

## EAAP 2013 Nantes France Horse Commission Session

# Do stallions recognize the estrous state by smelling the odor of mares?

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# Introduction

In several mammalian species odorant signals are given off by estrous females



**AND IN HORSE?**

“Horses could percept the odor of a mare in estrus half a mile away” ???



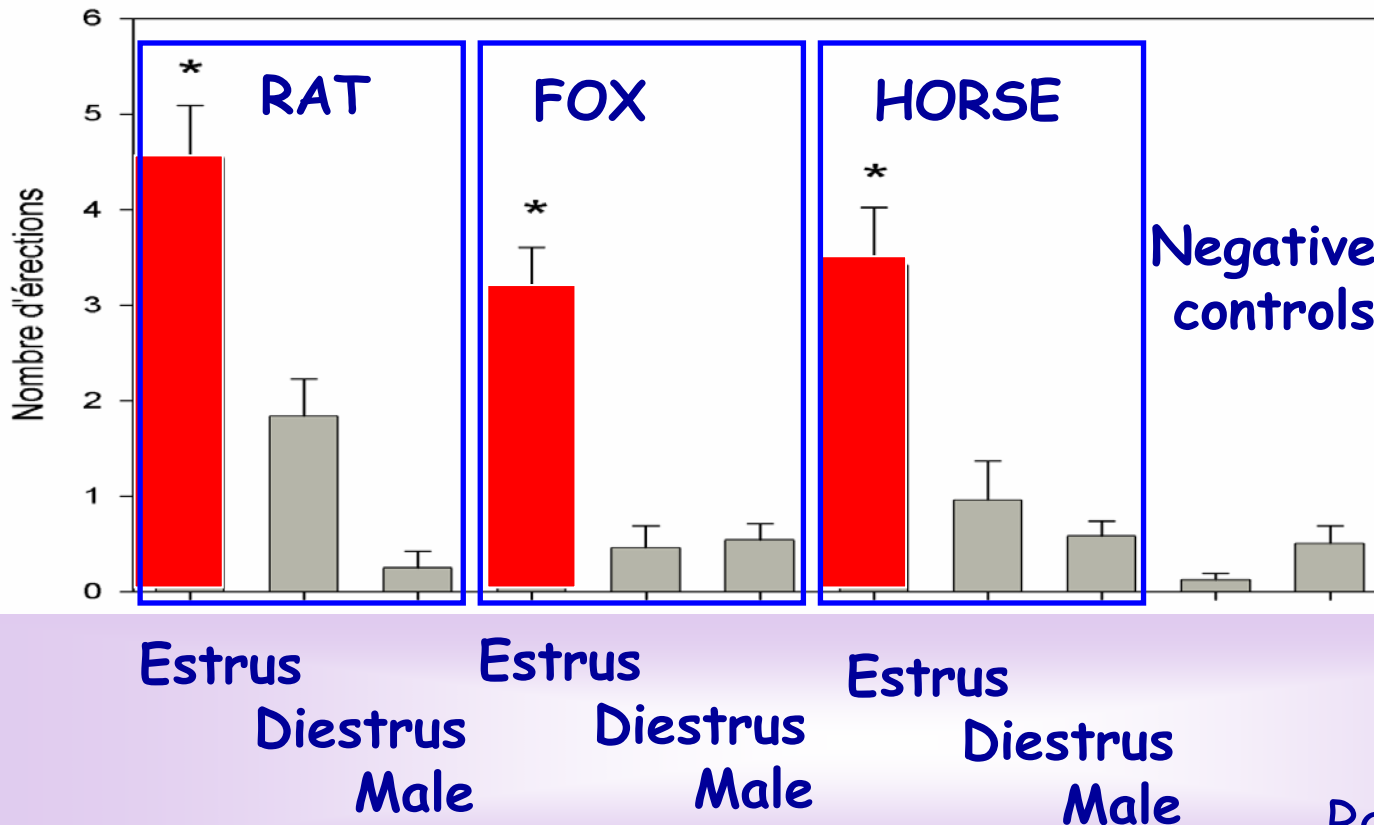
2008)

**HOWEVER...** Sight > olfaction > hearing (Blaschke *et al* 1984)  
Bulls do not show preference with estrous/diestrous restrained females (Wallach and Price 1988)  
or when physical contact is denied (Geary *et al* 1991)

# Question 1 : Is there an estrous odor in equine species?

## YES!

Mean number of erections presented by rats when smelling odor of faeces from...



FAECES

3 species

Rat

Fox

Horse

3 states

Estrous female

Diestrus female

Male

Rampin et al 2006

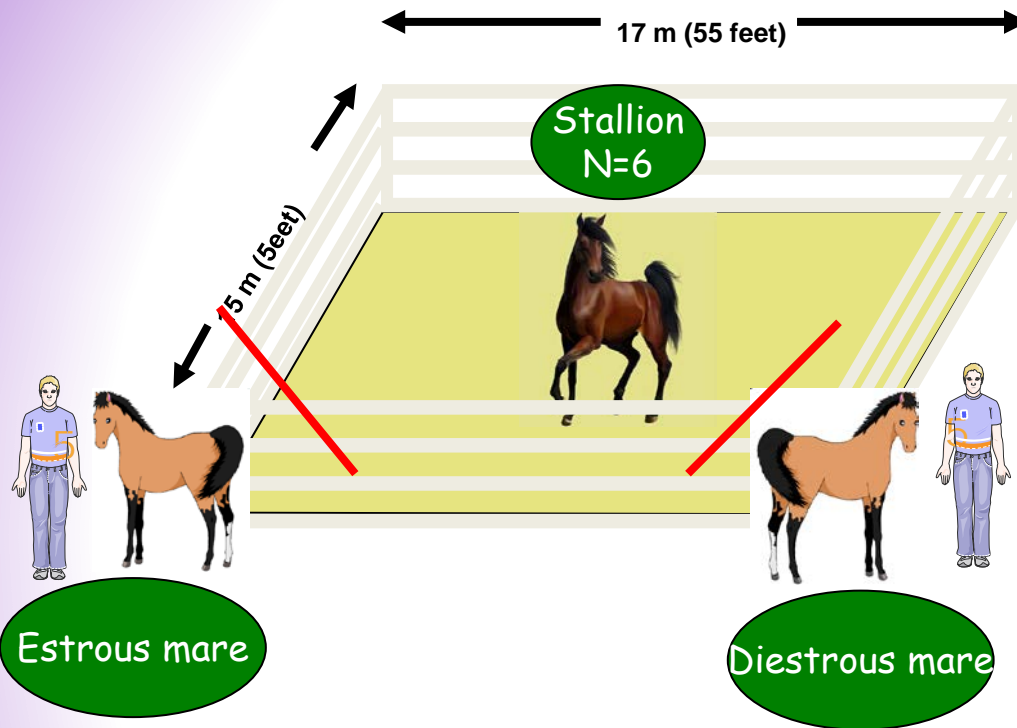
**Question(s) 2 :**  
**Do stallions recognize the estrous state**  
**by smelling the odor of:**

**A. Mares?**

**B. Urine of mares?**

**C. Faeces of mares?**

# A. Do stallions recognize the estrous state by smelling the odor of mares?



Two-choice tests :  
estrous mare / diestrous mare

Each test

Each experiment

Control test/treatment test  
Repeated on 2 successive weeks  
Alternating the sexual states  
of mares

3 experiments (= 3 treatments)

1) Without olfaction

2) Without sight

3) Without reactivity  
of mares = tranquilized mares

Auditory stimuli always present

Tranquilized mares

Acepromazine

+

Romifidine

# A. Control test :full behavioural sequence with the estrous mare



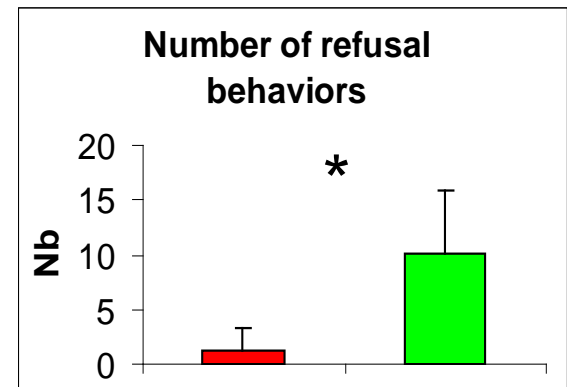
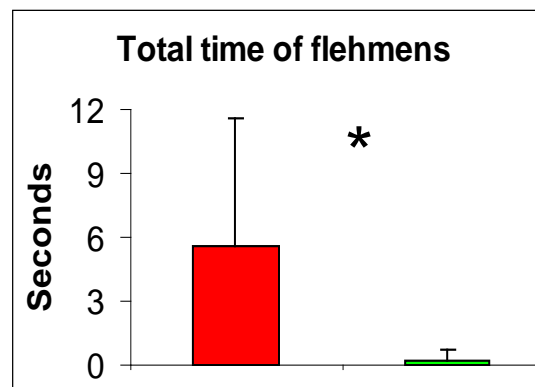
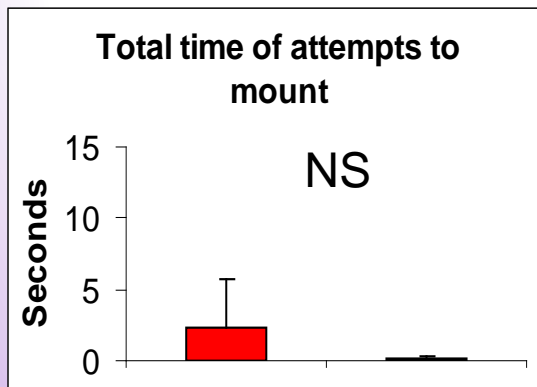
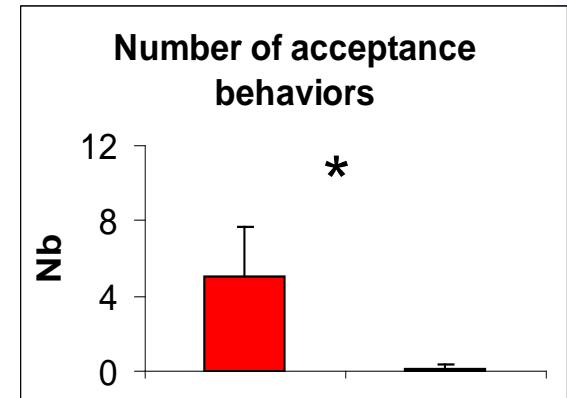
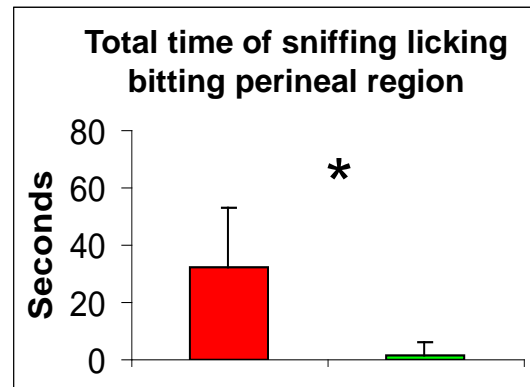
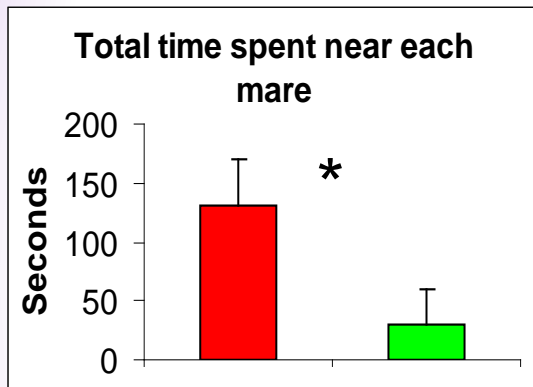
- Sniffing, licking, nuzzling from the head to the tail
- Interactions with perineal region
  - Flehmen(s)
  - Attempt of mount



# A. Control test

Behavior of the Stallion  
With the estrous mare  
With the diestrous mare

Behavior of the mares  
Estrous mare  
Diestrous mare



\* = P < 0.05 (n=6)

## A. Without olfaction

- Stallions still show a preference for the estrous mare
- The behaviour of the mares is not modified:  
Acceptance for the estrous mare  
Refusal for the diestrous mare
- Only the total time of flehmens is reduced



To detect the estrous mare  
olfaction is not absolutely necessary  
Another role?



## A. Without sight

Among the 5 stallions ...5 tried to find the mare with sight



(Briant et al, 2010)

## A. Without sight

Among the 5 stallions...only 1 find the mares with olfaction



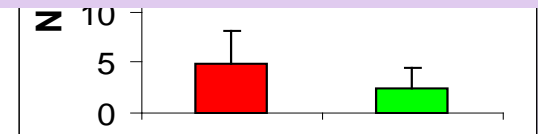
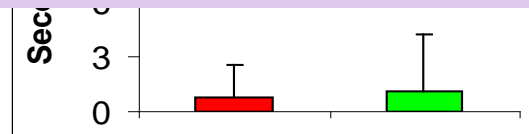
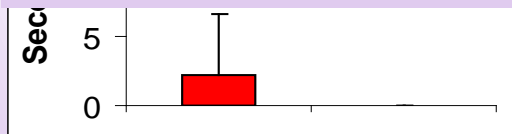
...but did not discriminate the estrous mare!

**To detect the estrous mare  
sight is absolutely necessary  
and olfaction alone is not sufficient**

# A. Tranquilized mares

es

**Conclusion 1**  
**To detect the estrous mare**  
**its reactivity is essential**



\* = P < 0.05 (n=6)

(Briant et al, 2010)

## B. Do stallions recognize the estrous state by smelling the odor of urine of mares?

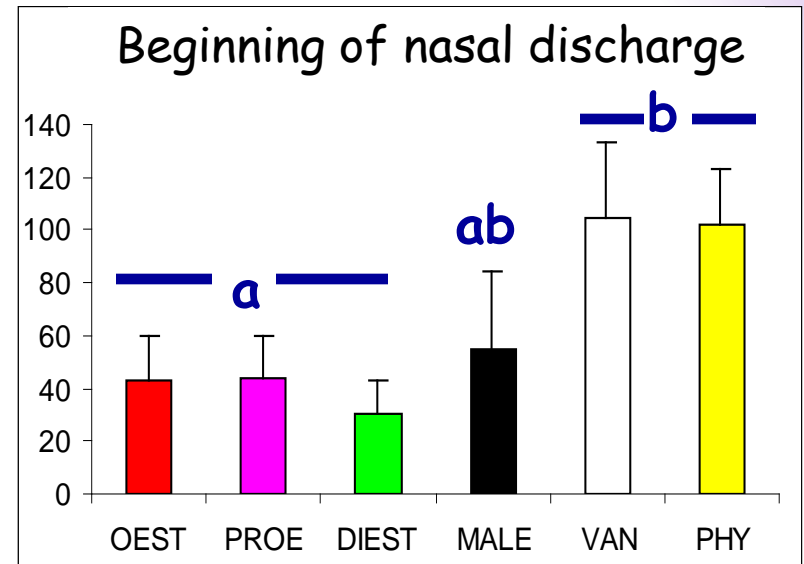
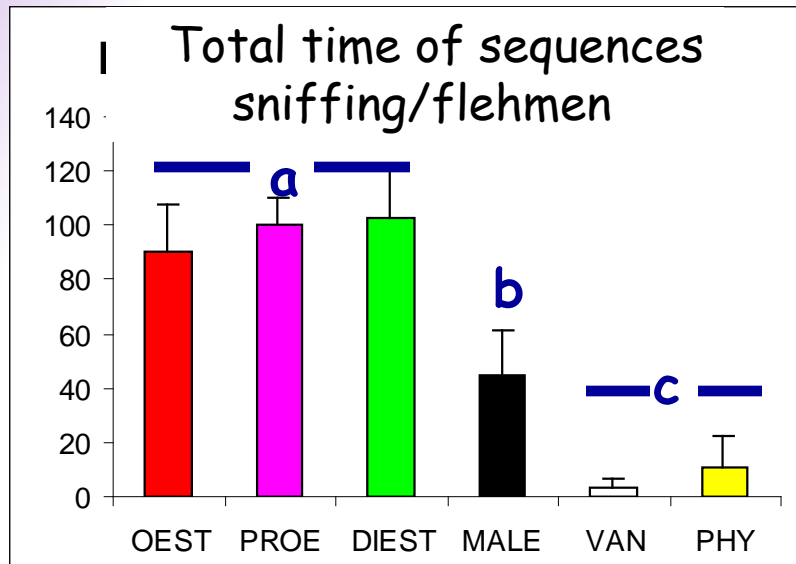
### ➤ Sequences sniffing / flehmen



Urine of pro-estrous mare  
Urine of estrous mare  
Urine of diestrous mare  
Urine of stallion  
2 negative controls

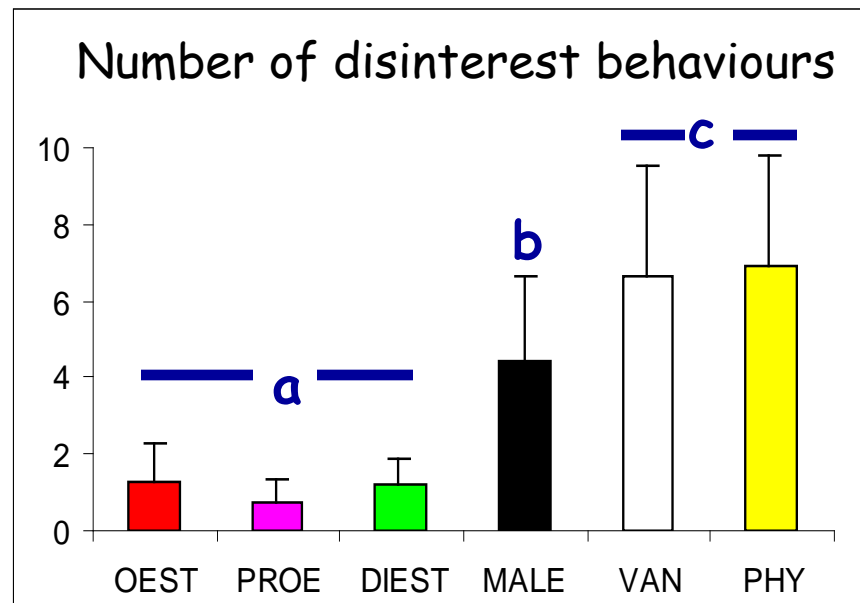
- Beginning of nasal discharge
- Disinterest behaviours

## B. Odor of urine of mares



Means  
+ET

Stallions n=6

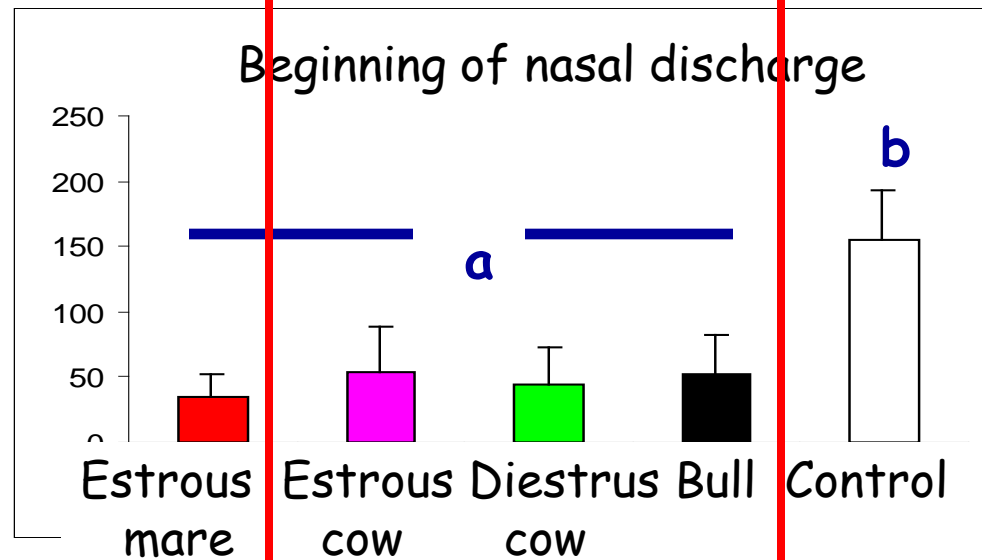
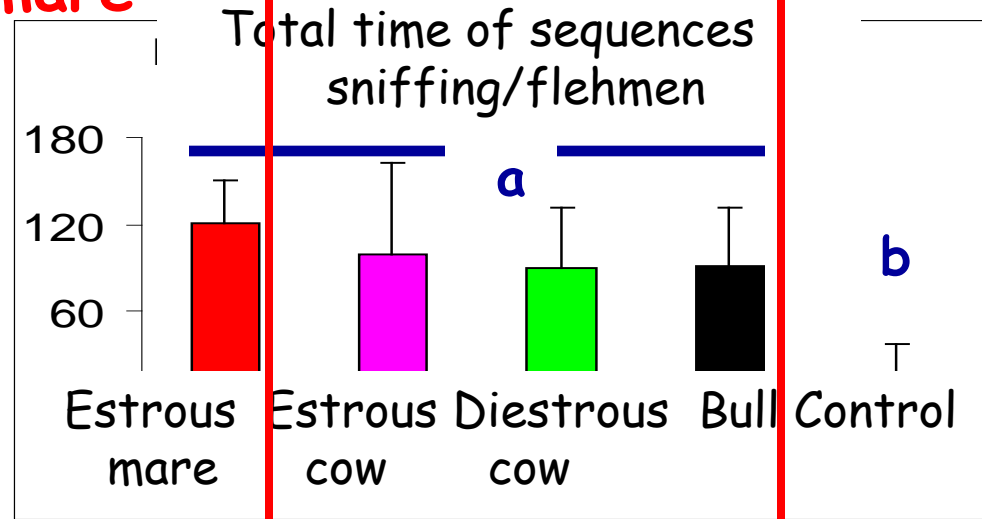


# B. Odor of bovine urine

Urine  
estrous  
mare

Urine  
Cow or bull

Negative  
control



Means  
+ET

Stallions n=6

Briant,  
not  
published

## Conclusion 2

### Sniffing of urine

#### Stallions :

- Recognize the odor of **urine**
- Do not seem to recognize the odor of estrus
- **Discriminate between the odor of mare and the odor of stallion**
  - Recognize bovine urine  
= common molecules?

**C. Do stallions recognize the estrous state  
by smelling the odor of faeces of mares?**



**Experiment 1**

Behaviour of stallions  
Hormones

**Experiment 2**

Behaviour of stallions  
Semen collection  
Quality of semen



# C. Odor of faeces of mares?

## Experiment 1



6 Welsh pony stallions  
4 faeces odors  
- Estrus  
- Diestrus  
- Male  
- Negative control

Sniffing of faeces for  
5 min

### Blood samples

From - 30 min to + 2h after sniffing of faeces

### Assays

Testosterone and prolactin

## C. Odor of faeces of mares

### Experiment 2



4 Welsh pony stallions  
4 faeces odors

Sniffing of faeces for 5 min

Semen collection

#### Semen quality

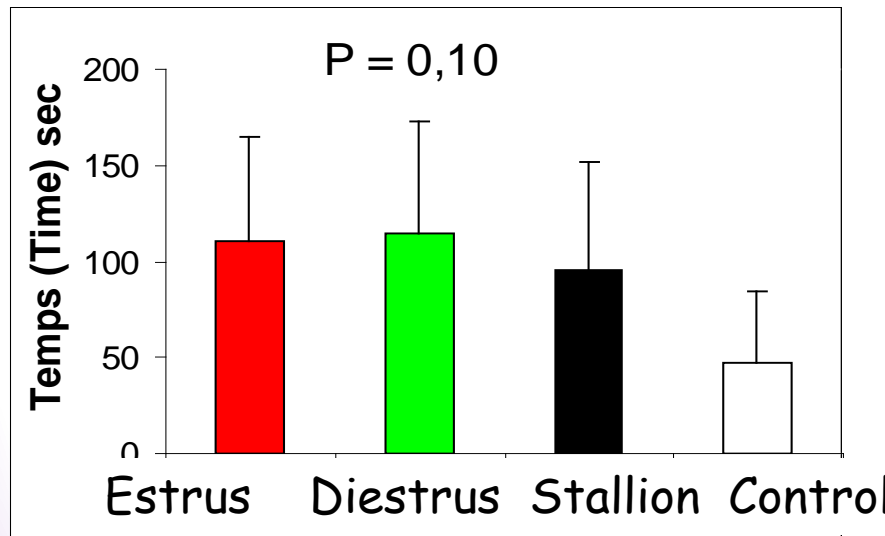
Immediate survival after 24 and 48 h: filtered volume, gel volume, concentration, total sperm count, sperm motility  
pure and diluted in "INRA 96"

# C. Odor of faeces of mares

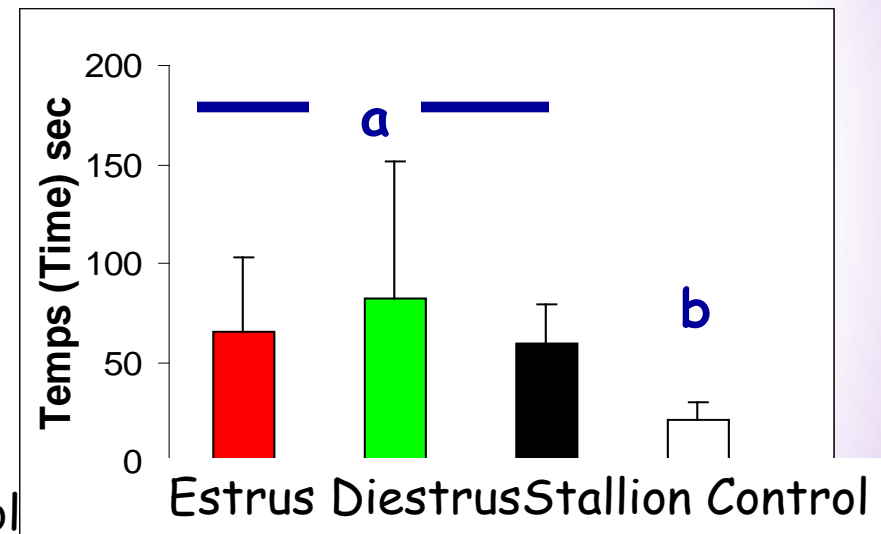
## Behaviour : sniffings

Means  
+ET

### Experiment 1



### Experiment 2



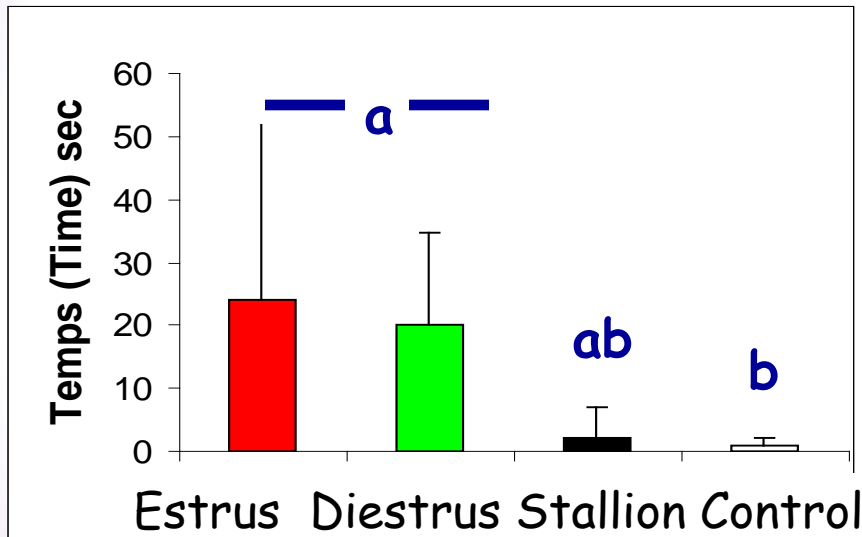
→ Stallions recognize faeces

# C. Odor of faeces of mares

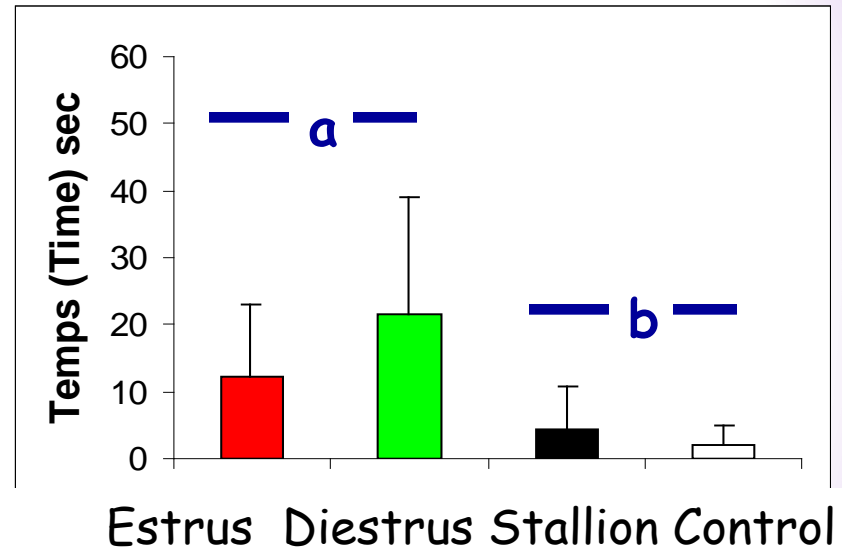
## Behaviour : Flehmens

Means  
+ET

### Experiment 1



### Experiment 2



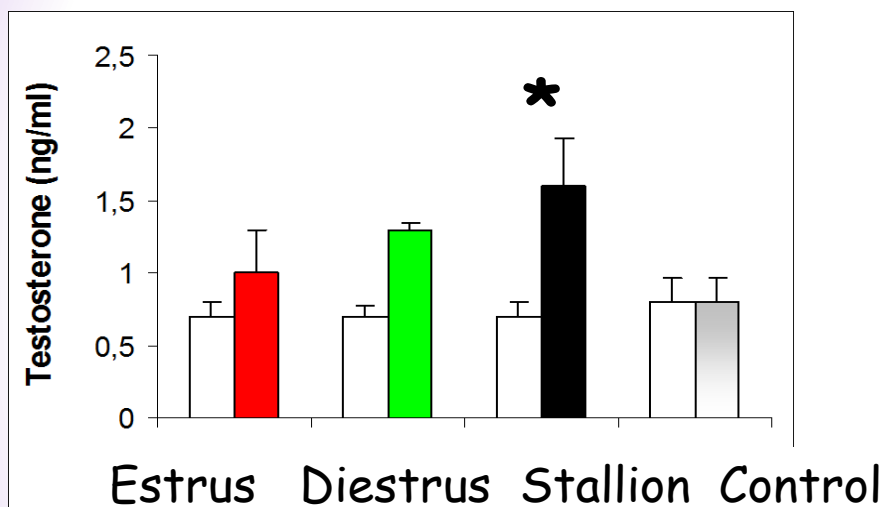
→ Stallions discriminate between stallion and mare faeces

# C. Odor of faeces of mares

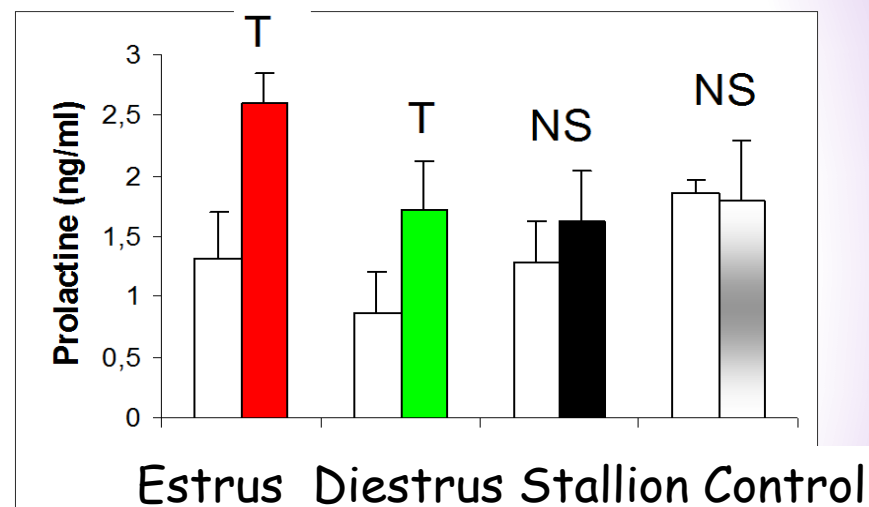
## Hormones

Means concentrations Before/After sniffing

### Testosterone



### Prolactin



↓

**Testosterone = indicates the recognition of the odor of «male»?**

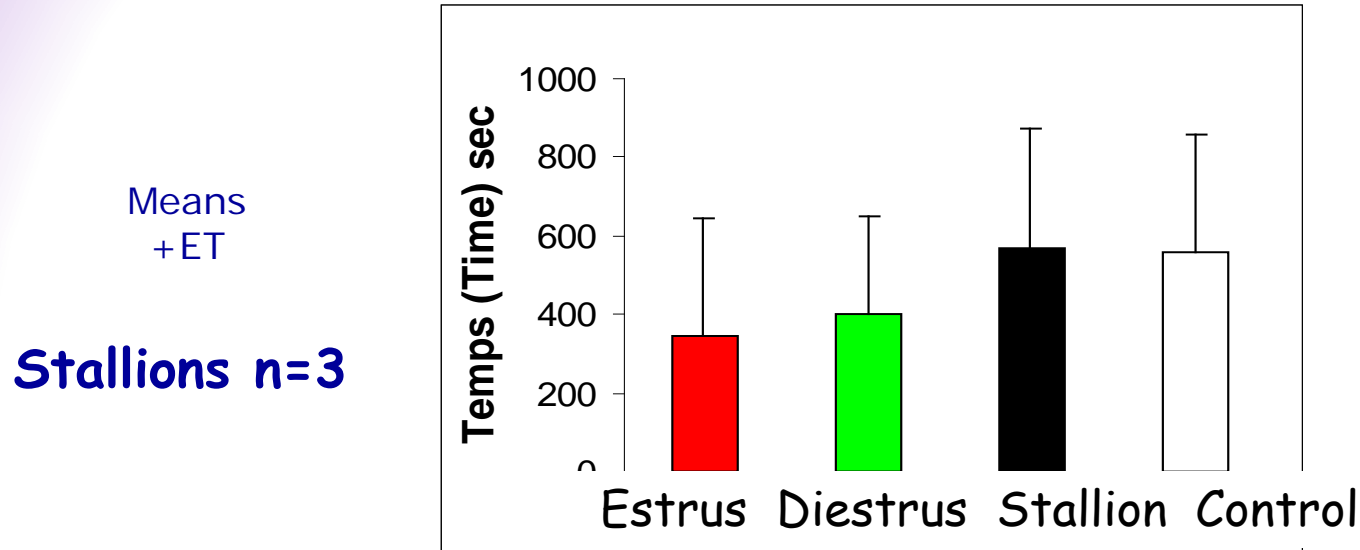
↓

**Prolactin = indicates the recognition of the odor of «female»?**

\* :  $p < 0.05$   
T :  $p < 0.10$

## C. Odor of faeces of mares

Semen : total time of semen collection



Reduction of the total time of semen collection with faeces of mare?

Semen quality

No effect could be seen

# Conclusion 3

## Sniffing of faeces

### Stallions :

- Recognize the odor of faeces
- Do not seem to recognize the odor of estrus
- Discriminate between the odor of stallion and the odor of mare

Testosterone and prolactin  
Could indicate this recognition

Faeces of mares (estrus or diestrus)  
could allow a quicker semen collection



**THANKS to...**



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