

Effects of an anti-gonadotrophin releasing hormone vaccine on the morphology and structure of bull testes

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Vaccination against gonadotrophin-releasing hormone (GnRH) is used as an alternative to surgical castration for the purposes of reducing pain and distress in the animals. Currently, no anti-GnRH vaccine has been authorized for use in cattle in the European Union. The aim of the present study was to assess the effect of an anti-GnRH swine-specific vaccine (Improvac[®], Zoetis, USA) on the morphology and structure of bull testes.

Sixteen calves were distributed into 2 equally sized groups depending on their LW at the beginning of study: light (172.9±30.00 kg) and heavy (323.8±37.79 kg). Half of the calves in each group were randomly selected to serve as the control (C) and vaccinated (VA) group. The calves were vaccinated at days 1, 21 and 104 of the experimental period. At slaughter (day 164), testes were weighed and measured, and then tissue samples were collected and fixed in formalin. Histological and immunohistochemical studies (anti-vimentin mAb and anti-human Ki-67 mAb, Dako Denmark A/S) were performed on the testes to measure the diameter of the seminiferous tubules and assess the testicular cell populations.

Hypoplasia of the testes was found to be associated with vaccination, since the weight, diameter and perimeter measurements, and volume of the testes were lower in VA calves than in C calves (P<0.0001). The C and HEAVY calves exhibited higher diameters of the seminiferous tubules than the VA and LIGHT calves (P<0.001 and P<0.05 respectively).

All C calves exhibited fully developed spermatogenesis. In contrast, the testes of all the VA calves except two exhibited a complete absence of spermatogenesis with a predominance of Sertoli cells in the seminiferous epithelium. Two of the VA calves (from the HEAVY group) exhibited normal microscopic features consistent with active spermatogenesis that was similar to that described in C calves. In the VA calves except the two from the HEAVY group, the seminiferous epithelium was immunolabelled with vimentin almost in its entirety, which indicated that it was largely composed of Sertoli cells. Only a few vimentin-negative cells, which corresponded to spermatogonia, were observed in the basal seminiferous epithelium; moreover, only a few of these spermatogonia were mitotically active, as indicated by Ki-67 immunolabelling. In C and the 2 VA calves from the HEAVY group, vimentin-positive Sertoli cells were evenly distributed between the spermatogenic cells, which comprised the majority of the cells. Ki-67 antigen staining revealed the presence of a large number of active spermatogonia and spermatocytes.

Our results demonstrate that immunization of male calves against GnRH with commercially available Improvac[®], which was originally developed for use in boars, severely affects testicular morphology and structure. The effect of Improvac[®] is more pronounced and consistent in calves vaccinated at a low LW than at a heavy LW, which suggests that vaccination is more effective when calves are vaccinated prior to puberty.

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Index

Plenary Conferences	S1
<i>Opening Congerence</i>	S3
<i>Plenary Conference</i>	S4
<i>Closing Conference</i>	S5
Symposium	S7
<i>Histology Applied to Experimental Pathology</i>	S9
<i>Histology and Animal Reproduction</i>	S15
<i>Histology and Aging</i>	S21
<i>Histology in Regenerative Medicine and Tissue Engineering</i>	S27
<i>Innovation in Histology Teaching</i>	S33
Oral Presentations	S39
<i>Session 1 (Thursday 12-14 h)</i>	S41
Room A	S43
Room B	S49
Room C	S57
Room D	S64
<i>Session 2 (Thursday 18-19 h)</i>	S69
Room A	S71
Room B	S74
Room C	S77
Room D	S81
<i>Session 3 (Friday 16-18 h)</i>	S85
Room A	S87
Room B	S92
Room C	S99
Room D	S105
Poster Presentations	S113
<i>Session 1 (Thursday)</i>	S115
Tissue Biology	S117
Histology of Organs and Systems	S129
Histopathology	S144
Teaching	S176
Tissue Engineering	S177
<i>Session 2 (Friday)</i>	S179
Teaching	S181
Comparative Histology	S192
Plant Histology	S198
Tissue Engineering	S203
Techniques	S236
Tissue Biology	S241