbreviated form ‘AMR’. In contrast, more than two thirds knew what was meant by ‘antibiotic resistance’ or ‘drug resistance’. A study by the Wellcome Trust (also in 2015) investigating the perceptions of people living in various regions of the United Kingdom revealed similar trends3.

Besides hampering public understanding, the interchangeable use of terms by the press as well as by scientists in publications and meetings is likely to be counterproductive in all sorts of contexts.Take food production.In recent years,calls have been coming from different arenas to phase out or abolish ‘antimicrobials’ used to promote animal growth in order to protect humans from increasing levels of bacterial resistance.4 By definition,antimicrobials include medicines against coccidian parasites, which play a vital role in sustaining current levels of poultry production worldwide. Anticoccidial medicines have no effect on bacteria, and are not a driver of bacterial resistance in humans or animals. In other words, a demand to abolish all antimicrobials for growth promotion misses the point and could potentially harm food security.

Likewise, targeting a global, sustained, public awareness campaign, [as called for by the WHO global action plan and the O’Neil report,4 ]at interventions to combat antibiotic resistance is going to be far more focused and understandable, than at antimicrobial resistance.

This highlights the role of simple, clear and focused terminology to help ensure that the global effort is focused on the greatest immediate challenge – the rise of drug-resistant bacteria that cause common illness due to the high use of antibiotics by humans. It could also improve people’s understanding and so engagement in the problem; the Welcome Trust study found that citizens either don’t understand the language currently used by scientists and the media in relation to antibiotic resistance, or they resist engaging with the problem because of feeling powerless to do anything about it.

**Word power**

Words have big effects. A recent study of word use in social media networks, for instance, indicated that the terms ‘climate change’ and ‘global warming’ have different effects on knowledge and awareness5. In fact, presumablyby imparting a greater sense of personal threat, ‘global warming’ is more likely than ‘climate change’ to prompt Americans to support large and small-scale US efforts to address the problem6.

Similarly, the term ‘secondhand smoke’ in the past **4**0 years has been critical to communicating the risks of smoking to the public.7 And the decision to name the cause of AIDS, Human Immunodeficiency Virus (HIV) in 1986 in preference to Human T-Cell Lymphotropic virus (HTLV-III) or Lymphadenopathy-Associated virus (LAV) – helped people understand that the disease was caused by a virus that harms the immune system.As such, it was critical to phasing out stigmatizing and inaccurate terms such as ‘the gay plague’ which had previously dominated communications around AIDS.

The recent appointment of a United Nations Interagency Group provides an opportunity to apply the power of words to drug resistance. We urge this group to focus on three issues in particular.

**Drug resistant infection.** We propose that ‘drug resistant infection’ be the overarching term used (in English) to describe used (in English) to describe infections caused by organisms that are resistant to treatment, including those caused by bacteria that do not respond to antibiotics. The WHO and Wellcome Trust surveys indicate that most people understand this term and it is already in use for tuberculosis. (Medical practitioners among otherscommonly refer to ‘drug-resistant tuberculosis’). We also suggest that more specific words such as ‘antibiotic’ or ‘antifungal’ are consistently used in preference to antimicrobial when referring to medicines against a specific type of organism.

**Stewardship.** ‘Stewardship’ frequently comes up in discussions about drug resistance – specifically, how stewards can ensure that antibiotics are used in such a way as to maximize their effect and the chance of their being conserved for future generations. But the term is invariably used too narrowly.

Historically, antibiotic stewardship has been conducted as part of hospital programmes and many people use it to refer to the actions of physicians and pharmacists. Yet today its practice is far broader (see Table). Antibiotic stewardship in human or animal health can be an individual, hospital or community-level commitment to restricting antibiotics to those patients or animals that have a non-self-limiting bacterial infection, and ensuring that all aspects of the prescription (dose, duration and so on) are correct. At the other end of the scale, work on developing a global stewardship framework – potentially akin to the WHO Framework Convention on Tobacco Control-- is underway at WHO.

Lastly, the term ‘conservation’ is often used interchangeably with stewardship. But ‘conservation’ has a broader meaning, encapsulating both stewardship and the prevention of infection in the first place, for instance through vaccination.

**War.** Much of the rhetoric around drug resistance has pitched humans in a fight against bacteria. For instance, people frequently refer to “the war against superbugs”, or the “fight against AMR”.Also -- in the pursuit of an enemy -- responsibility for the increase of antibiotic-resistant bacteria in humans is often placed at the door of animal health professionals, the livestock industry, farmers and veterinarians.

This war narrativeis unhelpful and misguided. The use of antibiotics in animals selects out bacteria that are resistant to antibiotics. And those resistant bacteria can be transferred from farm to fork. But the predominant driverof antibiotic resistance in humans is the intense pressure exerted by the misuse and overuse of antibiotics in people.

The war narrative also fails to recognize our symbiotic relationshipswith bacteria.The more we go on the ‘attack’ the more likely we are to interrupt the vital roles that bacteria play in our guts, airways and on our skin. Around 100 trillion bacteria reside in our guts, alone and the vast majority of them help us stay in good health.

War and threat were once potent rallying calls. But a more nuanced, standardized vocabulary that takes ecological balance into account is now needed.

ACTIONS SPEAK LOUDER

Because terminology has geographic, disciplinary and societal variations that affect understanding and interpretation, a programme of research is needed to optimize the lexicon across different countries and languages. Such a programme could be undertaken within the current WHO global action plan objective 1 — to improve awareness and understanding of drug resistance through effective communication, education and training.

Such a research programme could identify the terms used globally and establish whether the direct translation of English words into other languages renders them useful. The term drug-resistant infection is not used in France, for instance, nor is the translation of antimicrobial resistance — *résistance aux antimicrobiens*. Rather, *antibiorésistance*, a contraction for antibiotic resistance, is preferred. It could also explore how such phrases are interpreted by people from different walks of life, assess the impact of different language on understanding and on rates of infection, build a global consensus around the scientific terminology of drug resistance and integrate these terms into global education programmes and communication strategies.

William Shakespeare was the master of multiple meaning. Juliet’s “What’s in a name …” muse about her Romeo riffs on the arbitrary, insubstantial nature of labels. But, given the gravity of what’s ahead, now is the time consider the power of words to change the course of events. It is a lesson that those of us trying to broadcast an understanding of this crisis should heed.

**Marc Mendelson is Professor of Infectious Diseases and Head of the Division of Infectious Diseases & HIV Medicine at Groote Schuur Hospital, University of Cape Town.**

**Marc.mendelson@uct.ac.za**

**Manica Balasegaram is Director of the Global Antibiotic Research and Development Partnership, Drugs for Neglected Diseases Initiative, Geneva, Switzerland. mbalasegaram@dndi.org**

**Tim Jinks is Strategy Development Lead for Drug Resistant Infections at the Wellcome Trust, London, UK**

**T.jinks@wellcome.ac.uk**

**Céline Pulcini is Professor of Infectious Diseases in Nancy University Hospital and leads a research team on Antimicrobial Stewardship at the University of Lorraine, in Nancy, France**

**celine.pulcini@univ-lorraine.fr**

**Mike Sharland is Professor of Paediatric Infectious Diseases at the Institute of Infection and Immunity. St. Georges Hospital, University of London, London, UK**

**Mike.Sharland@stgeorges.nhs.uk**

**References**

1. UN News Centre. UN announces interagency group to coordinate global fight against antimicrobial resistance. Available at <http://www.un.org/apps/news/story.asp?NewsId=56365#.WMuHcxhh3BI> (Accessed on 17th March 2017)
2. World Health Organisation. WHO ANTIBIOTIC RESISTANCE: MULTI-COUNTRY SURVEY. Geneva, November 2015. Available at <http://apps.who.int/medicinedocs/documents/s22245en/s22245en.pdf> (accessed on 10th December 2016)
3. Wellcome Trust. Exploring Consumer Perspectives on Antimicrobial Resistance. Avaialbe at <https://wellcome.ac.uk/sites/default/files/exploring-consumer-perspective-on-antimicrobial-resistance-jun15.pdf> (accessed on 10th March 2017)
4. O’Neill J. Tackling drug-resistant infections globally: final report and recommendations. London: H M Government/Wellcome Trust, 2016.
5. Lineman M, Do Y, Kim JY, Joo G-J. (2015) Talking about Climate Change and Global Warming. PLoS ONE 10(9): e0138996. Doi:10.137/journal/pone.0138996
6. Leiserowitz, A., Feinberg, G., Rosenthal, S., Smith, N., Anderson A., Roser-Renouf, C. & Maibach, E. (2014). *What’s In A Name? Global Warming vs. Climate Change.* Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication.
7. Viet Nam News. Campaign launched against secondhand smoke. Available at [http://vietnamnews.vn/society/347520/campaign-launched-against-secondhand-smoke.html#QcSWcVkhXLefXTB0.97](http://vietnamnews.vn/society/347520/campaign-launched-against-secondhand-smoke.html%22%20%5Cl%20%22QcSWcVkhXLefXTB0.97) (Accessed on 17th March 2017).

|  |
| --- |
| MANY MEANINGSAntibiotic stewardship’ could refer to one of six endeavours; most people use it to describe the actions of physicians and pharmacists.  |

|  |  |
| --- | --- |
| Type | Features |
| Individual | Systematic approach taken by individual prescriber to optimize use of antibiotics to improve patient outcome and limit emergence of resistance, whilst ensuring patient safety. |
| Multidisciplinary | Recognizes that healthcare professionals with differing expertise may work in a team to optimize use of one or more **antibiotics** for a given patient or patients. Teams commonly comprise of infection specialists, microbiologists, non-specialist clinicians, pharmacists, infection prevention officers, and nurses.  |
| Hospital (Institutional) | Antibiotic stewardship programmes that are usually confined to hospitals or healthcare institutions. Commonly comprise one or more **stewardship** teams, usually coordinated by an antibiotic stewardship committee. |
| Community | Stewardship (individual or multidisciplinary) at primary health clinics, single or group practices, long-term care facilities, or in animal health, at single farms or farm groups. |
| National | Stewardship activities encompass broader issues, employ legislation and regulation to define access to medicines and who may prescribe them.  |
| Global | The WHO has been tasked with developing ‘a global stewardship framework to support the development, control, distribution and appropriate use of new antibiotics, diagnostic tools, vaccines and other interventions, with linkage to new model/s of research and development’ Global stewardship is intimately linked to development, and will expand on national stewardship programmes, to coordinate individual nations, country and regional networks, and continental stewardship activities. |

Marc Mendelson1\*, Manica Balasegaram2,Tim Jinks3, Céline Pulcini4, and Mike Sharland5

1Division of Infectious Diseases & HIV Medicine, Department of Medicine, University of Cape Town, South Africa

2Global Antibiotic Research and Development Partnership, Geneva, Switzerland

3Wellcome Trust, London, United Kingdom

4CHRU de Nancy, Service de Maladies Infectieuses et Tropicales and Université de Lorraine, EA 4360 APEMAC, Nancy, France

5Institute of Infection and Immunity. St. Georges Hospital, University of London, London, UK

\*Corresponding author

Prof Marc Mendelson

Division of Infectious Diseases and HIV Medicine

Department of Medicine

Groote Schuur Hospital

G16.68 New Main Building

Observatory 7925

Cape Town

South Africa

Tel +27 21 650 4943

Fax +27 21 650 6184

Email marc.mendelson@uct.ac.za

Conflicts of Interest.

Céline Pulcini is a member of DRIVE-AB, which is supported by the Innovative Medicines Initiative (IMI) Joint Undertaking (grant agreement n°115618 - Driving re-investment in R&D and responsible antibiotic use – DRIVE-AB – www.drive-ab.eu). Resources are composed of financial contribution from the European Union’s Seventh Framework Programme (FP7/2007-2013) and European Federation of Pharmaceutical Industries and Associations (EFPIA) in kind contribution.