Acellular pertussis vaccine (APV) contain single B. pertussis specific antigens. All of them contain pertussis toxoid, most also 1 to 4 further antigens (pertactin, filamentous haemagglutinin and fimbriae types 2 and 3) in various quantities and combinations. In contrast, whole-cell pertussis vaccines (WCV) consist of killed B. pertussis organisms. APV are less reactogenic than WCV. They all induce B pertussis specific serum antibodies in various quantities, but no reliable serologic correlate of protection is known. Vaccine efficacy has been established in large trials for several ACV and WCV. There is no uniform pattern that the one or the other type of vaccine would consistently be of superior efficacy compared to the other.

Lifelong universal immunization approach and its elements:

- **immunisation in pregnancy**
  Lifelong pertussis immunisation should begin before birth, i.e. by immunizing pregnant women. This provides two-fold protection: direct protection to the pregnant woman and indirect protection to the newborn via transplacental transfer of maternal anti-pertussis IgG antibodies.

- **timely immunisation of infants**
  Timely immunisation at the earliest recommended time point (usually 6 to 8 week of age) is of utmost importance as already 1 dose of vaccine offers significant protection from severe pertussis disease and this will be optimized by timely administration of further doses.

- **pre-school boosters**
  After the primary series in the first (and second) year if life, protection is solid for a few years but then it gradually wanes. Therefore, a booster at around 5 or 6 years of age – e.g. before the child will attend school – is reasonable and will prolong protection.

- **adolescent age boosters**
  After the pre-school booster dose, immunity against pertussis again will gradually wane. Therefore, a further booster dose in adolescents makes sense and is a recommendation that more and more countries have and will adopt.

- **boosters in adults**
  Adults are a major source of transmission of B. pertussis to infants. Since protection after the booster dose in adolescence again will wane, a reinforcing booster dose in adults is reasonable. Defining the optimal interval is challenging, because waning is a continuous process. In contrast to diphtheria and tetanus...
toxoids, pertussis antigens would need to be given fairly often in order to optimize protection. Without the availability of stand-alone acellular pertussis vaccines a good compromise regarding the optimal schedule needs to be found on a country level.

Risk group based approach and its challenges

- **cocooning around newborns**
  Cocooning, i.e. immunisation of close contact persons of newborns, is quite challenging. Yet, despite all of its shortcomings and difficulties in implementation, its value should not be underimmunised. It offers a unique chance to not only indirectly protect the newborns, but it also provides individual protection of the immunized individuals way beyond the critical phase of the newborn.

- **health care professionals**
  Pertussis does occur in hospitals and other health care settings sporadically but may also cause outbreaks which raise concern lead to significant morbidity amongst patients. Further, they lead to physical and emotional stress and absence from work amongst affected health care professionals (HCP). Finally they are a financial burden for the involved institutions. Therefore it is reasonable to recommend pertussis immunisation to HCP thereby ensuring the optimal safety of patients and HCP themselves.

**Topic conclusions**

Acellular pertussis vaccine is most widely used in European countries. Vaccine induced protection wanes therefore booster doses are needed. Lifelong immunisation starting from immunisation in pregnancy, universal immunisation of infants, boosting of toddlers and teens and boosting of adults every 10 years are considered to be the goals of the lifelong immunisation.

**Final notes**

Pertussis is a re-emerging infection worldwide. Pertussis case definitions are prepared by ECDC, however surveillance of pertussis in Europe is not harmonized. Acellular pertussis vaccine is most widely used in European countries. Immunisation in pregnancy is considered as an important tool in prevention of pertussis in new-born and as a step of the strategy of lifelong immunisation.