

For more on **Combating Resistance: Getting Smart About Antibiotics** see <http://www.cdc.gov/about/grand-rounds/>

Disease Prevention and Control is planning a Twitter chat on Nov 18 as well as promotional tweets and postings (#EAAD). The US CDC is hosting public health grand rounds called *Combating Resistance: Getting Smart About Antibiotics* on Nov 19 and a Twitter conversation on Nov 20. The observance will feature the release of an American Academy of Pediatrics Clinical Report in the *Journal of Pediatrics* on the principles of judicious antibiotic prescribing for paediatric upper respiratory tract infections. In Canada, social media and e-blasts will be used by all AAW partner organisations to build public health awareness about antimicrobial resistance. A campaign highlight will be webinars featuring talks by expert speakers on antimicrobial resistance. Various events and promotional activities are planned to take place across Australia covering both human and animal health, including Twitter and Facebook discussions. Health professionals and consumers will be invited to make an online pledge to help tackle the problem of antibiotic resistance, and hospitals will be invited to take part in a national antibiotic prescribing survey.

As *The Lancet Infectious Diseases* Commission on antibiotic resistance and use<sup>1</sup> makes clear, antibiotic-resistant infections are increasing at an alarming pace, posing a great threat to human health on every continent. Of the steps that need to be taken, we believe

that improvement of antibiotic use practices is the most important to slow development and spread of resistant bacteria. Antibiotics are frequently used inappropriately in both human beings and animals. We highlight an example of coordinated action, and our hope is to foster further cooperation worldwide to ensure prudent use of antibiotics and preservation of the gains made to reduce morbidity and mortality due to infectious diseases.

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1 Laxminarayan R, Duse A, Wattal C, et al. Antibiotic resistance—the need for global solutions. *Lancet Infect Dis* 2013; published online Nov 17. [http://dx.doi.org/10.1016/S1473-3099\(13\)70318-9](http://dx.doi.org/10.1016/S1473-3099(13)70318-9).

## Antibiotic effectiveness and child survival

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The latest estimates of child mortality show that although the global mortality rate in children younger than 5 years has roughly halved, from 90 deaths per 1000 live births in 1990 to 48 per 1000 live births in 2012, an estimated 6.6 million children died in 2012.<sup>1</sup>

As noted in *The Lancet Infectious Diseases* Commission on antibiotic resistance and use,<sup>2</sup> most of these deaths are caused by preventable infectious diseases; the largest cause is pneumonia (1 137 766 deaths; 17%), although neonatal sepsis (350 661; 5%) and meningitis (165 360; 3%) are also important.<sup>3</sup> The poorest and most marginalised children are most often exposed to disease-causing pathogens, and most likely to develop severe illness caused by malnutrition or comorbidities. But despite these children being in greater need of effective treatment, they are least likely to receive it. In high-burden countries, treatment remains critically

low, with antibiotics reaching about only a third of children in need.<sup>4</sup>

Because few data exist for causes of non-severe pneumonia, antibiotics have been targeted at the pathogens known to cause severe pneumonia. The common causes are *Streptococcus pneumoniae* (17–37% of severe pneumonia infections), *Haemophilus influenzae* (0–31%), and *Staphylococcus aureus* (1–33%).<sup>5</sup> Likewise, few data are available for the effect of antibiotic resistance in childhood pneumonia, although findings show an association between in-vitro resistance to co-trimoxazole and poor clinical outcome in acute otitis media.<sup>5</sup> Amoxicillin and co-trimoxazole are the most widely available oral antibiotics for non-severe pneumonia; however, data from at least one study<sup>6</sup> suggest higher treatment failure in patients with severe pneumonia given co-trimoxazole than in those given amoxicillin. As a result,

WHO recommends oral amoxicillin as the preferred first-line treatment for childhood pneumonia in settings with low HIV prevalence. Amoxicillin is also preferred in settings with high HIV prevalence because oral co-trimoxazole is recommended as prophylaxis to prevent pneumonia caused by *Pneumocystis jirovecii*.

To achieve Millennium Development Goal 4, child killers like pneumonia need to be more effectively targeted; good quality, cheap, and accessible antibiotics will be essential for success.<sup>7</sup> Therefore, aggressive actions to overcome challenges related to antibiotic resistance are crucial.<sup>1</sup> Evidence from large-scale programmes in Ethiopia, Malawi, Uganda, Zambia, and other settings show that community health workers can provide good quality treatment services and contribute to rational drug use.<sup>8,9</sup> Community health workers have shown themselves to be competent in illness classification, ability to follow treatment algorithms, and correct prescription of treatment, including non-prescription of antibiotics for children who did not need them. Although supportive supervision and close monitoring is needed to maintain skills, community health workers need to be an essential part of national strategies for child survival. At the health facility level, the WHO Integrated Management of Childhood Illness strategy has improved quality of care and rational prescribing by health workers.<sup>10</sup>

The contribution of antibiotics for treatment of childhood pneumonia to the total selection pressure for antibiotic resistance is probably lower than the overall (and often indiscriminate) use of antibiotics for adult illness in most countries. However, increased access to improved and adequate diagnostic methods and antibiotics that are suitable for children is crucial in the prevention of antibiotic resistance. Innovation by the public and private sector is underway to improve pneumonia diagnostic methods and the outcome of such research should be available in the next 1–2 years. Innovative preparations of antibiotics suitable for children are now widely available—notably dispersible tablets provided in unit-dose, user-friendly packs.

Flexible, solid, and oral dosing (eg, a dispersible tablet) removes the need for refrigeration, which is important in resource-limited settings with no power supply, and reduces the bulkiness of the product, and therefore lowers the cost of transportation and storage. Making the right form of antibiotic available

at the right level of health care contributes to the correct use of antibiotics. Further studies are needed of the association between pharmaceutical technology aspects of medicines such as formulations and outcomes.

The best way to avoid antibiotic resistance is to reduce pneumonia and meningitis infections through wide coverage of effective prevention strategies. These include handwashing<sup>11</sup> and introduction and scale-up of vaccines.

With political will and coordinated engagement of public, private, and civil society sectors, the world can fulfil the promise to give every last child the opportunity to survive and thrive. The availability of good quality antibiotics effective against childhood pneumonia and neonatal sepsis will be essential to success.

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