

WORLD LEADER  
IN REPRODUCTION  
BIOTECHNOLOGIES



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# POULTRY REPRODUCTION



**Semen collection**  
*Récolte de la semence*



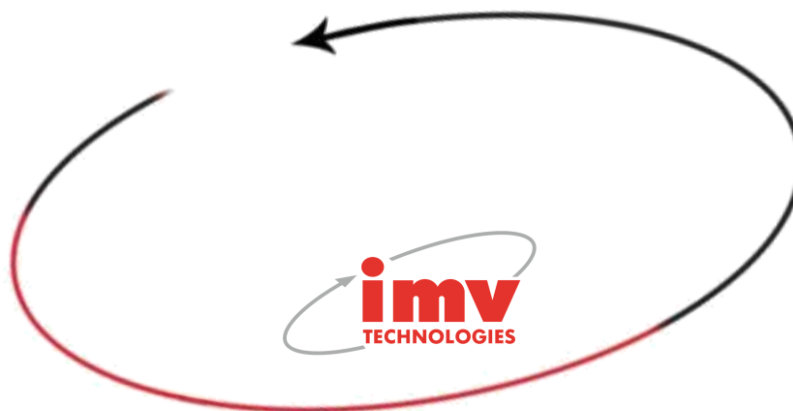
**AI Gun**  
*Insémination*



**AI chair**  
*Insémination*



**Semen analysis**  
*Analyse de la semence*



**Media**  
*Conservation de la semence*



**Straws**



**Canula**

*Conservation de la semence*



**Filling machine**  
*Conditionnement de la semence*



## POULTRY RANGE



Filtering block



Duck collector



EasyCyte



Accucell



Extender



M.R.A



AI gun



Poultry AI chair



Straws



Conservation vassel





# **INSEMINATION in POULTRY**



## INTRODUCTION

*In several poultry species, artificial insemination (AI) has been considered as the best strategy to maintain high reproductive performances over the reproductive season.*



## Reasons for this choice :

- Absence of mating-related constraints to select male and female lines:

*Ex Turkey : Males : 25-35 kg; Females: 9-12 Kg*

- Easier control of fertility during the latest weeks of the season
- Optimization of genetic potential issued from the best sires
- Rationnaly use the rooster available and so to realise savings on number of males



## RECALL:

The avian oviduct is equipped with specialized Sperm storage sites in which sperm may, depending on species and individuals, be kept for days up to weeks.

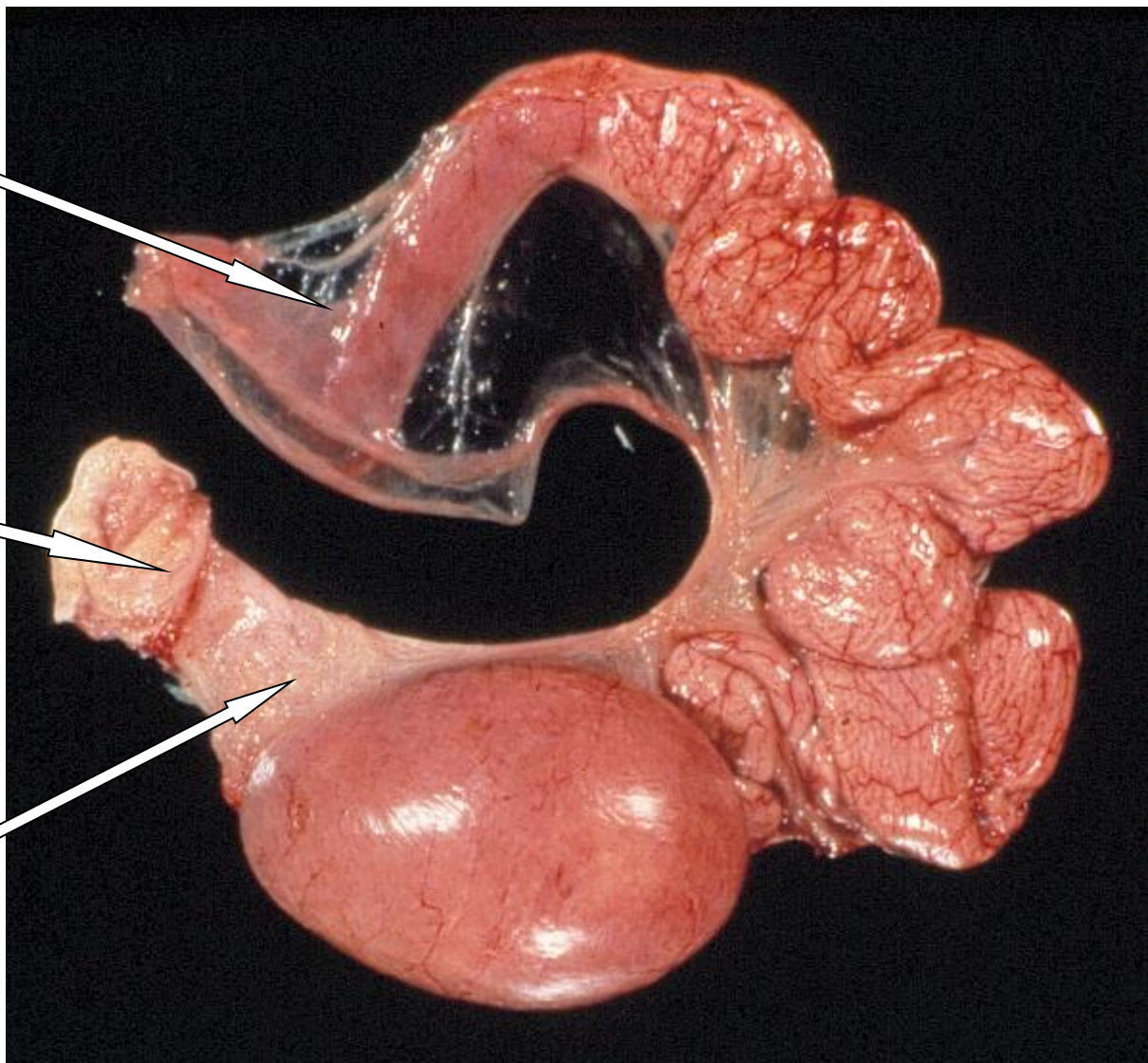
Sperm are selected by mechanical and immuno-dependent processes which, ultimately, allow not more than 1% of the initial dose to be stored in the SSTs.

***AI TARGET is so to allow to the best quality semen to join theses sites***

Infundibular SSTs

Vagina

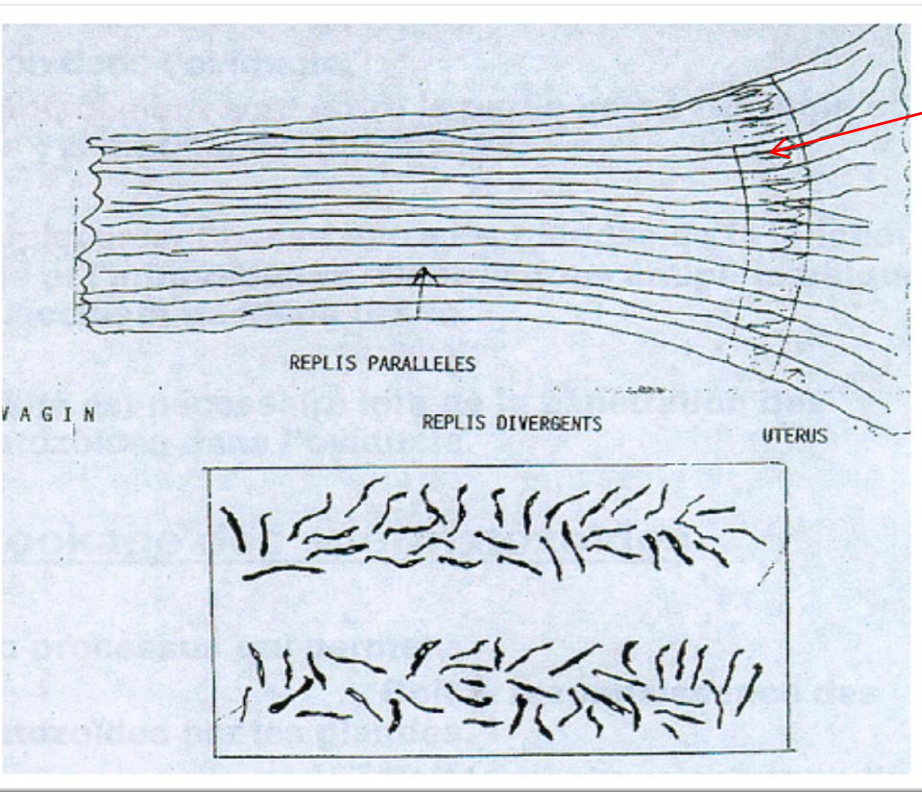
Uterovaginal SSTs



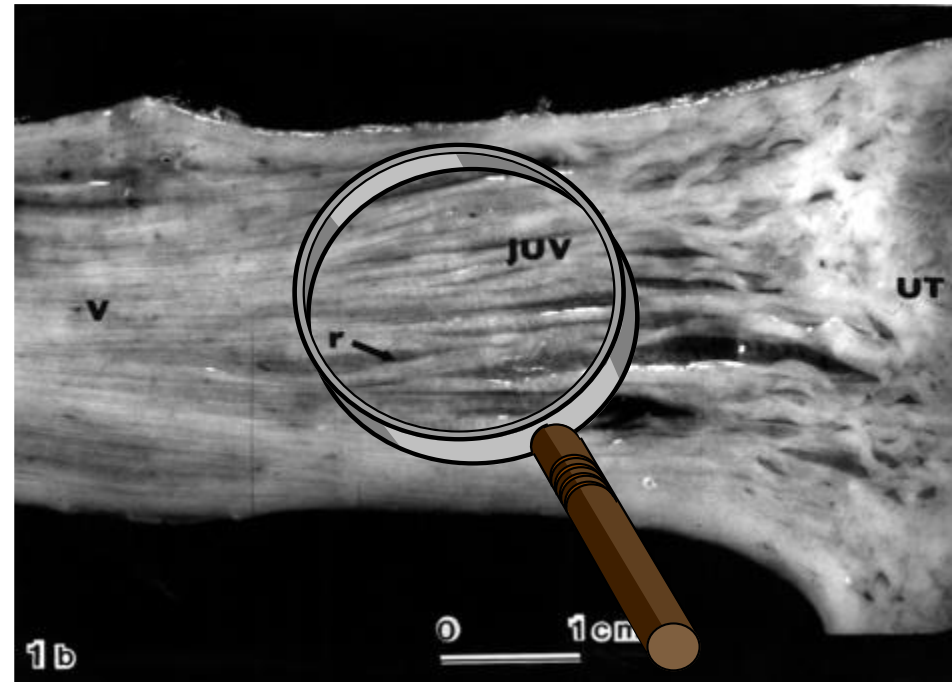
(Kindly provided by Dr M. BAKST, USDA, USA)



## Sperm storage Tubules in the uterovaginal junction (UVJ)



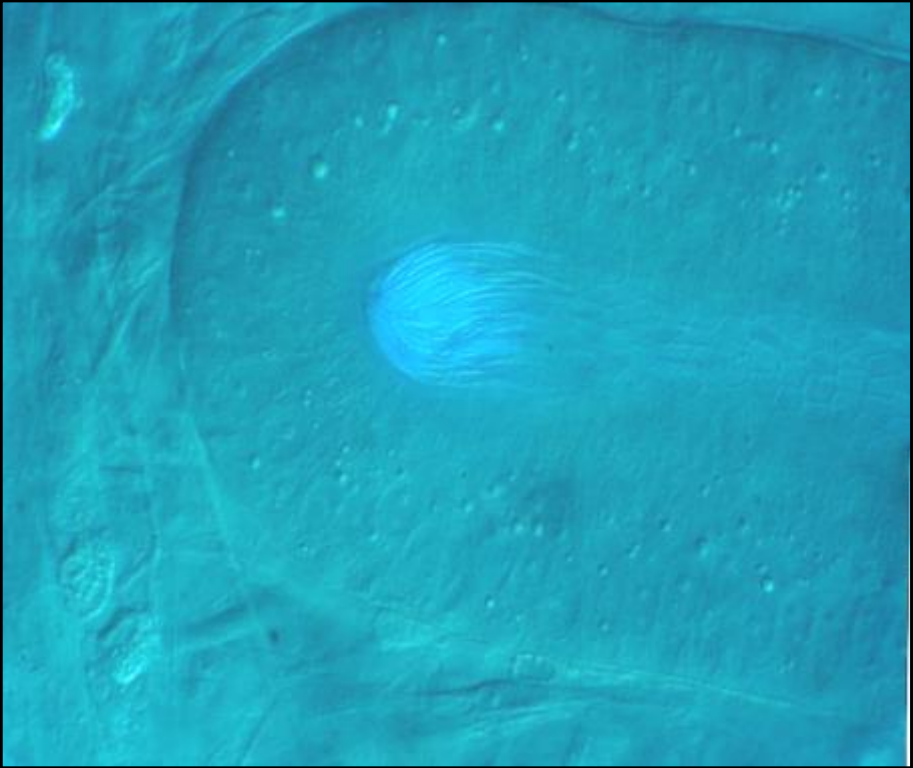
Storage glands



(Kindly provided by Dr M. BAKST, USDA, USA)



(From JP BRILLARD, INRA, F)



(From M. BAKST, USDA, USA)



## SPERM STORAGE GLANDS

- Motility is necessary for the SPZ to enter in the oviduct.
- Fertilizing capacity is according to the concentration of sperm cells located in the infundibulum.
- The number of SPZ at fertilization site is highly correlated to the number of SPZ stored in the UVJ.

***More sperm are stored in the UVJ ,  
more chances fertilized eggs you get.***



## FACTORS INFLUENCING SPERM STORAGE

### For the males :

Sperm quality

Number of sperm cells /ejaculate

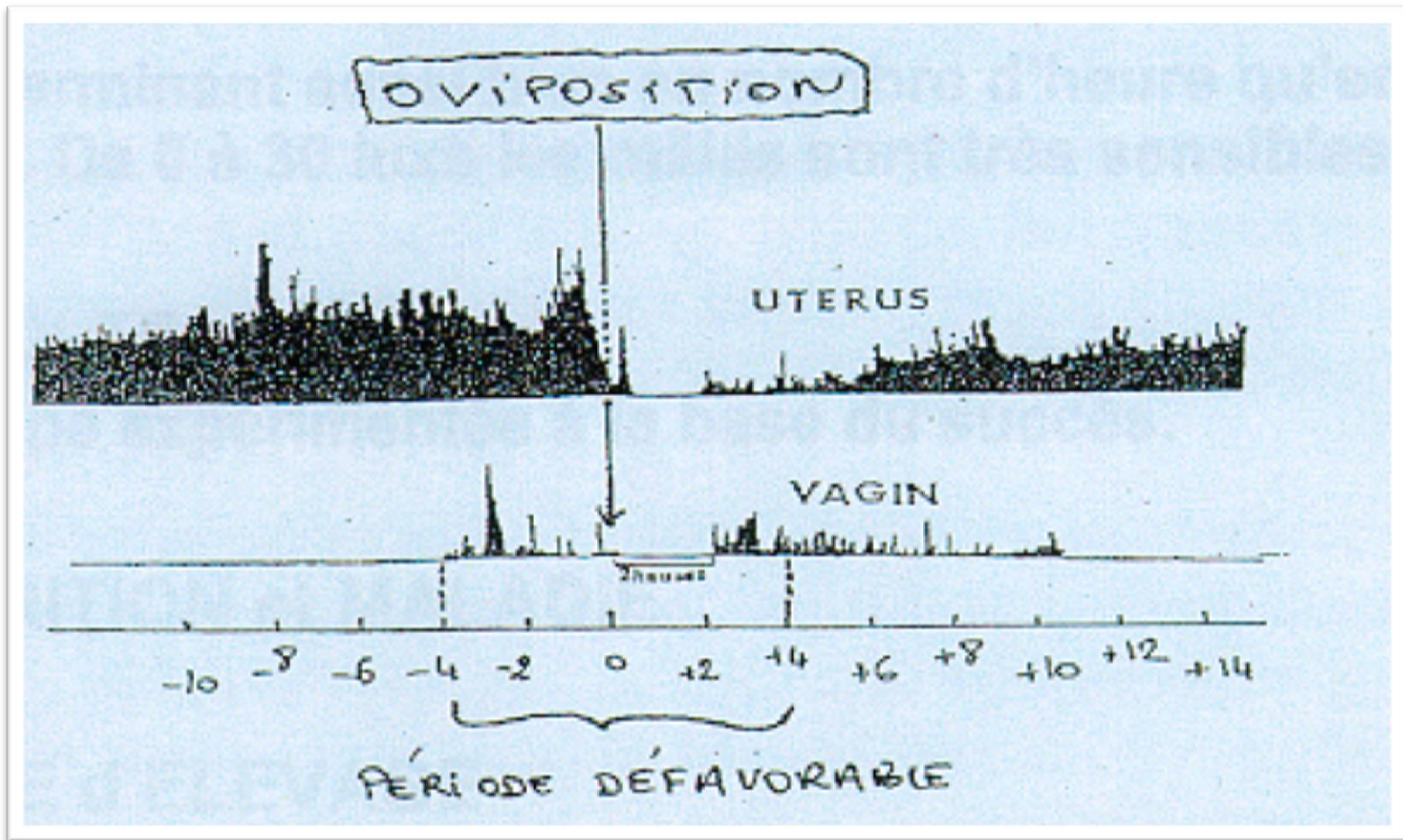
### For the females :

Storage adaptability (number of storage glands)

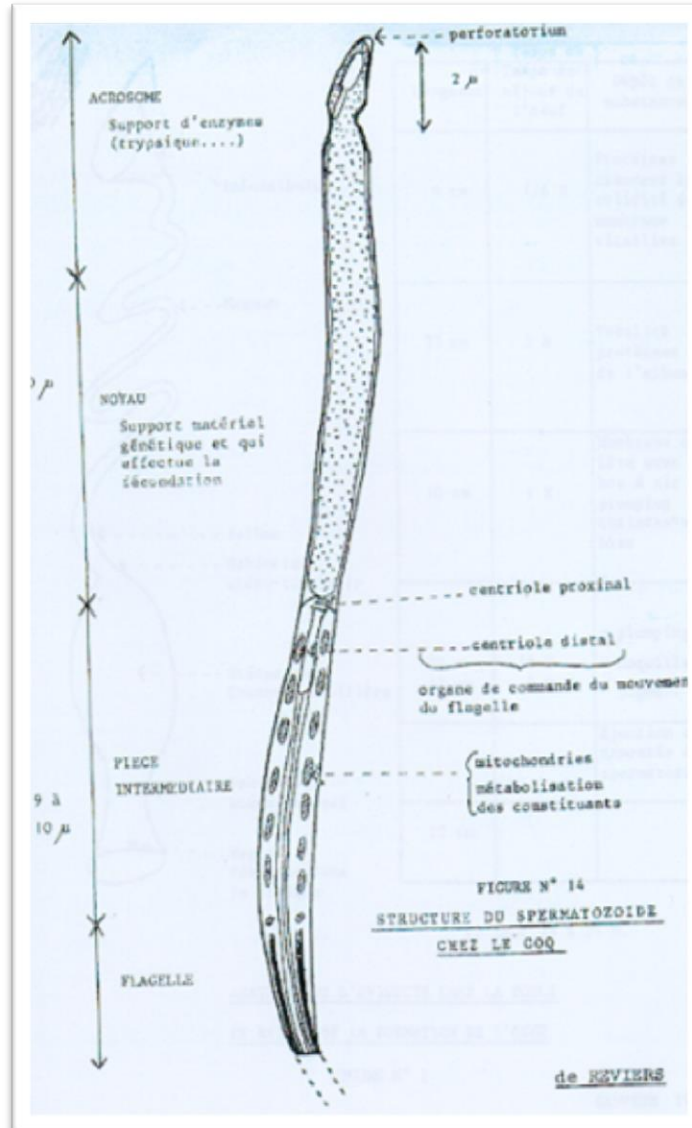
Age

Breed

## RIGHT TIMING FOR AI



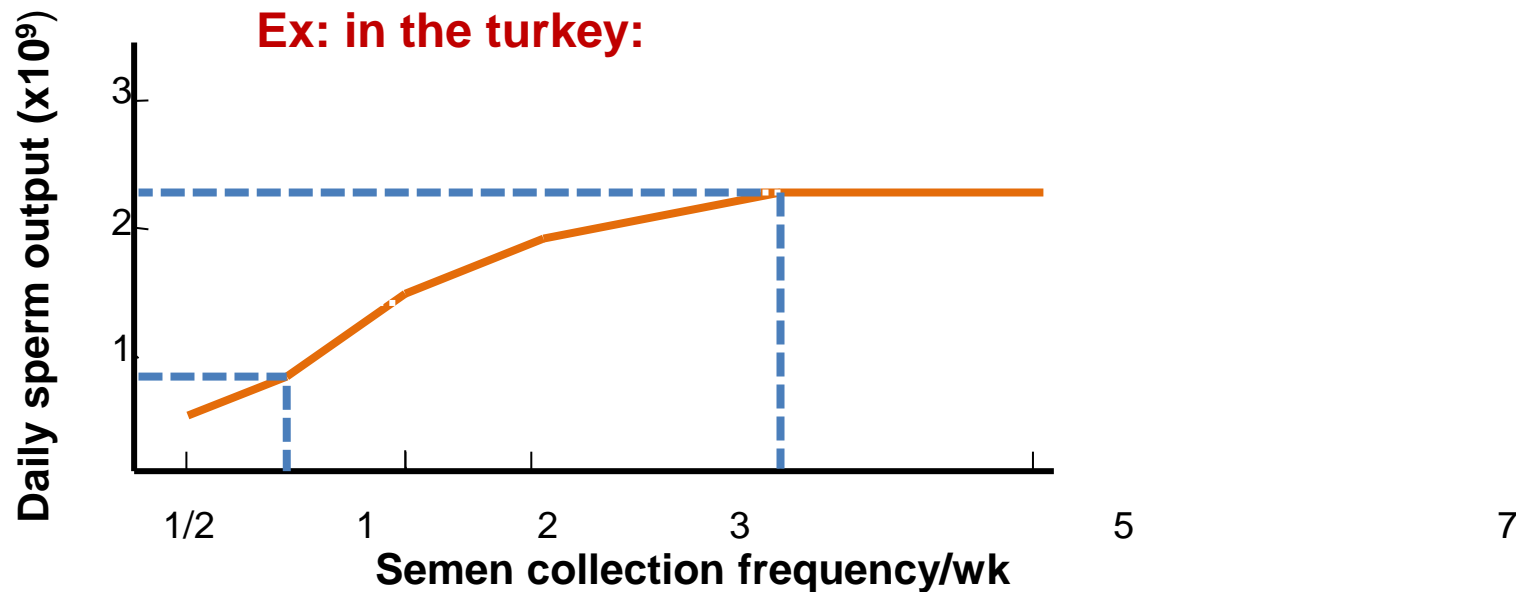
# SPERM CELL STRUCTURE





## OPTIMIZING SEMEN OUTPUT:

A positive correlation between the number of sperm produced by testes and the Number of sperm present in ejaculates can only be observed if males are collected at appropriate frequencies...



(From Noirault and Brillard, 2000)

**In addition, sperm viability increases when collection frequency increases:**

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**Semen collection frequency**

**1x/2wk      1x/w      2x/wk      3x/wk      5x/wk**

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**Percent viability**

85,1<sup>a</sup>

86,9<sup>b</sup>

87,5<sup>b</sup>

88,3<sup>c</sup>

90,6<sup>d</sup>

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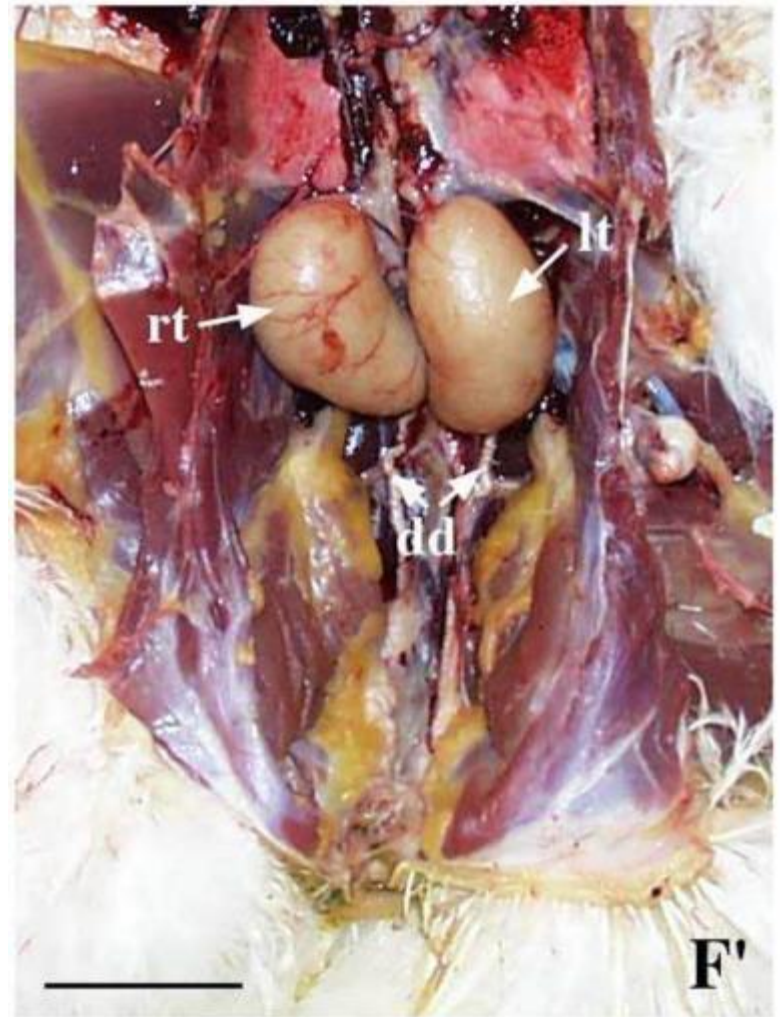
a,b,c,d: Significant if different ( $P>0.05$ )

(From Noirault and Brillard, 2000)





This result, also observed in chicken, reveals a progressive but negative effect of the local environment on sperm during their residence in the male tract





## SPERM CONCENTRATION

Most of the time operators fix the volume of the doses without knowing the sperm concentration due to :

environnement

or age

or breed

or individual.

That 's what you need to check regurlaly (once a month) the average concentration and to adapt the doses according to .

## SEMEN ANALYSIS RANGE



Microscope



Telos



Ultimate - IVOS  
*Computer Assisted Semen Analysis*



Lames pré-calibrées  
*Leja 4 ou 8 puits*



EasyCyte  
*Cytométrie en flux pour analyse  
de semence*



## MALES SELECTION

One of the first step . Without good roosters you will never achieve good fertility even if you respect all others main aspect of the breeding program

- Get the roosters used to be handled
- Place them in cages 2 to 3 weeks before starting AI planning.



## MALES SELECTION

Keep only after several collects the roosters giving good quality sperm.

Reject all roosters with:

- Aqueous sperm (watery like)
- Dirty color (brown, yellow, reddish) anything away from the white milky color that we are looking for



## MALES SELECTION

Semen evaluation must be done on:

- Sperm concentration with photometer:  
Easy to use and results given quickly
- Sperm motility with microscope:  
Use 100 x magnification  
Constant sample volume (10 $\mu$ l) between slide  
and coverlid  
Temperature controlled stage (30°C)



## Males selection

### Motility scoring:

- 0 = no t any sign of movement
- 1 = sperm cells agitate their tail only
- 2 = spz are moving but stay on the same place
- 3 = start to see waves motion
- 4 = Waves are moving against each other with high intensity
- 5 = very quick and fast displacement of the waves

This is done on raw sperm if possible . You must reject every rooster under 3 score .

Reminder: if you mix good sperm with high motility and add one with low motility you will reduce the capacity to fertilize . In fact by adding dying sperm to a pool of good one you will add some toxins detrimental to good sperm.



## SEMEN COLLECTION

Semen collection must be done in a quiet environment.

The aim is to collect quickly without stress on the bird when handling them.

Clean or wipe the cloaca to avoid to spoil and contaminate the sperm already collected.

Collected sperm should never be dirty, this is a main cause of decrease of fertility. In case it should happen discard the tube with the entire contents

Collect straight from the rooster into the sterile extender vial.

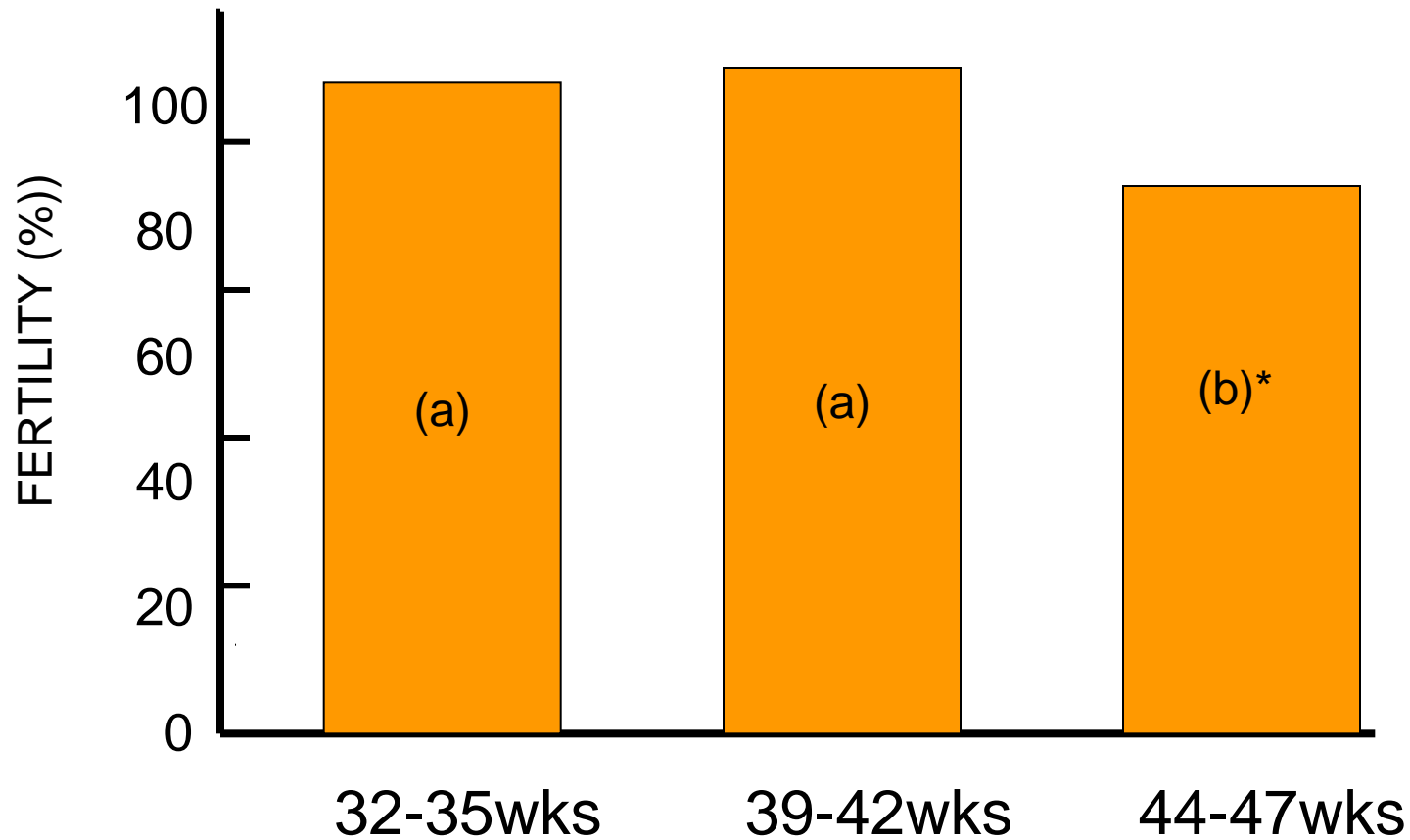
Be careful to thermal shocks.

Extender = Temperature between **25 to 30 °C**



## EFFECT OF MALE'S AGE ON FERTILITY IN TURKEYS

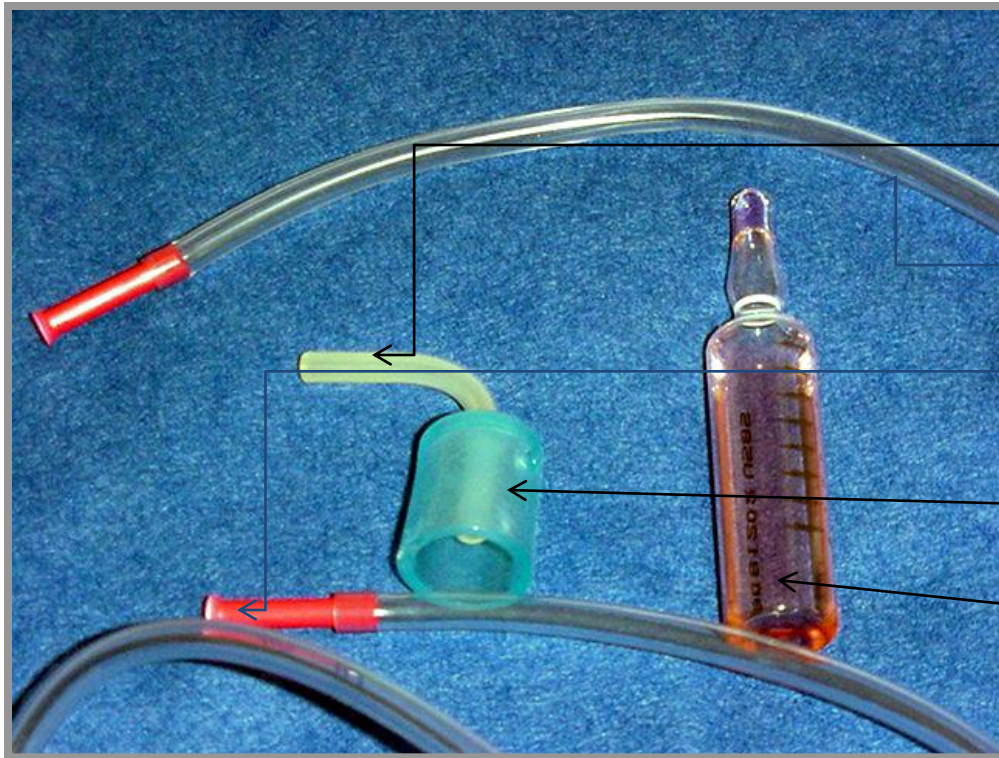
a,b significantly different ( $P < 0,05$ )





*Thus , semen quality should be thoroughly checked at least at the onset of reproductive period to eliminate low quality males which may affect egg fertility and embryo survival during the entire season*

## SEMEN COLLECTION



Gallus catheter

Tubing

Suction tips

Semen collector

Extender



## SECTION II

# PRESERVATION OF SPERM FERTILIZING POTENTIAL IN THE FEMALE TRACT



## Sperm quality

Among factors known to directly influence sperm storage, the initial quality of gametes is probably the most important.



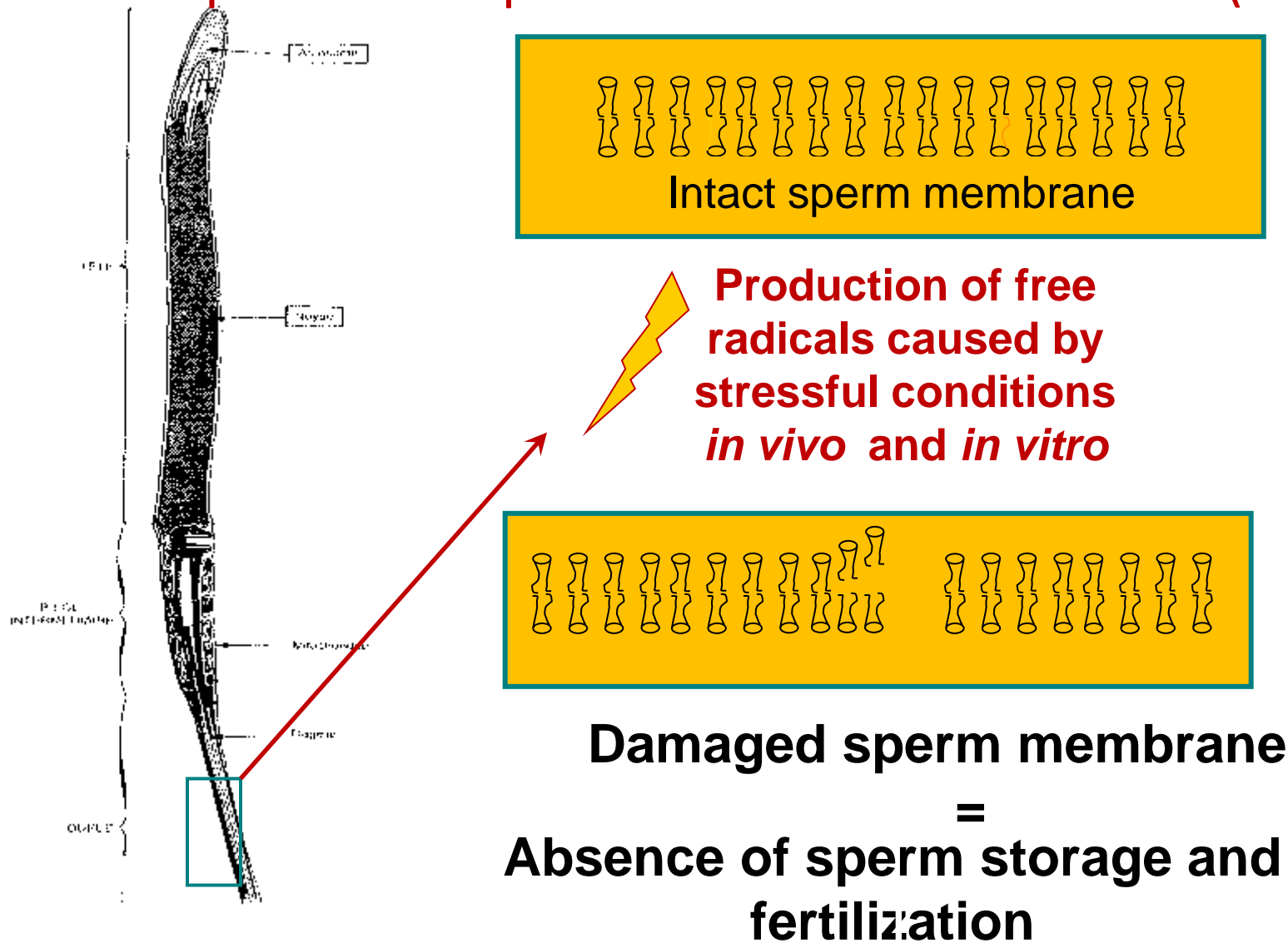
Let's recall that sperm in avian species must maintain their viability and fertilizing potential for longer periods than mammals :

*Ex :*

*About 10 days after their production at testicular level in Breeder turkeys Al<sup>ed</sup> at weekly intervals....*



# Consequences of sperm membrane alterations (Ex: lipids)





## CONCLUSIONS

- 1) Initial semen quality is a key issue to ensure high fertility rates and high embryo survival
- 2) Ensuring appropriate protection of sperm membrane is essential to ensure optimal sperm storage *in vivo* and *in vitro*,
- 3) Such protection can be optimized by preventing or limiting the production of free-radicals in both sexes





## HEN INSEMINATION

- The equipment must be prepared in advance and extremely clean.
- Do not start A.I. before 5 to 6 hours after switching the light on. Hens should have laid.

*If the hen has an egg with a hard shell in the oviduct should not be inseminated.*

- A.I. every hen that can be « returned ».
- A.I. doses :
  - 150 to 200 millions spz /dose for layers
  - 180 to 240 millions spz/dose for broilers

# HEN INSEMINATION

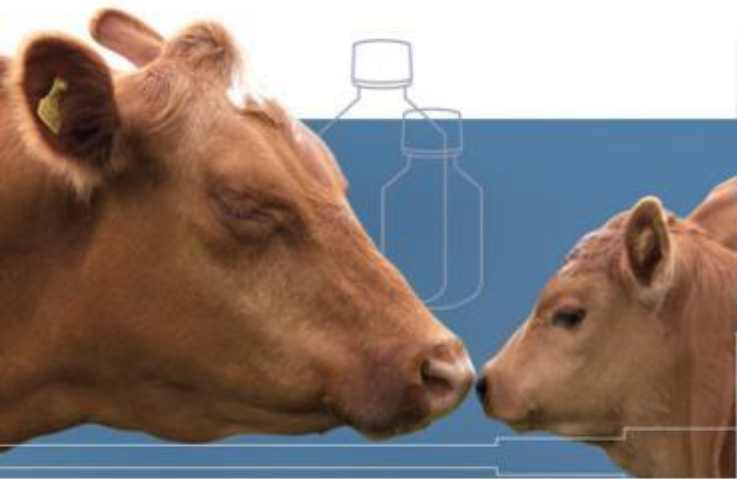
## Insemination equipment



Volumetric system for A.I.

Poultry straws





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