HIGH POTENCY VACCINES INDUCE PROTECTION AGAINST HETERLOGOUS CHALLENGE
WITH FOOT-AND-MOUTH DISEASE VIRUS

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ABSTRACT

Introduction
While generally serological r-values are used to assess the ability of vaccines to protect against foot-and-mouth disease (FMD) field strains, there is a lack of experimental cross protection studies. Therefore, we investigated the capability of high potency type A vaccines to induce protection against heterologous challenge and also the correlation of protection and neutralization titres recorded for post vaccination sera.

Materials and methods
A series of three homologous and eight heterologous cattle challenge experiments was performed according to the protocol described in the European Pharmacopoeia monograph.

Results
It was shown that high potency vaccines against FMDV of serotype A can induce protection even against heterologous challenge infection with viruses that give low r-values with the vaccine strains. Three vaccines (A22Iraq24/64, AIran2/97, AIran22/99) with homologous PD50 values of at least 32 showed significant protection even against heterologous challenge with viruses showing low r-values.
The r-values were determined on the basis of full dose group mean titres and did not exceed 0.23. In six out of eight heterologous challenge experiments, the high potency vaccines still conferred a protection of at least six PD50. Therefore, in a situation when vaccination is considered, but no closely related vaccine is available, the usage of a high potency vaccine may be justified despite low r-values. The challenge virus specific neutralizing antibody response on the day of challenge (21 days post vaccination) generally correlated with protection.

Discussion
While the results of this study do not yet provide a sufficient statistical basis to establish a probit curve (titre vs. probability of protection), they already can be used to support a decision on the use of a vaccine. As the results of a heterologous challenge test would only be obtained after more than a month while the decision to vaccinate usually will have to be made very fast, field virus specific neutralizing antibody titres, which can be obtained within days, will provide valuable information.

However, it will have to be investigated if these results for serotype A are also valid for other serotypes. In serotype O cross challenge experiments, poor cross protection was found despite good r-values. Furthermore, VNT titres obtained by different groups with different test systems cannot be directly compared. In order to create a better scientific basis for the choice of vaccines, it is suggested to analyse sera produced during this and related projects also in other laboratories and with other methods for comparison. There also is an urgent need to address protection against newly emerging strains, e.g. recent type A strains circulating in the Middle East. In particular, vaccine trials with the O PanAsiaII strain have to be performed because of the recent increase of clinical apparent type O outbreaks in Turkey despite the use of apparently good vaccines and relatively high r-values. This might be interpreted as an indication that this strain has an increased intrinsic ability to overwhelm protection. It should be examined whether this is true and if so, which mechanisms might be responsible.