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Case Report Open Access

Intrafamily Transmission of *Streptococcus pneumoniae* and the Protective Power of Vaccination

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Abstract

In May 2010 a young boy (16 months) developed clinical signs of conjunctivitis, a running nose and a cough. In a swab taken from the conjunctiva a mucoid *Streptococcus pneumoniae* (serotype 3) could be grown. Subsequently his father became severely ill with high fevers and bronchitis. A mucoid *Streptococcus pneumoniae* (serotype 3) could be isolated from the purulent sputum. The mother of the boy who took care of both patients did not develop any clinical symptoms. At the time of the onset of disease the boy already had completed the locally recommended basic vaccination routine against pneumococci (4 injections, 3×PCV7, 1×PCV13). The father of the boy was not vaccinated against pneumococci. The mother had been vaccinated against pneumococci in 2006 (PPV23). The likely origin of the serotype 3 strain is the day-care group of the boy consisting of four children altogether.

Keywords: Infectious outbreak; Streptococcus pneumoniae, PCV, vaccination

Introduction

Streptococcus pneumoniae is a pathogen known to cause pneumonia [1], bacteremia [2], meningitis [3], otitis media [4], sinusitis [5] and conjunctivitis [6]. Additionally it is a well-known colonizer of the upper respiratory tract of children and adults [7]. The main risk groups for pneumococcal diseases are children <5 years and adults >65 years. With the introduction of Polysaccharide (PPV) and Conjugated Vaccines (PCV) pneumococcal diseases became preventable by vaccination. Today polysaccharide (23-valent) as well as conjugated vaccines (10-valent, 13-valent) is available. The protective potential of the different vaccines is multiply documented [8,9]. However, even infectious diseases specialists rarely associate *S. pneumoniae* with outbreaks. But awareness seems to increase as several outbreak reports were published just recently [10-14].

Outbreak Report

In May 2010 a 16 month old boy (boy1) presented with the clinical signs of a bacterial conjunctivitis in his right eye. Within the following 3 days he developed a running nose and a cough but no fever or elevated temperatures. Apart from difficulties in breathing through his congested nose he was not hampered in his daily routine. He was treated symptomatically with hourly cleaning of the affected eye, nose drops and cough syrup but did not receive any antibiotics. Three days later his father (40y) developed a running nose, cough, sinusitis and fever (39.5°C) and had to stay at home from work for three days altogether. Within three days with bed rest (and symptomatic therapy, no antibiotics) his health status improved, i.e. he could go back to work. However, after two days at work his health condition deteriorated again and he had to stay at home for another couple of days. In the meanwhile the running nose and cough of the boy had resolved but not the conjunctivitis. A sample was taken and analyzed for bacterial growth, which resulted in a pure culture of a *Streptococcus pneumoniae*. On the morning of the first day of his second absence from work the father produced purulent sputum, which on analysis grew a pure culture of *S. pneumoniae*. In their aspect on the respective blood agar plates the two strains were identical, i.e. the cultures were extremely mucoid. Susceptibility testing of the two isolates gave identical results. Serotyping at the National Reference Centre for Streptococci in Aachen, Germany revealed that both strains were a serotype 3, which was expected due to their extremely mucoid growth. The father was put on moxifloxacin (1×400 mg daily). After ten days of therapy he was fit and well again.

The assumed origin of the *S. pneumoniae* is the playgroup the young boy attends every morning from Monday to Friday. It consists of 4 boys altogether of which boy 1 is the youngest. Boy 2 is about 4 weeks older than boy 1, boy3 and boy4 were almost 2 years old at the time of the episode. Two weeks before the onset of the conjunctivitis in boy1 boy4 had to stay at home for a week due to fever and cough and was put on antibiotics (amoxicillin/clavulanic acid). Five days after the onset of the illness in boy4 boy3 developed an otitis media and high fever and was put on antibiotics (amoxicillin/clavulanic acid), too. After 24 hours of treatment he attended the playgroup again. Three days after the onset of the conjunctivitis in boy1 boy 2 was seen at the Children's hospital emergency room due to acute otitis media and high fever (40°C). He was put on antibiotics (unknown substance) and stayed at home for about one week (Table 1).

Unfortunately during the illnesses of boy 2,3 and 4 no samples for microbiological analysis were collected.

Protection against invasive pneumococcal infection can be achieved by vaccination with one of the available vaccines. However, protection is serotype specific [15]. Therefore the extent of protection is dependent on the type of vaccine used. The PCV7 (which is no longer available) and the PCV13 vaccines are conjugated vaccines which protect against serotypes **1, 3,** 4, **5, 6A**, 6B, **7F,** 9V, 14, 18C, **19A,** 19F, 23F (bold: only PCV13). The 23-valent polysaccharide vaccine protects against

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	Age at episode	Vaccination status	Clinical symptoms	Illness caused by	Antibiotics
Boy 1	16 months	Yes 3×PCV7 1× PCV13 (2009/2010)	Conjunctivitis, running nose, cough	*S. pneumoniae* serotype3	No
Boy 2	17 months	No	Otitis media, fever	unknown	Yes
Boy3	2 years	Unknown	Otitis media, fever	unknown	Yes
Boy 4	2 years	Yes 4×PCV7 (2008/2009)	Fever, cough	unknown	Yes
Father boy1	40 years	No	Cough, fever, sinusitis, bronchitis	*S. pneumoniae* serotype3	Yes
Mother boy 1	37 years	Yes 1×PPV23 (2006)	none	No illness	No
Parents boy 2, 3, 4	No information	No information	No information	No information	No information

Table 1: Synopsis of age, vaccination status and clinical data.

serotypes 1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 20, 22F, 23F, 33F. Protection against serotype 3 infections can only be achieved by administration of PCV13 or PPV23. The capsule polysaccharides of serotype 3 are not included in the PCV7. Therefore only boy1 and the mother of boy1 can be considered protected against serotype 3 infections. This is in very good concordance with the events i.e. the two persons who suffered only from light disease or remained healthy, had received a vaccine which is capable of conveying protection against serotype 3 pneumococcal diseases.

We consider this to be a good example for the protective power of pneumococcal vaccines and perhaps this report can initiate a discussion about extending vaccination recommendation to parents of children <5 years of age.

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