The Role of Vaccines In Preventing Antimicrobial Resistance

Dr Rajeka Lazarus

Vaccines Network UK
Severn Pathology Infection Service
Vaccines are a critical weapon in the fight against superbugs

SETH BERKLEY

A nurse takes a patient's temperature during last summer's cholera and typhoid outbreak in Zimbabwe. Credit: JESSICA NYEMWA/AFPP
January 2019
Up to £1m funding awarded to develop bacterial vaccines in global fight against antimicrobial resistance

26TH FEBRUARY 2019
Vaccines for AMR panel discussion event
Vaccines to tackle drug resistant infections
An evaluation of R&D opportunities
Brain Damage/Death from Vaccines is NOT Rare
Why has antibiotic use and resistance increased despite the use of vaccines?
Reducing Resistance
Graph showing *Haemophilus influenzae* type b laboratory reports by quarter: England, 1990-2014*

- **Hib vaccine introduced**
- **Hib vaccination catch-up campaign**
- **Routine 12-month Hib booster introduced**

*Provisional data
Source: Routine laboratory data combined with reference laboratory data

July 15, 1974

**Haemophilus influenzae Type B Resistant to Ampicillin**

A Report of Two Cases

Waheed Khan, MS; Sydney Ross, MD; William Rodriguez, MD; et al


**Abstract**

Recently, two infants with severe infections due to ampicillin-resistant strains of *Haemophilus influenzae* type B were treated at Children's Hospital National Medical Center. In both cases, it was necessary to change therapy to chloramphenicol. One patient with meningitis died while the second with bacteremia and pneumonia recovered. A survey of 60 recent isolates of *H influenzae* type B in the Washington community showed that 10% were ampicillin-resistant. The enzyme produced by these resistant strains was found to be a β-lactamase. Careful appraisal is now necessary to decide whether ampicillin is the drug of choice as initial therapy in *H influenzae* meningitis in pediatric patients.

*(JAMA 229:298-301, 1974)*
Overall decrease in antibiotic non-susceptible serotypes
Reducing Antibiotic Use
Pneumococcal Conjugate Vaccine

35 antibiotic prescriptions per 100 vaccinated children prevented

1.4 million antibiotic prescriptions prevented in the US


Lee et al Outpatient antibiotic prescribing in the United States: 2000 to 2010 BMC Medicine 201412:96
Universal Influenza vaccination

64% decrease in antibiotic prescribing for influenza associated infections compared to other provinces

~144 000 antibiotic prescriptions prevented

Kwong et al The Effect of Universal Influenza Immunization on Antibiotic Prescriptions: An Ecological Study Clinical Infectious Diseases 2009; 49(5):750–756
Universal Influenza vaccination

- Reducing secondary bacterial complications
- Reducing inappropriate prescribing

Havers HP et al. Outpatient Antibiotic Prescribing for Acute Respiratory Infections During Influenza Seasons JAMA Netw Open 2018 1;1(2):e180243

Norwegian Salmon Farming
Reduce burden of infection

Reduce burden of resistant organisms

Reduce appropriate and inappropriate antibiotic use

Reduce burden of transmissible infection

Reduction in AMR
Reduce the Burden of Infection
Reduce the Burden of Infection

<table>
<thead>
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<th>Antigen</th>
<th>Optimisation</th>
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<td>Pneumococcus</td>
<td>Increase serotype coverage, whole cell vaccine</td>
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<td>Older adults - improve effectiveness</td>
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<td>Influenza</td>
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<td>Improve breadth of serotype coverage</td>
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<td>HPV</td>
<td>Serotype coverage</td>
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</table>

Optimise vaccines that are currently in use
Reduce the Burden of Infection

Group A Strep

*S. aureus*

*E. coli*
Reduce the Burden of Infection

- Group A Strep
- S.aureus
- E.coli
- TB
- Malaria
- HIV
Reduce the Burden of Resistant Organisms

Gonococcus

CPE

Salmonella
High Risk Populations
High Risk Populations

- Children
- Elderly
- MSM
- Transplant
- Pregnancy
- Surgical
CMV
EBV
RSV
Candida
C. difficile
MRSA
Reduce burden of infection
Reduce burden of resistant organisms
Multidrug resistant organisms

Reduce appropriate and inappropriate antibiotic use
Reduce burden of transmissible infection
Hospital acquired infection

Individual Protection
Herd Immunity
High risk groups

Reduction in AMR
Vaccine Uptake
Vaccine Hesitancy

- Complacency
- Confidence
- Convenience
Socioeconomic Factors

Influenza vaccine Merseyside


HPV vaccine in South West

Routine Vaccination Practice after Adult and Paediatric Allogeneic and Haematopoietic Stem Cell Transplant

• minority of adult (8%) and paediatric (10%) programmes offer 77 vaccination on site

• Nearly two-thirds (65%) of programmes do not maintain a record of vaccine administration in patients’ case notes

• Variation in vaccination time points and vaccinations given

Miller PDE et al Routine vaccination practice after adult and paediatric allogeneic haematopoietic stem cell transplant: a survey of UK NHS programmes
Bone Marrow Transplantation Volume 52, page 1082 (2017)
Conclusions

Vaccines prevent AMR by multiple mechanisms. In order to use vaccines to their full potential we need to optimise current use and support vaccine development.
The Role of Vaccines in Preventing Infectious Diseases and Antimicrobial Resistance
The UK Clinical Vaccine Network exists to bring updates in vaccinology to clinicians and offer opportunities for clinicians to get involved in vaccine development.
UK Clinical Vaccine Network Conference 2019

14th June
Oxford

Welcome to the UK Clinical Vaccine Network Conference 2019, a single day conference focusing on the future direction and challenges within the vaccine arena, and set to be the go-to annual conference for all those interested in vaccine development and use. The aim of the conference is to harness the collaborative power of vaccines to improve public health, and to consider the challenges and opportunities now facing the vaccine community.

REGISTER NOW
Time between deployment of an intervention and the first documented failure in humans due to resistance (marked with “x”s).

David A. Kennedy, and Andrew F. Read
PNAS 2018;115:51:12878-12886

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Do you need the flu jab?

Asthma?  Heart disease?  Diabetes?  Weakened immune system?

Liver disease?  Lung disease?  Kidney disease?

If you have any of these conditions, you are also more likely to develop serious complications from flu, such as pneumonia. Contact your GP today to book your flu jab. It’s quick, safe and free.

www.nhs.uk/flu

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