



## Pneumococcal Conjugate Vaccine

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**P**neumococcal conjugate vaccine was first licensed for use in the United States of America in February 2000 and an increasing experience of the impact of this vaccine on pneumococcal disease is now emerging. The serotype distribution of invasive pneumococcal disease varies around the world with nearly 90% of invasive disease caused by the seven vaccine types included in the conjugate vaccine in the U.S. This percentage is low in Asia, Africa and South America. There is therefore a need for extended formulations of the vaccine which include serotypes one and five. Emerging evidence from the U.S. suggests that additional serotypes may be required to deal with antibiotic resistant non-vaccine types.

Conjugate pneumococcal vaccine impacts on carriage of pneumococci by preventing the acquisition of vaccine strains. The vaccine therefore interrupts transmission in the community and allows the development of a considerable herd effect. Conjugate vaccine has been shown to reduce the burden of pneumococcal otitis media by 57%. The overall impact is however reduced because of an increase in non-vaccine types. Vaccine given after the first year of life to otitis prone children may not reduce their burden of disease and has been associated in one study with an excess of staphylococcal infections.

Conjugate pneumococcal vaccine has been shown to reduce the burden of invasive pneumococcal disease amongst vaccinated children. Reductions of >80% have been identified in randomized trials and in surveillance conducted by the Centers for Disease Control in the United States. There is evidence of serotype replacement among invasive isolates but the degree of replacement is minimal in comparison to reduction in disease burden due to vaccine types. This vaccine has also been shown to reduce invasive pneumococcal disease among HIV-infected children.

The most important impact of the vaccine in developing countries will be its effects on pneumonia. A number of studies have shown the vaccine can reduce pneumonia by 20-25% and the use of conjugate vaccine as a probe has allowed a number of novel observations regarding the role of the pneumococcus in respiratory tract infections. The pneumococcus has been shown to cause a significant fraction of pneumonia beyond that characterized by consolidation on chest X-ray. The public health usefulness of conjugate vaccine can therefore be measured by its impact on clinical pneumonia in addition to radiologically confirmed pneumonia. The specificity of the pneumonia endpoint in vaccine trials can be enhanced by the use of measures of acute phase reactants such as procalcitonin and C-reactive protein.

Finally, pneumococcal conjugate vaccine has demonstrated the role of the pneumococcus as a super-

infection of patients with influenza- and RSV-associated pneumonias in hospitalized children may be prevented by the conjugate vaccine.

As conjugate vaccine serotypes tend to be antibiotic resistant there has been a dramatic reduction in antibiotic resistance among blood isolates of pneumococci from the U.S. There is however increasing evidence of antibiotic resistance among non-vaccine serotypes in non-blood isolates.