ssDNA viruses in swine: from subclinical infections to devastating diseases






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- Comprise three major virus families:
  - *Anelloviridae*
  - *Circoviridae*
  - *Parvoviridae*

- Associated risks:
  - Most if not all of them are already circulating in the swine farms worldwide
  - Moderate to high mutation rate (especially circoviruses)
  - Evidence of at least one existing endemic pathogen causing a pandemic (*Porcine circovirus 2* [PCV-2]) by late 90s and early 2000s – huge economic losses (900 million €/year in Europe)
  - Subclinical infections are detrimental for performance (i.e., PCV-2 on average daily weight gain: loss of 10-40 g/day)
  - Continuous discovery of new ssDNA viruses in swine – increasing evidence of association with disease
  - One health – xenotransplantation and presence of viral DNA in medicinal products

ssDNA viruses in swine: disease association

- Anelloviruses – 3 species in swine
  - Evidence of increased viral load in co-infections
- Circoviruses – 4 species in swine
  - PCV-2 well established pathogen; the most used vaccine in the world
  - PCV-3 is associated to reproductive and post-natal disease
  - PCV-4 has unknown outcome but found in different disease outcomes
- Parvoviruses – multiple species (7 parvoviruses, 4 bocaviruses)
  - PPV1 well established pathogen; sow vaccination worldwide
  - High viral load of different PPVs have been found in sick pigs

- CRUCIAL FACT: these viruses need activation of the immune system (blastogenesis) to replicate – co-infections and vaccinations as potential triggering factors for disease outcome

ssDNA viruses in swine: major research gaps

- ssDNA viruses represent a dynamic system with the potential for emergence of important new natural variants with altered properties – viral prospective is needed in the swine population
- Lack of reagents and basic viral detection techniques (for some cases only PCR is available) including viral isolation in some cases
- Lack of animal models to study pathogenesis
- Epidemiology and geographical distribution
- Association with disease outcome – meaning of high viral loads
- Role of co-infections in disease outcome – high frequency of detection with other pathogens
- Subclinical effect and its impact on production
- Immunity – correlates of protection