DTPa-HB-IPV-Hib vaccine (Vaxelis® and Infanrix hexa®)

Vaxelis® is a combination vaccine designed to protect infants and young children against diphtheria, tetanus, pertussis, hepatitis B, polio and Haemophilus influenzae type b (Hib). It was added to the National Immunisation Program (NIP) on 1 July 2023 as an alternative vaccine to Infanrix hexa®, for use in for children at 2, 4 and 6 months of age.

This article contains six general facts and six disease-specific facts about Vaxelis that were discussed at the PHN-ISP Coffee Hour in July 2023.

General facts

- Vaxelis contains 12 antigens, while Infanrix hexa has 10 antigens. The additional antigens in Vaxelis are pertussis fimbriae type 2 (FIM2) and pertussis fimbriae type 3 (FIM3). Common antigens to both vaccines include diphtheria toxoid, tetanus toxoid, pertussis toxoid (PT), pertussis filamentous haemagglutinin (FHA), pertussis pertactin (PRN), hepatitis B, poliovirus type 1, poliovirus type 2, poliovirus type 3 and Hib polyribosyl ribitol phosphate (PRP).

- Vaxelis has an extensive history of use in other countries: it was approved by the European Medicines Agency in 2016, while in the US it was licensed in 2018 and became commercially available in June 2021. Vaxelis is widely regarded as safe, with no specific safety concerns reported and millions of doses having been administered overseas to date.

- Vaxelis can be co-administered with all other scheduled vaccines at each NIP schedule point. A study conducted in Sweden and Italy showed no safety concerns when Vaxelis was co-administered with Rotarix® at 2 and 4 months. In the same study, Vaxelis also narrowly met the non-inferiority criterion when compared to Infanrix hexa for antibody response to rotavirus. In relation to 13vPCV, in a US study that used the same pneumococcal vaccination schedule as Australia, Vaxelis met the non-inferiority criteria compared to Infanrix hexa for all pneumococcal serotypes except serotype 6B. However, serotype 6B is less commonly associated with invasive pneumococcal disease in Australia. In contrast, a UK study with a different 13vPCV schedule (dose 1 at 3 months and dose 2 at 12 months) found similar immunogenicity between Vaxelis and Infanrix hexa. No safety concerns related to co-administration were found in either study.

- A clinical trial was conducted in the UK in which Vaxelis was co-administered with the 4CMenB vaccine (Bexsero®) at 2 months and 4 months of age, following the UK schedule. The trial protocol included pre-vaccination paracetamol, making it challenging to assess any increased risk of fever with this combination of vaccines. However, no specific safety concerns were identified. In the same UK study, after the first dose of Bexsero the Vaxelis group displayed slightly higher immunogenicity to all three meningococcal B antigens, while after the second dose of Bexsero the Infanrix hexa group had slightly higher immunogenicity to two out of the three meningococcal B antigens. However, the sample sizes were too small to allow a clear interpretation of these findings or to determine if the Hib component of Vaxelis (PRP conjugated to the outer membrane protein of meningococcal B) interfered with immune response to Bexsero.

- While it is preferred to remain with the same vaccine brand for the 2-, 4- and 6-month doses, Vaxelis can be used interchangeably with Infanrix hexa if necessary. In a Spanish study, infants were given an alternating schedule of Vaxelis/Pediacel®/Vaxelis, and by 7 months of age they displayed sufficient antibody levels for all six components of Vaxelis, including hepatitis B, despite Pediacel not containing any hepatitis B antigens.

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- Both Vaxelis and Infanrix hexa contain aluminium adjuvants, with the same chemical composition but in different quantities. Specifically, Vaxelis has less aluminum phosphate and aluminum hydroxyphosphate sulfate compared to Infanrix hexa. While this does not change the immunogenicity or safety of either vaccine, it may be useful to know when faced with a parent or caregiver with this specific concern

Disease-specific facts

- **Diphtheria**: Immunogenicity against diphtheria after three doses of Vaxelis showed mixed results when compared head-to-head against Infanrix hexa. One study found no statistical difference between Vaxelis and Infanrix hexa, while a smaller study reported a lower antibody response from Vaxelis compared to Infanrix hexa. Over time, however – by 13 months of age – there was no statistically significant difference between the two vaccines.

- **Tetanus**: Both Vaxelis and Infanrix hexa demonstrate excellent immunogenicity against tetanus, with 100% of participants achieving protective antibody titres one month after three doses. Further, at 13 months of age, all participants still maintained protective antibody levels.

- P**ertussis**: Vaxelis contains five pertussis antigens, whereas Infanrix hexa has three. However, Vaxelis contains lower quantities of each antigen compared to Infanrix hexa. It is not known exactly how each pertussis antigen contributes to the overall effectiveness of either of these vaccines against pertussis. Therefore, the additional pertussis antigens in pertussis do not necessarily translate to better protection.

- **Hepatitis B**: There was no statistical difference in antibody levels after three doses between Vaxelis or Infanrix hexa. Two European studies showed that there was no difference in antibody levels between children who received Vaxelis or Infanrix hexa at 4–5 years of age. Additionally, at 8–9 years of age, 98.9% of children who had received three infant doses and one toddler dose of Vaxelis demonstrated a satisfactory antibody response when challenged with an additional dose of the hepatitis B vaccine.

- **Polio**: Vaxelis and Infanrix hexa contain the exact same strains and quantities of each poliovirus antigen. Both vaccines elicit excellent immunogenicity against polio, with 99–100% of participants achieving protective antibody titres against each type of poliovirus one month after three doses and maintaining these protective levels at 13 months of age.

- ***Haemophilus influenzae* type b (Hib)**: Vaxelis proves to be immunogenic in children with additional risk factors for severe Hib disease, such as indigenous children and preterm infants. It shows no statistical difference in Hib antibody response between preterm and term infants.

A link to the recording of this presentation from the August PHN-ISP coffee hour can be found **here**.
NCIRS also has webpage **DTPa-HB-IPV-Hib vaccine (Vaxelis® and Infanrix hexa®)** which provides key points, frequently asked questions and useful links.