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RESEARCH ARTICLE

Importance of Vaccination Against Atrophic Rhinitis in Pigs on Average Daily Gain and Mortality Rate

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Summary

The aim of this study was to investigate the effect of pigs, sows and piglets vaccination against atrophic rhinitis (AR) on the production results, the average daily gain (ADG) and mortality rate. Unvaccinated piglets, originating from vaccinated sows had a slightly higher ADG and only slightly less mortality than the control piglets (unvaccinated piglets and their mothers). Vaccinated piglets had a significantly higher ($P<0.01$) ADG and almost twice lower mortality rate than piglets unvaccinated, whether originating from vaccinated or unvaccinated mothers. Based on the observed results it is concluded that vaccination of pigs against AR significantly increases ADG and reduces mortality, and vaccination of sows against AR only slightly improves production performance and it is not economically justified for the studied farm.

Keywords: *Atrophic rhinitis, Vaccination, Average daily gain, Mortality rate, Pig*

Domuzlarda Atropik Rinite Karşı Aşılamanın Ortalama Günlük Kazanç ve Mortalite Oranı Üzerindeki Önemi

Özet

Bu araştırmanın amacı, domuzların, dişi domuzların ve domuz yavrularının atropik rinite (AR) karşı aşılamalarının üretim sonuçları, günlük kazanç oranı (ADG) ve mortalite oranı üzerine etkisini araştırmaktır. Aşılanmış domuz, yavruları aşılanmış ya da aşılanmamış annelerden olup olmadığına bakılmaksızın aşılanmamış yavrulara göre yüksek ADG ($P<0.01$) ve neredyse iki kat düşük mortalite oranı gösterdiler. Bu sonuçlara dayanarak, domuzlarda AR'e karşı aşılamanın önemli derecede ADG'nı arttırdığı ve mortaliteyi düşürdüğü, ve dişi domuzların AR'e karşı aşılanmasının sadece az miktarda üretim performansını arttırdığı ve bunun çalışılan çiftliklerde ekonomik olarak anlamlı olmadığı sonucuna varılmıştır.

Anahtar sözcükler: *Atropik rinit, Aşılama, Ortalama Günlük Kazanç, Mortalite Oranı, Domuz*

INTRODUCTION

Gram-negative bacteria *Pasteurella multocida* and *Bordetella bronchiseptica* are the primary infectious etiologic factors of atrophic rhinitis (AR). It is characterized by the formation of thick dry crusts in a roomy nasal cavity, which are result of progressive wasting away or decrease in size (atrophy) of the mucous nasal lining (mucosa) and underlying bone [1]. The various symptoms include foetor (strong offensive smell), crusting/nasal obstruction, nosebleeds, anosmia (loss of smell) or cacosmia (hallucination of disagreeable odour), secondary infection, maggot infestation, nasal deformity, pharyngitis, otitis media and even, rarely, extension into the brain and its membranes [2]. Atrophic rhinitis can be classed as primary or, where it is a consequence of another condition or event, secondary. Infections of pigs with *P. multocida* and *B. bronchiseptica* can also result in bronchopneumonia [3,4]. Moreover, AR causes significant global economic loss in swine production due to growth retardation [5].

Vaccines to coritrol AR have exploited knowledge of

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the pathogenesis of AR. Vaccines have been assessed for efficacy in reducing clinical signs and lesions of AR following both natural challenge in field trials and artificial challenge in controlled experiments [5]. Researchers have also evaluated the efficacy of AR vaccines in improving the growth rate of pigs, eliminating infection by toxigenic *P. multocida* and *B. bronchiseptica* from a farm, and inducing immune responses in sows and piglets to these bacteria [6,7].

On the basis of this, the objective of this investigation was to evaluate the effect of commercial vaccines against AR on the average daily weight gain and mortality rate.

MATERIAL and METHODS

Experimental Animals

The experiment was performed on a pig farm, with a capacity of 2500 sows, with an intensive way of keeping the pigs infected with AR enclosed. Infection status was assessed by serologic testing and detection of *Pasteurellae* and *Bordatellae* genom in serum. The experiment was performed on 4 groups of sows and their piglets (A, B, C and D) of the breeds Landras x Large Yorkshire hybrid (F_1), Large Yorkshire, and Landrace. Group A piglets originated from group A sows, group B piglets originated from group B sows, group C piglets originated from group C sows, and group D piglets originated from group D sows. All the animals had tags on their ears and a tattooed number.

Vaccinations of Animals

Animals were vaccinated with commercially vaccine against AR to the manufacturer's instructions (IDT Biologika GmbH). The vaccine had inactivated bacteria *Bordetella bronchiseptica* and inactivated bacteria *Pasteurella multocida* (A type and D type) and toxoid (dermonecrotoxin).

Vaccination of Sows

A total of 103 pregnant sows were used in this study. The health of the animals before vaccination was clinically normal. Two programs were performed: in groups A and B 50 sows were vaccinated twice at 5 and 2 weeks before parturition, and in groups C and D, 53 sows were unvaccinated. The vaccine was applied in 4 ml dosages, subcutaneous, behind the ear.

Vaccinations of Piglets

A total of 627 piglets were used in this study. Two programs were performed: in groups A and C 304 piglets were vaccinated twice at 35 and 56 days of age (the vaccine was applied in 1 ml dosages, subcutaneous, behind the ear), and in groups B and D 323 piglets were unvaccinated.

Average Daily Gain and Mortality

Each of the groups A and B contained 25 sows and their 152 piglets, group C contained 26 sows and their 152 piglets and group D (control group) contained 27 sows and their 198 piglets. The piglets were selected by random sampling method. After weaning, all piglets were housed in one building and were divided by 10 piglets per box. Average daily gain and mortality were monitored from 28th to 175th day of life.

Statistical Analyses

The data were processed by ANOVA and Post Hoc Test was used for comparison of the means of treatments. Statistical significance of differences between means was determined at the level of $P<0.01$.

RESULTS

Influence of Vaccination on Average Daily Gain of Pigs (ADG)

Table 1 presents the results of the ADG in tested piglets. In group A piglets (sows and piglets vaccinated) ADG values were significantly higher ($P<0.01$) than in group B piglets (sows vaccinated only). Between group A and group C piglets (vaccinated pigs only) there was no significant difference ($P>0.01$) in ADG. Group A piglets had significantly higher ($P<0.01$) ADG than group D piglets (control group). Group B piglets had significantly lower ($P<0.01$) ADG than group C piglets. At the same time, group B piglets had higher ($P<0.01$) ADG compared to control piglets (group D). Vaccinated piglets (group C) had significantly higher ($P<0.01$) ADG compared to the control group.

Influence of Vaccination on Mortality of Piglets

To determine the effect of vaccination against AR on mortality of piglets, mortality was calculated using the

Table 1. *Average daily gain*
Tablo 1. *Ortalama günlük kazanç*

Group	Frequency	Percent	Mean	SD	MIN	MAX
GROUP A	152	23.2	682	33.36	620	740
GROUP B	152	23.2	632	45.10	570	730
GROUP C	152	23.2	678	49.90	570	765
GROUP D	198	30,3	615	64.64	480	740
Total	654	100.0				

initial number of the piglets in each observed group on the 28th day of life. Group C piglets had the lowest number of deaths (5.3%), which is almost twice lower value compared to the control piglets (group D). Unvaccinated piglets whose mothers were vaccinated (group B) had a very high mortality (9.2%), almost as in control group piglets. Vaccinated piglets, whose mothers were also vaccinated, had a mortality of 6.6% *(Table 2)*.

Table 2. *Mortality rate (%)*
Tablo 2. *Mortalite oranı (%)*

Group			
A	**B**	**C**	**D**
6.6	9.2	5.3	10.1

DISCUSSION

The results of this study clearly indicate that vaccination of pigs against AR on studied farms significantly influenced the increase of the ADG and reduced mortality of piglets. Vaccinated piglets, originating from vaccinated and non-vaccinated sows had about 10% higher daily gain, reducing the feeding duration for 10 days as determined in their studies by Liao et al.[5]. In vaccinated piglets there were almost half the deaths than in non-vaccinated pigs [8]. Unvaccinated piglets, originating from vaccinated sows had a slightly higher ADG and only slightly less mortality than the control piglets. This is a consequence of the termination of colostral immunity and the occurrence of infection in the same piglets [9,10]. Evaluation of the safety and efficacy vaccines in this study suggest that they have potential in reducing the cost of AR in commercial farms. However, based on the experience of others [8,11], these vaccines are unlikely to eliminate the causative agents of AR, *P. multocida* and *B. bronchiseptica* from a farm. By vaccinating the piglets better production results were achieved. This justifies the vaccination economically and at the same time on the studied farm there is no need for sows vaccination. The vaccinated piglets originating from both vaccinated and unvaccinated sows show no significant difference in ADG and mortality rate is almost identical. Nielsen [12] found that there is no difference in ADG between piglets originating from vaccinated and unvaccinated mothers during lactation period. Considered that, as well as the results obtained in this study, where there is almost no significant difference in production results between unvaccinated piglets originating from vaccinated and unvaccinated sows, economic justification was not confirmed vaccination of sows on farm examined. In the previous researches performed by other authors [13,14] it has been established that vaccination of older pigs, has little benefit against clinical AR and is generally less effective than sow vaccination. However recent results in researches show that there is no difference between ADG and mortality rate with pigs derived from vaccinated and non-vaccinated sows. Distinction in ADG and mortality rate shall be shown in at a later stage of life, aged 90 days and over, so pigs vaccination has been recommended in herds in which AR causes have been established [15].

Vaccination of piglets has unquestionable beneficial effect but current vaccines are not able to eliminate the bacteria. Optimal results can only be obtained when vaccination is combined with husbandry and management measures such as all-in/all-out production, correct vaccination, hygiene, reduction of stocking density and avoiding of stress [16].

REFERENCES

1. Lee JM, Kang SY, Park SI, Woo HJ and Kwon MS: Molecular cloning and characterization of the gene for outer membrane protein H in a *Pasteurella multocida* (D:4) isolate from pigs with atrophic rhinitis symptoms in Korea. *J Microbiol Biotechnol*, 14, 1343-1349, 2004.

2. Sakano T, Okada M, Taneda A, Mukai T, Sato S: Effect of *Bordetella bronchiseptica* and serotype D *Pasteurella multocida* bacterin-toxoid on the occurrence of atrophic rhinitis after experimental infection with *B. bronchiseptica* and toxigenic type A *P. multocida*. *J Vet Med*, 59 (1): 55-57, 1997.

3. Brockmeier SL, Register KB, Magyar T, Lax AJ, Pullinger GD, Kunkle RA: Role of the dermonecrotic toxin of *Bordetella bronchiseptica* in pathogenesis of respiratory disease in swine. *Infect Immun,* 70, 481-490, 2002.

4. Davies RL, MacCorquodale R, Baillie S, Caffrey B: Characterization and comparison of *Pasteurella multocida* strains associated with porcine pneumonia and atrophic rhinitis. *J Med Microbiol,* 52, 59-67, 2003.

5. Liao CM, Huang C, Hsuan SL, Chen ZW, Lee WC, Liu CI, Winton JR, Chien MS: Immunogenicity and efficacy of three recombinant subunit *Pasteurella multocida* toxin vaccines against progressive atrophic rhinitis in pigs. *Vaccine,* 24, 27-35, 2006.

6. To H, Someno S, Nagai S: Development of a genetically modified nontoxigenic *Pasteurella multocida* toxin as a candidate for use in vaccines against progressive atrophic rhinitis in pigs. *Am J Vet Res*, 66 (1): 113-118, 2005.

7. Hsuan SL, Liao CM, Huang C, Winton JR, Chen ZW, Lee WC, Liao JW, Chen TH, Chiou CJ, Yeh KS, Chien MS: Efficacy of a novel *Pasteurella multocida* vaccine against progressive atrophic rhinitis of swine. *Vaccine,* 27, 2923-2929, 2009.

8. Kabay MJ, Mercy AR , Lloyd JM and Robertson GM: Vaccine efficacy for reducing turbinate atrophy and improving growth rate in piggeries with endemic atrophic rhinitis. *Australian Vet J,* 69 (5): 101-103, 1992.

9. Tizard IR: Veterinary Immunology. 6th ed., London, WB Sauders, 89: p. 223, 2000.

10. Rooke AJ, Carranca C, Bland MI, Sinclair GA, Ewen M, Bland CVI, Edwards AS: Relationship between passive absorption of immunoglobulin G by the piglet and plasma concentrations of immunoglobulin G at weaning. *Livestock Prod Sci,* 81, 223-234, 2003.

11. Foged NT, Nielsen JP, Jorsal SE: Protection against progressive atrophic rhinitis by vaccination with *Pasteurella multocida* toxin purified by monoclonal antibodies. *Vet Rec,* 125, 7-11, 1989.

12. Nielsen JP, Foged NT, Sorensen V, Barfod K, Bording A and Petersen SK: Vaccination against progressive atrophic rhinitis with a recombinant *Pasteurella multocida* toxin derivative. *Can J Vet Res,* 55, 128-138, 1991.

13. Giles CJ, Smith IM: The value of vaccinating pigs with *Bordetella bronchiseptica*. *Pig Vet Soc Proc,* 9, 61, 1982.

14. Giles CJ, Smith IM: Vaccination of pigs with *Bordetella bronchiseptica*. *Vet Bull,* 53, 327, 1983.

15. Kang ML, Shin SW, Rayamahji N, Seo YS, Lee SI, Lee WH, Yoo HS:

Field efficacy of a combined vaccine supplemented with recombinant *Pasteurella multocida* toxin subunits against atrophic rhinitis. *Korean J Vet Res*, 48 (1): 53-60, 2008.

16. Haesebrouck F, Pasmans F, Chiers K, Maes D, Ducatelle R, Decostere A: Efficacy of vaccines against bacterial diseases in swine: what can we expect? *Vet Microbiol*, 100, 255-268, 2004.