THE EFFECTIVENESS OF AN INACTIVATED COMBINED IBR/IPV VACCINE FOR SANITIZATION OF A BHV 1 INFECTED DAIRY HERD

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INTRODUCTION

Infectious bovine rhinotracheitis, pustular vulvovaginitis caused by the bovid herpesvirus type 1 (BHV 1) is a contagious, febrile disease of cattle which is associated with respiratory disease, fertility disorders, abortions and, rarely, encephalitis (8). The disease occurs worldwide and, as is commonly observed with other herpesviruses, BHV 1 frequently induces latent infections after natural exposure or vaccination with live virus vaccines (8).

In many countries coordinated sanitization programs are therefore being employed. The basics of combatting IBR/IPV viral infections of cattle in Germany are culling or vaccination of seropositive animals with an attenuated and/or inactivated vaccine (7). Herds with a high seroprevalence rate are preferably vaccinated with an attenuated vaccine, whereas by low seroprevalence rates individual animals are either culled or an inactivated vaccine is used (7). Because of the lifelong latent infections after application of live vaccines (3,5,8)a long term investigation was geared to the question of whether an inactivated combined IBR/IPV vaccine could reduce or prevent new infections in a dairy herd with a high seroprevalence rate for BHV 1.

MATERIAL AND METHOD

The examinations were performed in a dairy herd initially consisting of 123 animals including heifers and male beef calves. The numbers of the various breed animals were as follows: german black pied (n=70), Jersey (n=12), Limousine (n=11), german red pied (n=7), german Gelbvieh (yellow cattle) (n=3), Simmentaler (n=2), Hereford (n=2), and Hinterwälder (n=1). The lactating cows, calves and young animals as well as dry cows and beef cattle were held in separate sectors of the same stable. Breeding heifers were housed in a second building. Furthermore, a group of seven heifers were held in a third more remote building in loose housing.

The sanitization program involved the following measures:

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With the exception of the seven aforementioned heifers, which were shown to be serologically negative for BHV 1, the remaining 116 animals over six months of age were vaccinated twice with the IBR/IPV vaccine BOVIGRIP plus^{R} (Fa. Hoechst, Germany). After every six months subsequent booster shots were given according to the serological results solely to the positive animals.

Prior to the first, second and third vaccination nasal and vaginal swab samples were taken for virological examination. Additional animals brought into the farm were examined for BHV 1 antibodies and vaccinated when positive.

Serological examinations for antibodies against BHV 1 were determined by means of a microneutralisation test. 100 TCID50 of the virus were mixed with log 2 dilutions of the serum and incubated for one hour at 37° C. Titers ≥1:2 were considered positive.

Nasal and vaginal swab samples were suspended in Eagles Minimal Essential Medium and inoculated onto monolayers of fetal calf lung cell cultures. Cytopathic isolates were identified with direct immunofluorescent antibody assay using an IBR/IPV conjugate (Fa. Bioveta Nitra, CSFR).

RESULTS

In spring 1987, prior to vaccination, 114 animals out of the total of 123 (92.7%) were serologically positive for BHV 1. Only two lactating cows (one Hinterwälder and a german black pied) as well as the seven heifers held in the separate building were shown to be negative.

Of the swab smears taken prior to the first vaccination BHV 1 was isolated in three cases; one lactating cow, one of the beef cattle and one of the heifers housed in the second building. The following virological studies performed prior to the 2nd and 3rd vaccination gave negative results, although, seroconversions to BHV 1 were determined in 3 animals between November 1987 and May 1988.

Of 40 paired serum samples collected from cows before and 8 weeks after the 3rd vaccination 15 showed a significant rise (≥4 fold) in their antibody titer, whereas the titers of the other 25 animals remained unchanged.

At the time of the present intermediate evaluation of the study the herd consists of 93 animals older than 6 months of age, only 18 of which are serologically positive for BHV 1. This indicates a reduction in the seroprevalence rate from 92.7% (1987) to 19.4% (1991).

DISCUSSION

Systematic BHV 1 disease control in cattle herds follow various strategies such as culling or vaccination of carrier animals (4,5,8). Due to the enormous financial burden resulting from consequential culling, vaccination programs for combatting BHV 1 infections are prefered in countries having a comparatively high infection rate like in Germany. Extensive examinations showing that the vaccination of BHV 1 infected cattle suppress viral spreading provided the basics for this strategy (2,4,5,9).

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The guidelines set forth for controlling IBR/IPV in Germany assign the use of attenuated live vaccines in herds with high infection rates (7). It should, however, be determined whether live vaccines can be substituted with an inactivated vaccine (BOVIGRIP plus^{R}).

In a dairy herd with a high rate of infected animals (92.7%) the seroprevalence rate was decreased to a level of 20% within 5 years by regular vaccination of positive animals and breeding of negative animals. Serological controls of the animals involved were done at 6 month intervals to detect newly infected animals.

These results are in accordance with similar studies using live vaccines in which 20 to 50% of the animals in the respective herds were reported to be serologically positive 5 years after beginning vaccination (6).

In our study only three initially seronegative animals seroconverted between November 1987 and May 1988. This has been frequently reported in other references of vaccination programs (2,6,7,9). Several factors have been discussed as possible causes: 1) uncontrolled buying of infected animals 2) latent infected, but serologically negative animals and 3) contact with viral shedders (pasture) (6). Regarding the holding conditions described above the third explanation is the most plausible.

The fact that additional infections occur in herds which are being sanitized shows the necessity for repeated serological examinations at short intervals as was performed in our study(2).
By examination of paired serum samples collected from 40 cows before and after their 3rd vaccination a booster effect could be shown solely in 15 cases. Although a large number of animals apparently were not boostered, when regarding the humoral immune response, no additional infections occurred in serologically negative animals which were restabled to these cows over the entire period of examination (4.5 years). This indicates that the level of the antibody titer is of limited value for predicting the immune status in individual animals (1). Under practical conditions qualitative serological results are believed to be sufficient for determining the success of vaccination.

CONCLUSION

The findings of the present study indicate that high BHV 1 seroprevalence rates in cattle herds do not necessitate the use of live vaccines for combatting the disease. With regular applications of an inactivated safe vaccine and repeated serological examinations similar results were achieved compared with studies using live vaccines (2).

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SUMMARY

Presented is a sanitization program using an inactivated combined IBR/IPV vaccine (Bovigrip plus) in a dairy herd (123 animals) with 92 % BHV 1 infected cattle. With the exception of seven serologically negative, separately housed animals the remaining 116 cattle were vaccinated twice at a six month interval. Booster shots were subsequently given every six months, combined with serological control examinations. All the animals (n=3) which seroconverted after the vaccination program was started were immediately integrated into the vaccination procedure. Prior to the beginning of the program bovid herpes virus type 1 was isolated from nasal and vaginal swab samples.

With controlled breeding of serologically negative animals the seroprevalence rate decreased from 92 % to less than 20 % within five years.

In combatting BHV 1 infections in dairy herds with high seroprevalence rates the use of inactivated IBR/IPV combined vaccines appears very promising. However, regular vaccination and repeated serological control examinations are recommended.

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ZUSAMMENFASSUNG

Es wird am Beispiel einer Milchviehherde (123 Tiere) mit über 92% BHV 1 infizierten Rindern über ein Sanierungsverfahren mit einer inaktivierten IBR/IPV Kombinationsvakzine (Bovigrip plus^{R}) berichtet.
Mit Ausnahme von sieben im Neutralisationstest IBR/IPV serologisch negativen Tieren wurden die restlichen 116 Rinder zweimal im Abstand von sechs Monaten geimpft. Wiederholungsimpfungen erfolgten in halbjährlichen Intervallen, kombiniert mit serologischen Kontrolluntersuchungen. Alle Tiere (n=3), die nach Beginn des Impfprogrammes eine Serokonversion aufwiesen, wurden umgehend in die Vakzination einbezogen. Vor Beginn des Sanierungsverfahrens konnte aus Nasen- und Vaginaltupferproben von drei Tieren bovines Herpesvirus Typ 1 (BHV 1) isoliert werden.

Durch kontrollierte Nachzucht serologisch negativer Tiere fiel in der Herde innerhalb von fünf Jahren die Seroprävalenzrate von 92% auf unter 20%.

Zur Bekämpfung der BHV 1 Infektion in Milchviehherden mit hohen Seroprävalenzraten ist demnach auch die Verwendung inaktivierter IBR/IPV Kombinationsvakzinen erfolgversprechend. Voraussetzungen sind jedoch regelmäßige Impfungen (alle sechs Monate) und wiederholte serologische Kontrolluntersuchungen.

RESUME

A l'exemple d'un troupeau de vaches à lait (123 betes) composé de bovides infectés à 92 % par le virus BHV 1, il sera rendu compte d'une méthode d'assainissement par l'utilisation d'un vaccin combiné inactivé IBR/IPV (Bovigrip plus^{R}).

Mis à part sept betes, sérologiquement négatives lors du test de neutralisation IBR/IPV, on a vacciné à deux reprises les 116 autres betes en l'espace de six mois. Les vaccinations de renouvellement ont été effectueés dans un intervalle de six mois et combineés à des controles sérologiques. Tous les animaux (n=3) chez les quels on a constaté une conversion sérologique après le commencement du programme de vaccination, ont été immédiatement inclus dans le processus de vaccination. Avant de commencer l'assainissement et suite à des prélèvements effectués avec des tampons d'ouate dans les naseaux et le vagin, il avait été possible d'isoler chez trois bovidès le virus herpes bovines (BHV 1).

Par un élevage postérieur controlé des animaux sérologiquement négativs le taux de prédominance sérologique est passé en lèspace de cinq ans de 92 % a` moins de 20 %.

Pour combattre l'infection due au virus BHV 1 dans un troupeau de vaches à lait avec un taux de prédominance sérologique élevé, l'utilisation d'un vaccin combiné inactivé IBR/IPV s'avère prometteuse. Des vaccinations régulières et des controles sérologiques répétés en restent cependant la condition.

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