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A novel recombinant virus-like particle vaccine for prevention of porcine parvovirus-induced reproductive failure

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Abstract

A novel vaccine against porcine parvovirus (PPV), composed of recombinant virus-like particles (PPV-VLPs) produced with the baculovirus expression vector system (BEVS) at industrial scale, was tested for its immunogenicity and protective potency. A formulation of submicrogram amounts of PPV-VLPs in a water-in-mineral oil adjuvant evoked high serum antibody titres in both guinea pigs, used as reference model, and target species, pigs. A single immunisation with 0.7 μg of this antigen yielded complete foetal protection against PPV infection after challenge with a virulent strain of this virus. Furthermore, also in the presence of mild adjuvants the protective action of these PPV-VLPs is excellent. This recombinant subunit vaccine overcomes some of the drawbacks of classical PPV vaccines.

Keywords: Porcine parvovirus; Virus-like particles; Vaccine; Recombinant

1. Introduction

Porcine parvovirus (PPV) is an autonomously replicating member of the feline parvovirus subgroup of the genus parvovirus within the family Parvoviridae [1,2]. Parvoviruses have a single-stranded DNA genome encapsidated by an non-enveloped icosahedral particle of 25 nm in diameter that is composed of three structural proteins: VP1, VP2 and VP3, of which VP2 is the major component [3].

PPV is an extremely durable and highly infectious virus. One of the major consequences of PPV infection in swine is reproductive failure, characterised by foetal death and mummification [4,5], in addition to its role in porcine respiratory disease complex [6], and post-weaning multi-systemic wasting syndrome [7,8]. When susceptible adult pigs are exposed to PPV at mating or during gestation, the virus readily crosses the placental barrier and infects the embryos or foetuses. Litters infected with PPV may have variable numbers of affected foetuses due to intrauterine spread of the virus between foetuses [9]. The stage of gestation at the time of a PPV infection mainly determines the resulting clinical manifestations. When transplacental infection of PPV occurs before 35 days of gestation, resorption of some or all foetuses takes place, resulting in a reduction of the litter size or return to service. If an infection occurs between day 35 and day 70 of gestation, one or more foetuses may die and mummificate. Infections

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