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Research Article

Generation of Recombinant Porcine Parvovirus Virus-Like Particles in *Saccharomyces cerevisiae* and Development of Virus-Specific Monoclonal Antibodies

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Porcine parvovirus (PPV) is a widespread infectious virus that causes serious reproductive diseases of swine and death of piglets. The gene coding for the major capsid protein VP2 of PPV was amplified using viral nucleic acid extract from swine serum and inserted into yeast *Saccharomyces cerevisiae* expression plasmid. Recombinant PPV VP2 protein was efficiently expressed in yeast and purified using density gradient centrifugation. Electron microscopy analysis of purified PPV VP2 protein revealed the self-assembly of virus-like particles (VLPs). Nine monoclonal antibodies (MAbs) against the recombinant PPV VP2 protein were generated. The specificity of the newly generated MAbs was proven by immunofluorescence analysis of PPV-infected cells. Indirect IgG ELISA based on the recombinant VLPs for detection of PPV-specific antibodies in swine sera was developed and evaluated. The sensitivity and specificity of the new assay were found to be 93.4% and 97.4%, respectively. In conclusion, yeast *S. cerevisiae* represents a promising expression system for generating recombinant PPV VP2 protein VLPs of diagnostic relevance.

1. Introduction

Porcine parvovirus (PPV), first isolated from sows in Germany [1], has been found to occur worldwide [2–4]. PPV is the major causative agent in a syndrome or reproductive failure in swine. This syndrome is characterized by stillbirth, mummified fetuses, early embryonic and fetal death, delayed return to estrus, and infertility (abbreviated as *SMEDI*) [5, 6]. PPV is also shown to be an agent able to increase the effects of porcine circovirus type 2 infection in the clinical course of postweaning multisystemic wasting syndrome [7], which is a significant disease in global swine production [8].

Five different groups of porcine parvoviruses (PPV) have been identified: classic PPV (PPV1), PPV2, PPV3 (known as porcine PARV4, hokovirus, or partetravirus), and PPV4 and porcine bocaviruses, which all have substantial genetic divergence [9–12]. Recently, a new parvovirus provisionally proposed to be named as PPV5 was discovered in the United States [13].

Classic PPV has one serotype subdivided into four clinical genotypes (biotypes) according to their pathogenicity. The NADL-8 strain can cause viremia and crosses the placenta to infect fetuses, leading to fetus death [14]. In contrast, nonpathogenic NADL-2 strain is currently widely used as an attenuated vaccine and causes only limited viremia without crossing the placental barrier in experimental infections [15]. The other two groups are the Kresse and IAF-A83 strains, which are associated with dermatitis and enteric diseases, respectively [16].