Deletion of the African swine fever virus gene DP148R does not reduce virus replication in culture but reduces virus virulence in pigs and induces high levels of protection against challenge

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Abstract

Many of the approximately 165 proteins encoded by African swine fever virus do not have significant similarity to known proteins and have not been studied experimentally. One such protein is DP148R. We showed that the DP148R gene is transcribed at early times post-infection. Deletion of this gene did not reduce virus replication in macrophages showing that is not essential for replication in these cells. However deleting this gene from a virulent isolate, Benin 97/1, dramatically reduced the virulence of the virus *in vivo*. All pigs infected with the BeninΔDP148R virus survived infection showing only transient mild clinical signs soon after immunisation. Following challenge with the parental virulent virus all pigs immunised by the intramuscular route (11/11) and all except one immunised by the intranasal route (5/6) survived. Mild or no clinical signs were observed after challenge. As expected control non-immune pigs developed signs of acute ASF. Virus genome and infectious virus were observed soon after immunisation coincident with the onset of clinical signs (~10^6 genome copies or $TCID_{50}$/ml). Levels of virus genome declined over an extended period of up to 60 days post-immunisation. In contrast infectious virus was no longer detectable by days 30 to 35. IFN-γ was detected in serum between days 4 and 7 post-immunisation, and IFN-γ producing cells were detected in all pigs analysed following stimulation of immune lymphocytes with whole virus. ASFV specific antibodies were first detected from day 10 post-immunisation.

Importance

African swine fever (ASF) is endemic in Africa, parts of the Trans Caucasus, Russian Federation and several European countries. The lack of a vaccine hinders control. Many of the ASF virus genes lack similarity to known genes and have not been characterised. We have shown that one of these, DP148R, is transcribed early during virus replication in cells and can be deleted from the virus genome without reducing virus replication. The gene deleted virus, BeninΔDP148R caused mild clinical signs in pigs and induced high levels of protection against challenge with parental virulent virus. Therefore deletion of this gene can provide a target for rational development of vaccines.