Effect of stabling stallions with mares during the non-breeding season on semen collection behaviour, semen characteristics and plasma testosterone concentrations

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1. Introduction

There is growing evidence that reproductive physiology of stallions may be modified by social conditions. In free-running horses, the plasmatic testosterone level of harem stallions is higher than those of bachelor stallions (McDonnell and Murray, 1995). Housing stallions together in boxes without mares could resemble bachelor social condition (McDonnell, 2000). The aim of this study was to measure the effect of various types of domestic housing to reproduce harem and bachelor social conditions on specific reproductive parameters and semen collection behaviour.

2. Materials and methods

Twelve stallions (age in 2001: 5 ± 1.3 years (sd)) were used in two experiments. Before each experiment, stallions were housed in groups without direct or indirect contact with females. Then half the stallions were housed with mares either pregnant (Experiment 1) or altrenogest-treated (Experiment 2) and half the stallions were housed singly in one barn without mares. The stallions were checked at 4 periods: prior to and 22-27, 57-62, 83-113 days after their stabling with the mares. The last two ejaculates of five daily collections (obtained on a phantom in the presence of a castrated mare) were analyzed for total volume, and for concentration, total number, motility, % live spermatozoa and morphology of the spermatozoa. The width of the testicles was evaluated ultrasonographically. The latencies for erection, ejaculation and from first ejaculation to second erection (= refractory latency, 60 min if no 2nd erection) were recorded. Plasma testosterone concentrations were measured 2 weeks before, during the first week after housing with the mares, weekly for 3 weeks, and every other week until the end of experiment.

2.1. Experiment 1.

From mid-September to mid-December 2001, six “Treated” stallions were housed in a Barn A, singly with one mare on each side according to the scheme: one mare, one stallion, one

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mare then an empty pen and again one mare, one stallion and one mare in the barn A. Each pen (3 x 5.8 m) had horizontal metallic pipes spaced 0.22 m apart separating neighbouring pens. This allowed visual, auditory and limited tactile (heads, legs) communication. Six "Control" stallions were housed singly in a barn B, separated from the barn A only by a very large door, left open.

2.2. Experiment 2.

From mid-October 2002 to mid-February 2003, six "Treated" stallions were housed with two mares into 100 m^2 pens (mini-harems) in two different barns (one barn with four harems, and one barn with two harems). Each mini-harem was next to another mini-harem, allowing visual, auditory and limited tactile communication through horizontal thick bars spaced 0.45 m apart. Six "Control" stallions were housed singly in another barn, with no contact at all with mares (neither visual nor vocal). At the end of the experiment (119 days), mares were removed and, five days later, Treated stallions were housed singly in another barn until end of march 2003 and sampled for testosterone measurement.

3. Results

In Experiment 1, Treated stallions remained quiet in their pens and took no interest in their neighbouring mares. None of the parameters measured in spermatozoa, blood or testis were significantly influenced either by treatment or by interaction of treatment x time (Fig.1).

In Experiment 2, Treated stallions herded and actively guarded their two mares, running along the fence between the two harems. A global treatment effect and a treatment x time interaction were observed for gel volume, gel free volume, refractory latency ($P<0.05$) with a marked increase at 22 days in Treated stallions and a normalization at 113 days. Sperm concentration was similarly affected with a marked decrease at 22 days and at 57 days. None of the other parameters measured was significantly influenced by these two effects (Fig.2). At 22 days, ejaculation latency was higher in Treated group ($P<0.01$).

4. Discussion

In this study, housing stallions next to mares or with mares has not increased testosterone concentrations, quantity and quality of spermatozoa, nor did it benefit semen collection behaviour. The type of mares (pregnant mares or altrenogest treated mares) have been chosen to bring a standardized socio-sexual stimulation to each stallion in that season of year and to avoid mating, and it is likely that cyclic mares would have produced better stimuli. The fact that experiments took place in the non-breeding season was not a drawback in terms of the physiology of the stallions. Although the hypothalamic-pituitary-testicular axis of normal stallions has a lower activity in the non-breeding season, it is much more responsive, to a GnRH challenge for instance (Roser & Hughes 1992).

In Experiment.2, refractory latency increased strongly at 22 and 57 days, although erection and first ejaculation latencies, demonstrating that refractory latency is a more sensitive criterion for libido evaluation, as suggested by S. McDonnell (University of Pennsylvania, personal communication). It was often observed that Treated stallions with no second erection in 60 min during the test, presented an erection immediately when they returned to their harem. It is possible that, in our experiments, the housing and semen collection conditions could have induced complex and contradictory stimuli.

Both the volume of filtered semen and the volume of gel increased transiently at 22 and 57 days, but returned to pretreatment level at 113 days. It is well-known that long-lasting

teasing or long-lasting erection before ejaculation lead to increased volume of ejaculate (Ionata et al, 1991).

In conclusion, the two types of housing of stallions and mares that were tested failed to increase parameters associated with male reproductive performance. Other housing schemes must be studied to find optimal was of doing so.

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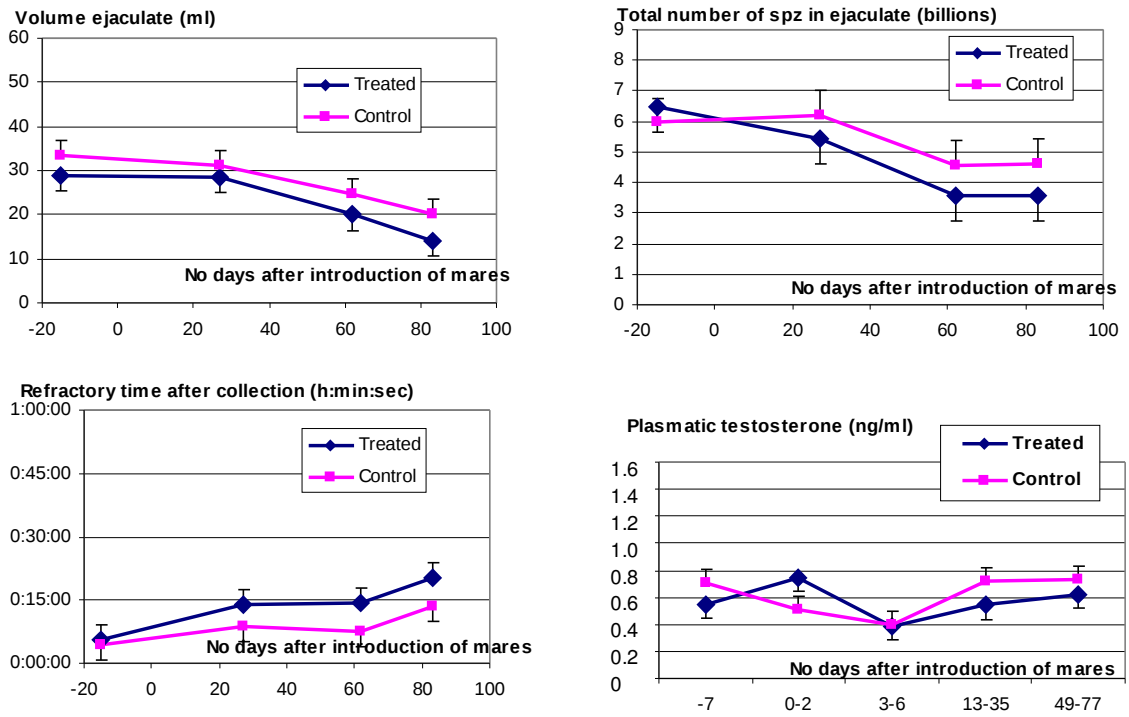

Fig. 1 : Reproductive characteristics of stallions before and after housing next to pregnant mares (Experiment 1: 6 Treated stallions and 6 Control stallions, mean ± S.E.M).

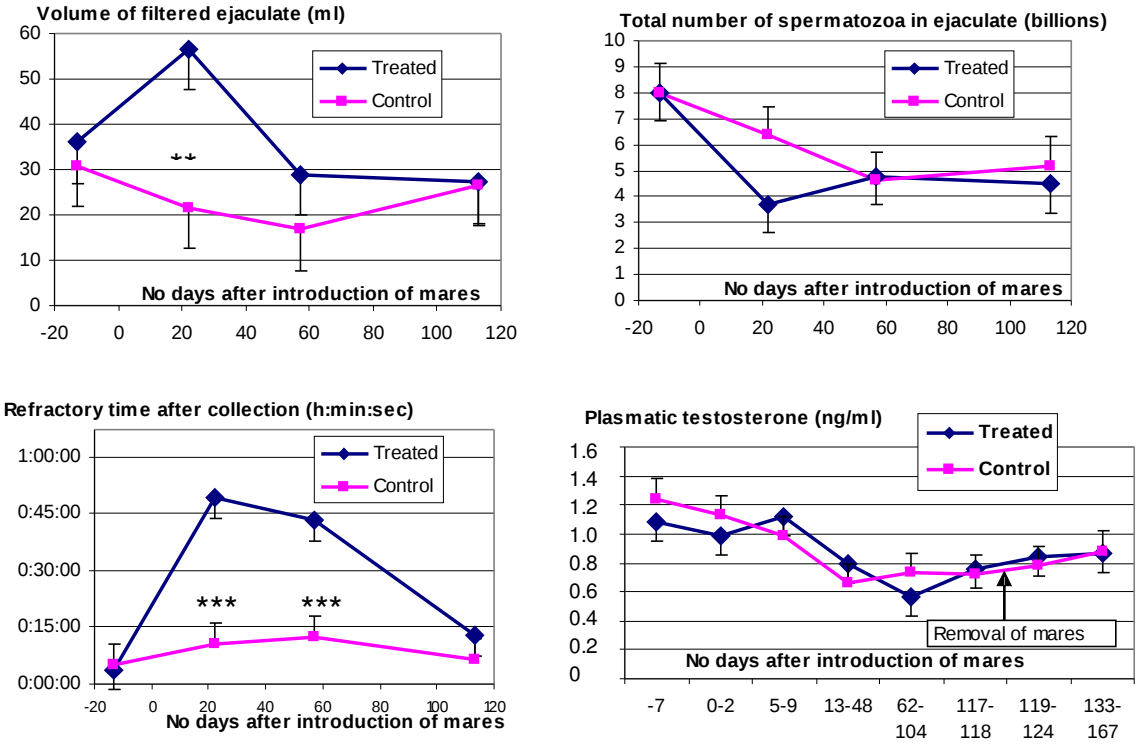

Fig. 2: Reproductive characteristics of stallions before and after housing with mares treated with altrenogest (Experiment2: 6 Treated stallions and 6 Control stallions, mean ± sem, ** P<0.001, *** P<0.0001)