Custom-engineered chimeric FMD vaccine elicits protective immune responses in pigs

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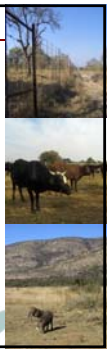
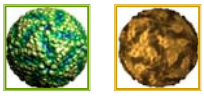
Introduction



- The financial impact of the 2009 FMD outbreak in South Africa was R25 million
- Certain FMDV are unsuitable as vaccine candidates
- Conventional cell adaptation is tedious and costly and may also alter the antigenic composition of the virus
- SAT types display high genomic and antigenic variation: serious implications for the control of the disease by vaccination
- Production of efficient vaccines necessitates the use of good vaccine strains: rapid growth in cells, high yields of stable antigen and appropriate immunological specificity
- Chimeric SAT type FMDV was engineered to produce conventional, chemically inactivated vaccine as an alternative control measure for FMD

Objectives

- Characterisation of phenotypic and antigenic properties
- Determination of the immune responses elicited in guinea pigs
- Comparison of the immune response evoked in pigs and the level of protection following challenge with live virus



vKNP/SAT2 KNP/196/91

Summary

FMDV genome can accommodate molecular manipulation: engineering of recombinant viruses to be used in vaccine production by introduction of the external capsid region of a field isolate

Chimera viruses retains properties of the parental virus

Recombinant viruses can be successfully propagated, inactivated, purified and formulated as vaccines with commercial oil-based adjuvant

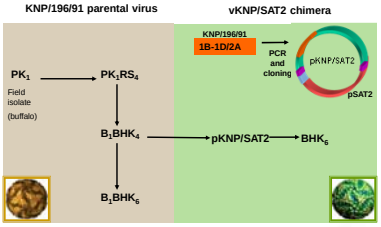
Similar immune responses induced in guinea pigs for both vaccines, indicating similar immunological profiles for the respective viral capsids

Vaccine containing chimera antigen induced significant immune responses in pigs to protect animals against homologous virus challenge

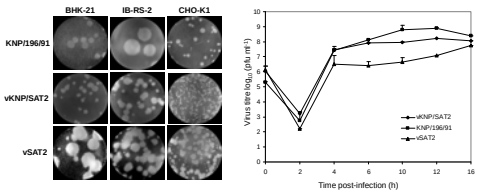
Formulated FMD recombinant vaccine was stable for 9 months

Results

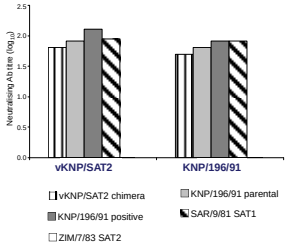
Generation of chimera and parental vaccine stocks



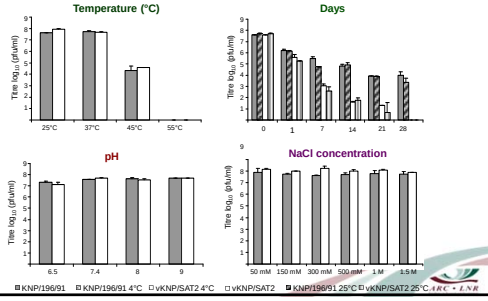
FMDV replication in cell culture



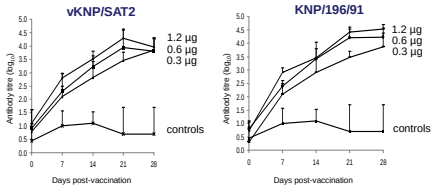
Antigenic profiles of vKNP/SAT2 and KNP/196/91 viruses



Biophysical properties of FMDV



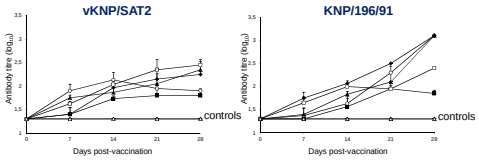
Guinea pig antibody titres in relation to vaccine dose



Chimera and parental vaccines: inactivated 146S antigens as double oil emulsions with Montanide ISA 206

Sera tested in a KNP/196/91-specific sandwich ELISA

Full potency test in pigs induces FMDV-specific antibody responses

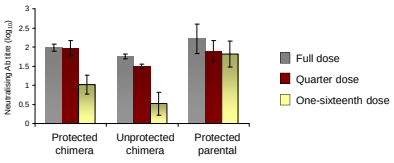


Potency test: Full dose 6 µg
Quarter dose 1.5 µg
One-sixteenth dose 0.375 µg

Sera tested in a KNP/196/91-specific solid-phase competition ELISA (SPCE)

Challenge with 10^4 PID_{50} FMDV at 28 dpv

Comparison of neutralisation titres and protection

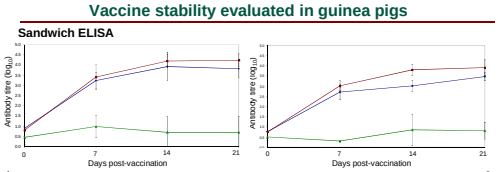


PD50 for vKNP/SAT2 chimera vaccine: >6.4

KNP/196/91 parental vaccine: >39.4

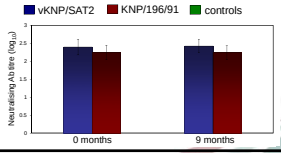
Vaccine stability evaluated in guinea pigs

Sandwich ELISA



0 months 9 months

VNT



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Thank you... Vielen Dank... Dankie

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