

**Ovum Pick-Up
and
in vitro Fertilization**

André Dayan

- VITROGEN -

Research and Development in Reproductive Biotechnology

Introduction:

Evolution of Biotechnologies used in cattle production

↓ AI

↓ SOV + ET

↓ OPU + IVF- Bracket *et al.* (1982): first IVF calf

- Pieterse *et al.* (1988): first OPU-FIV calf

Ovarian Physiology

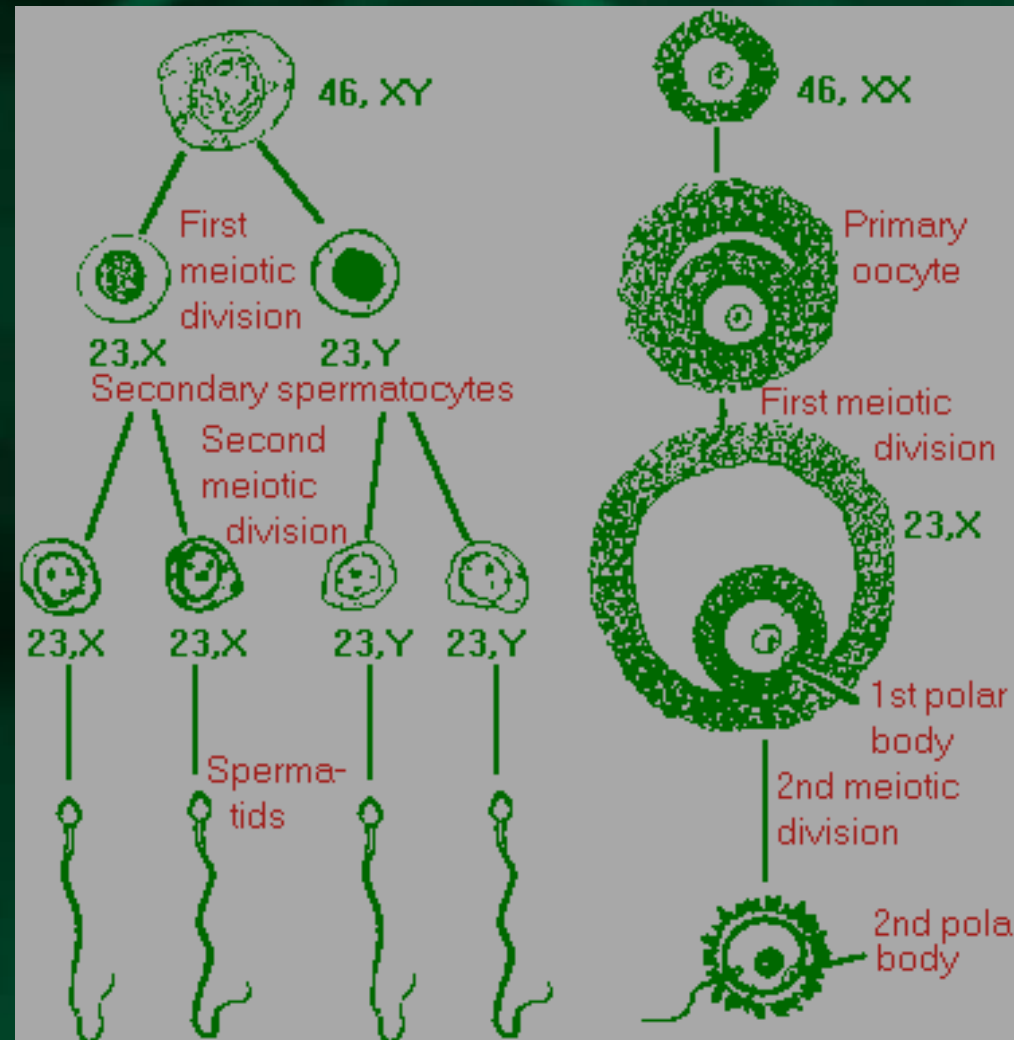
↓ At birth: 300.000 - 500.000 oocytes

↓ Cycle - 21 days ↻ 17,4 ovulations/year

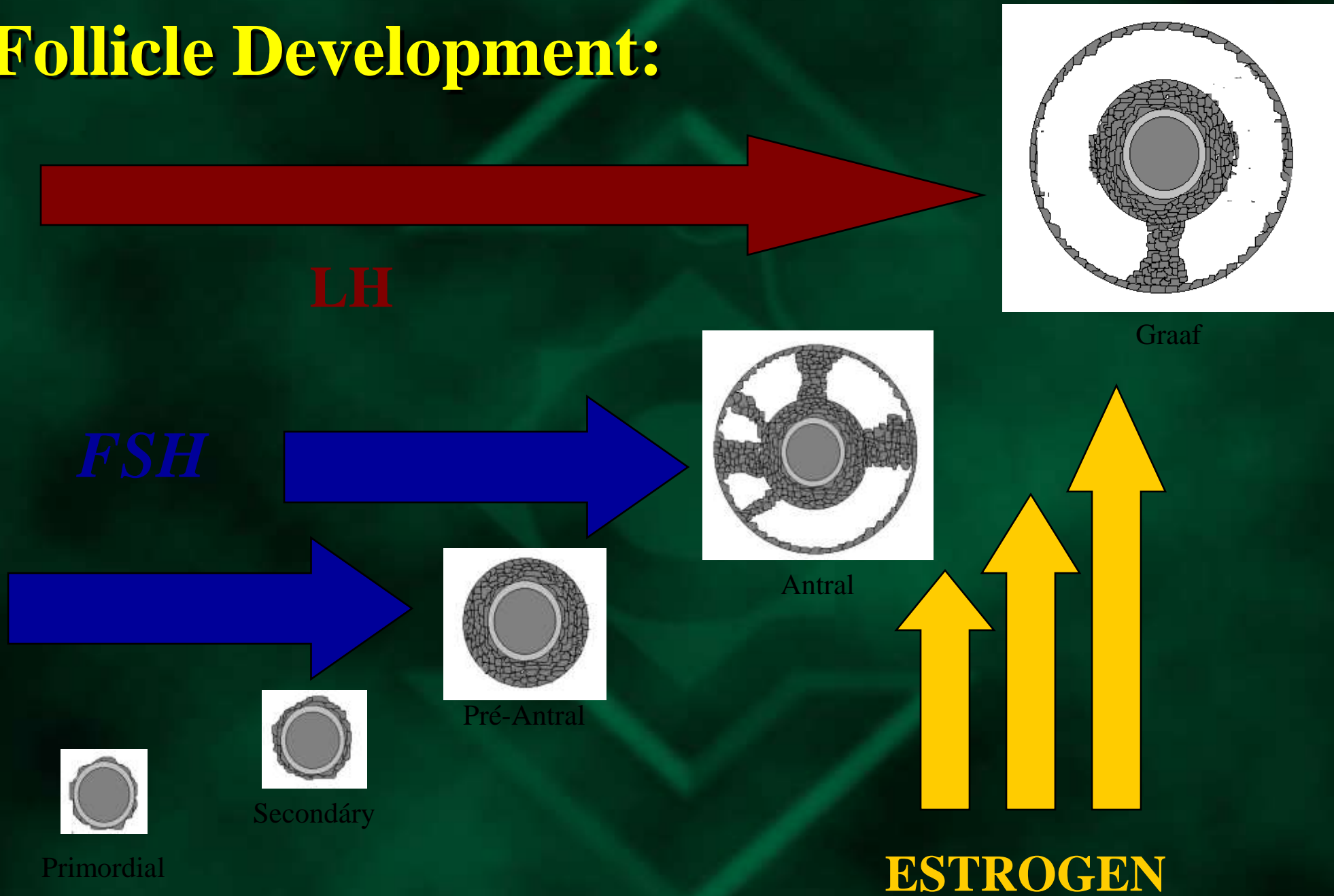
↓ 15 years (17,4 x 15) ↻ 261 ovulations/life

↓ “-”years of pregnancies ↻ **0,01 % of genetic potential**

Gametogenesis:



Follicle Development:



Anatomy:

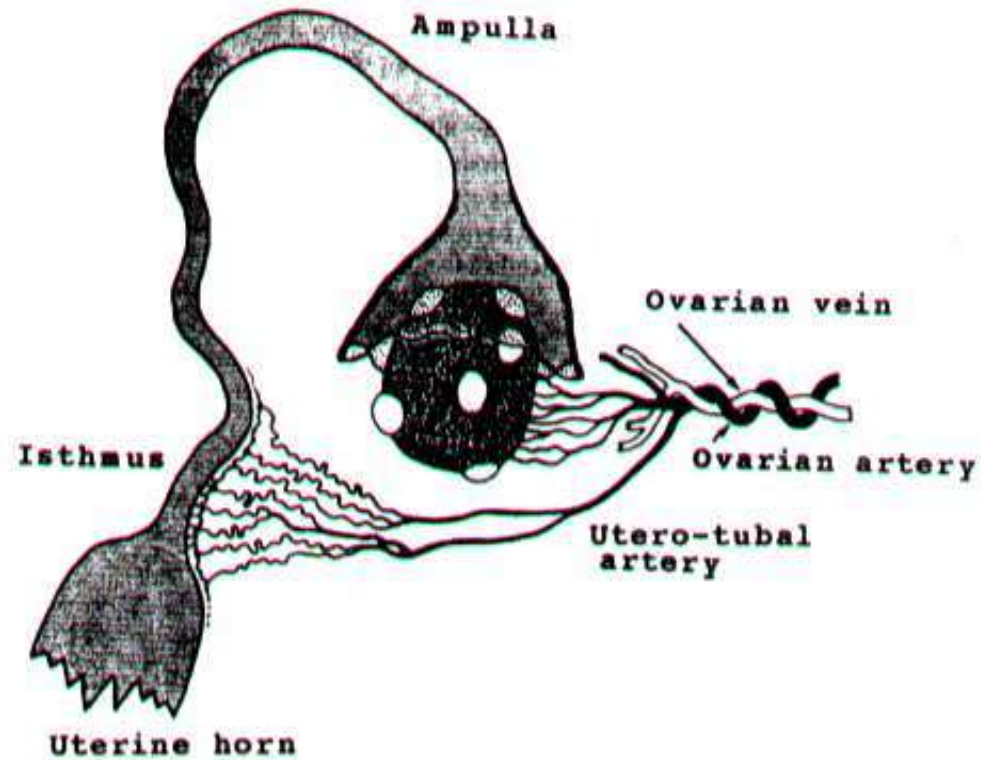


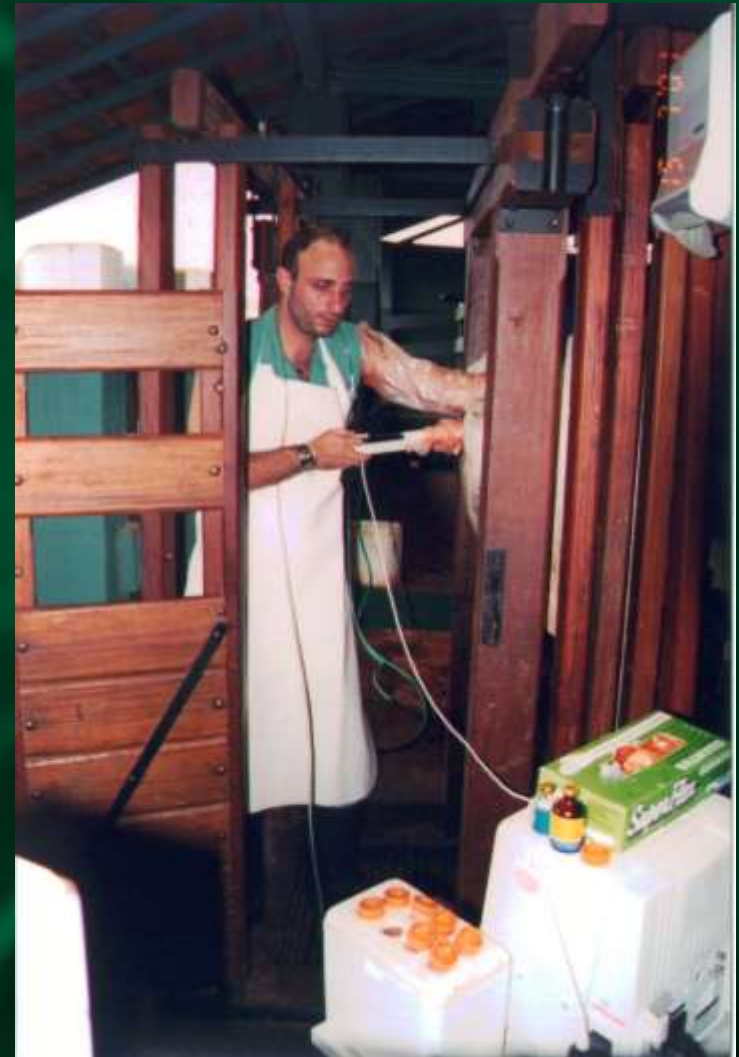
FIG. 7. Representation of the arterial blood supply to the ovary and isthmus of the pig oviduct. (From ref. 1064.)

Ultrasound-Guided Ovum Pick Up Procedure

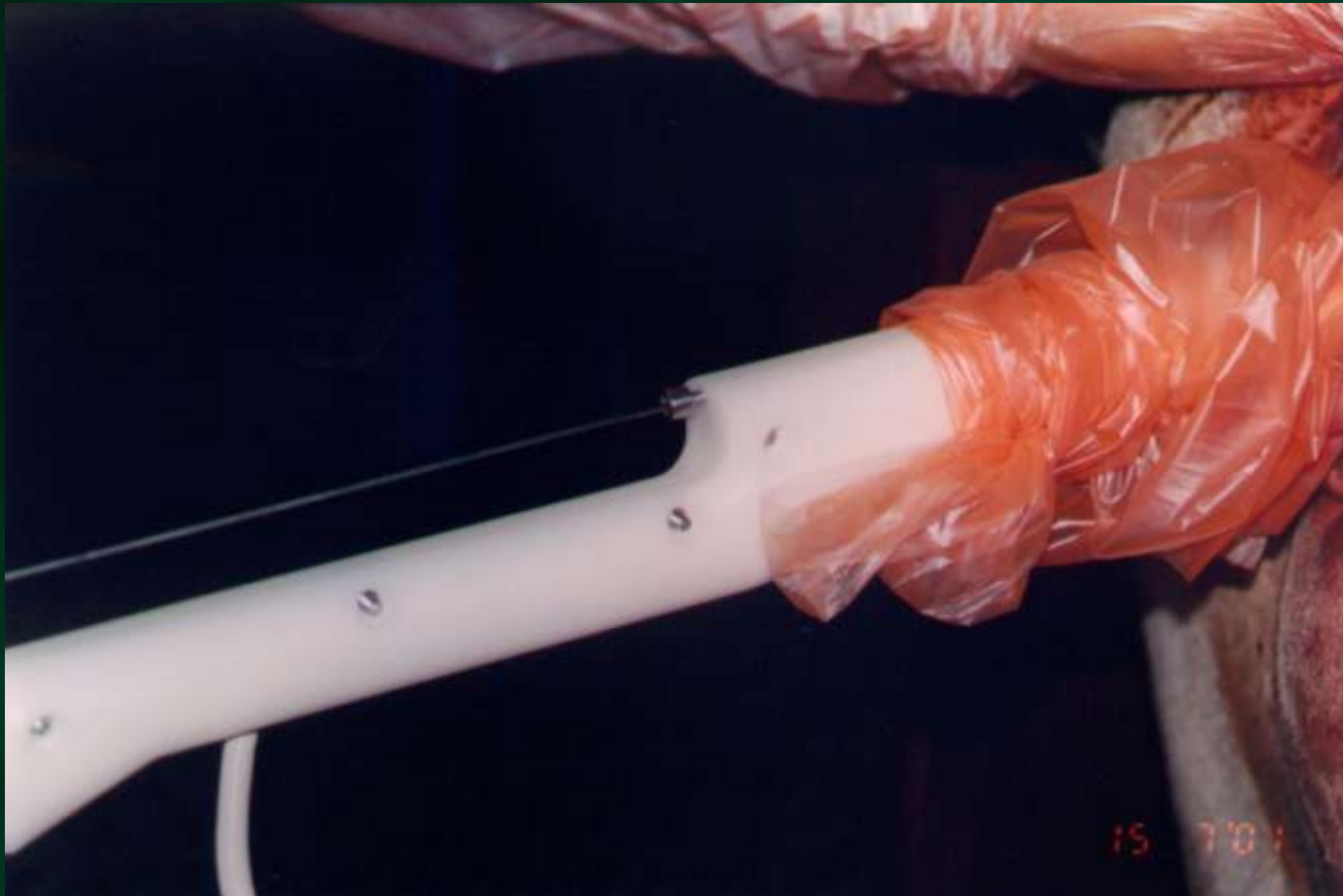
➔ Donor Preparation

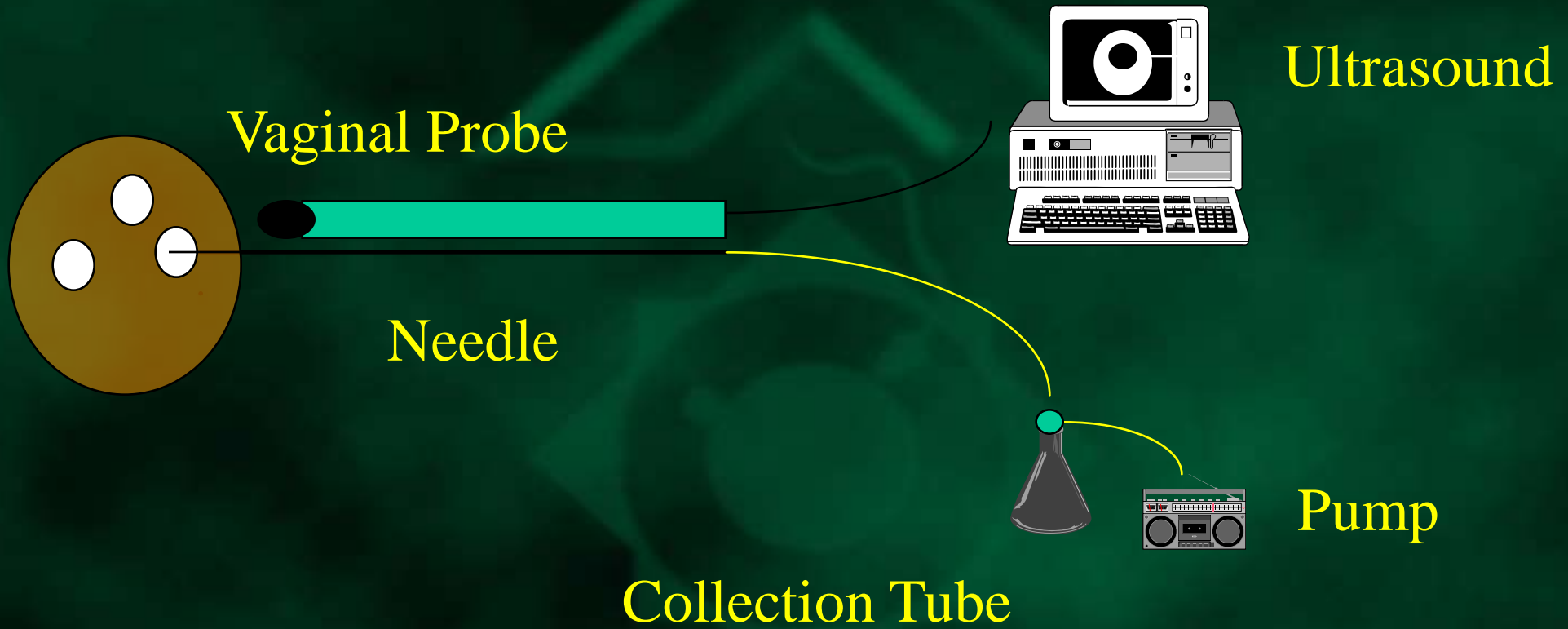


➔ Equipment



➔ Introducing the probe





OPU System

Pieterse e col. 1988

➔ Field Lab



➔ Filtering the collection



➔ Search and Evaluation of oocytes



➔ Packaging to Transport



➔ *in vitro* Maturation

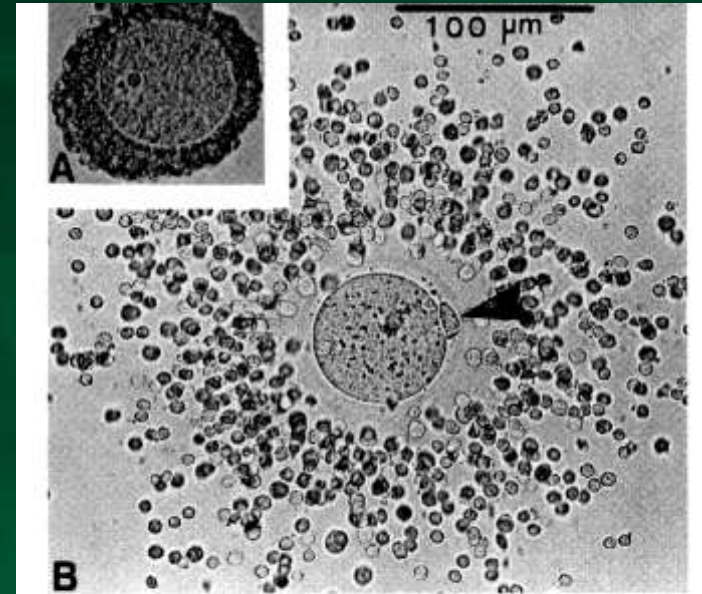
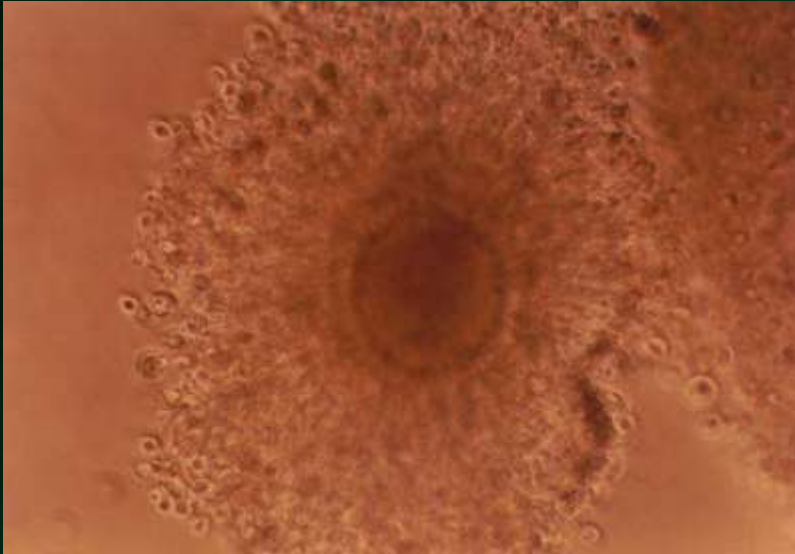
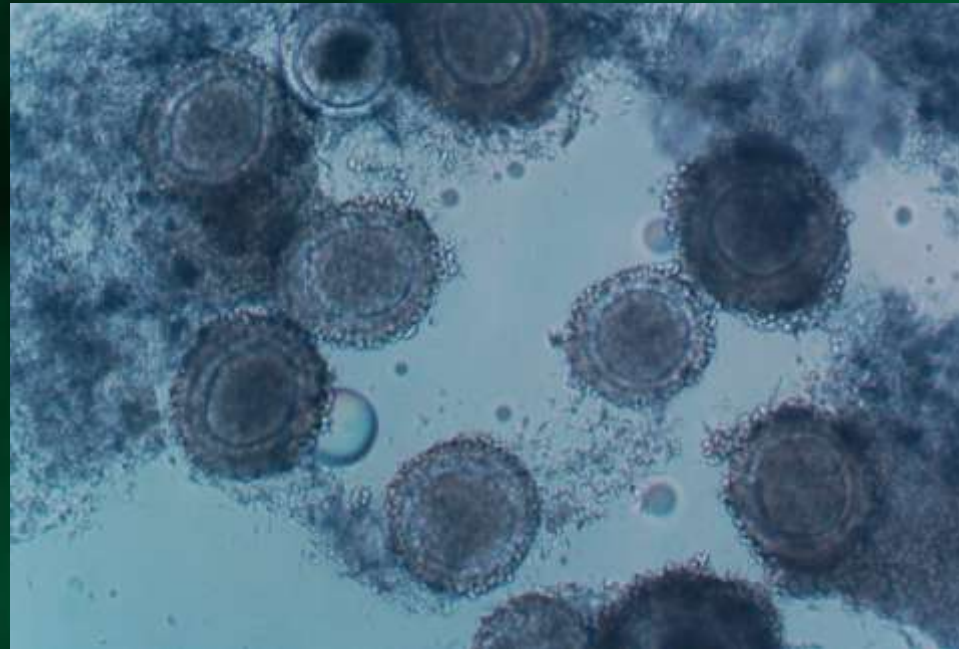
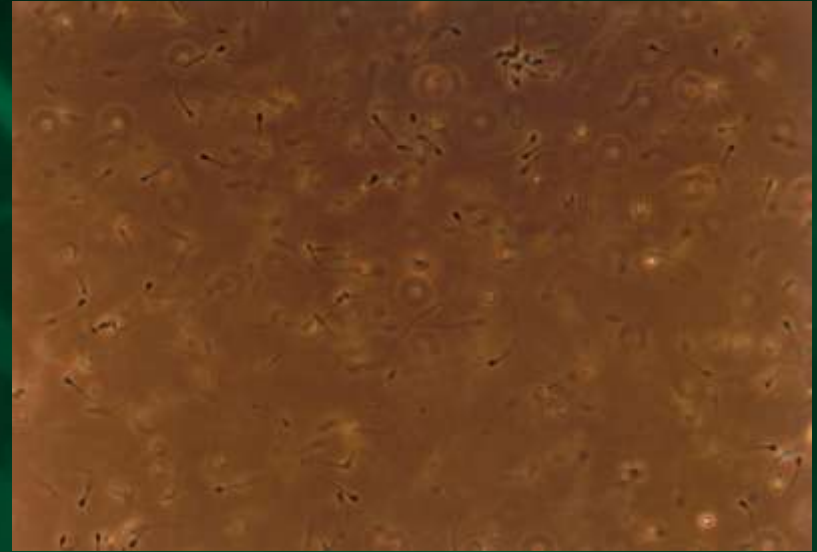
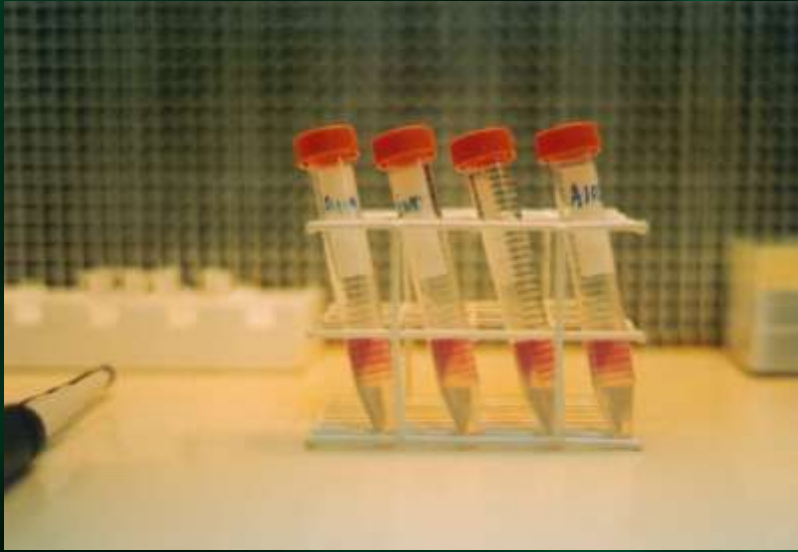


FIG. 38. Mouse cumulus oophorus before and after expansion. (A) A mouse egg isolated from a preovulatory antral follicle, with compact cumulus; (B) a recently ovulated mouse egg in an expanded cumulus. An *arrowhead* indicates the 2nd polar body. (From ref. 922a.)

➔ *in vitro* Fertilization



Fertilization:

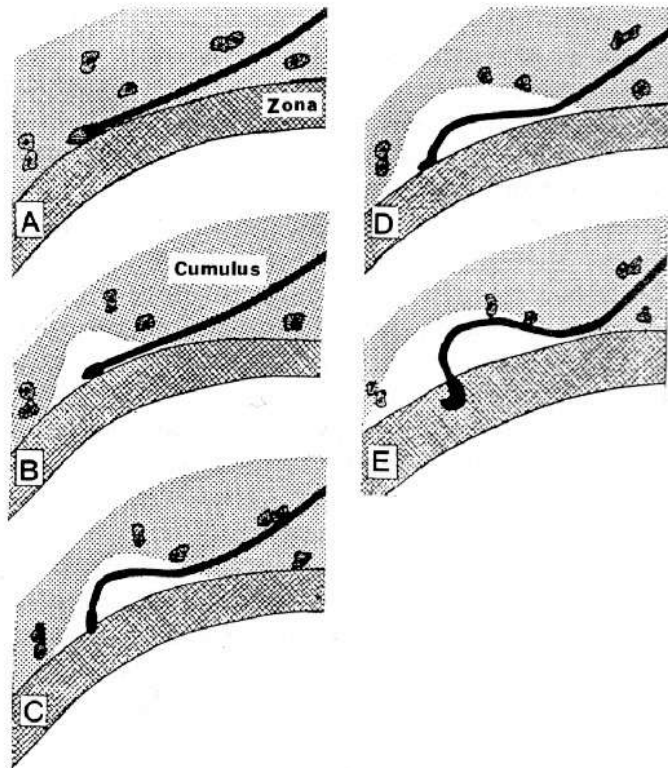
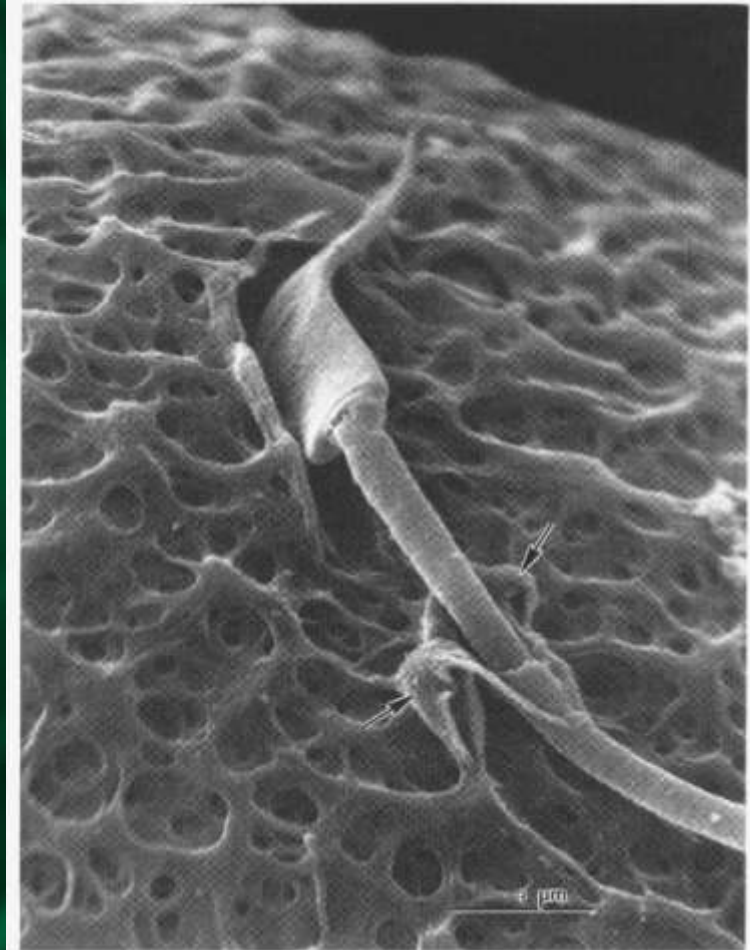
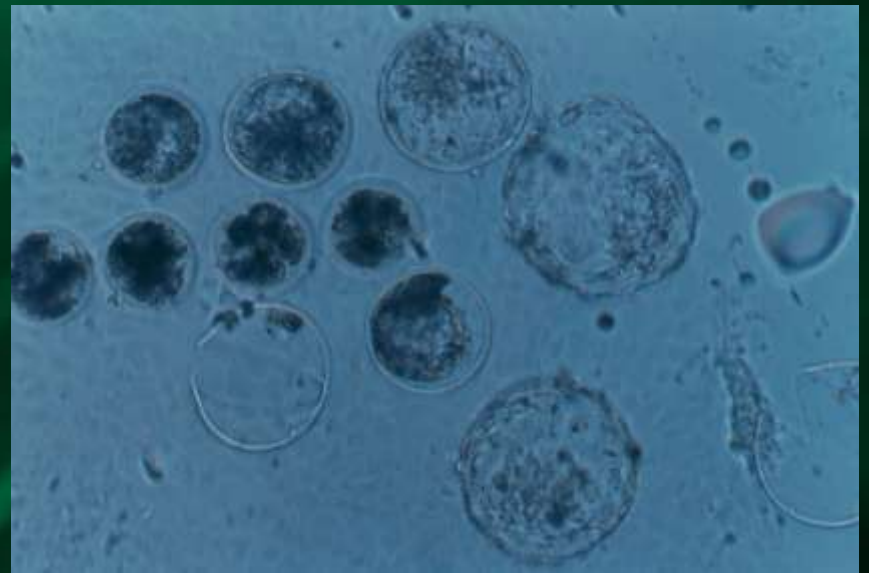
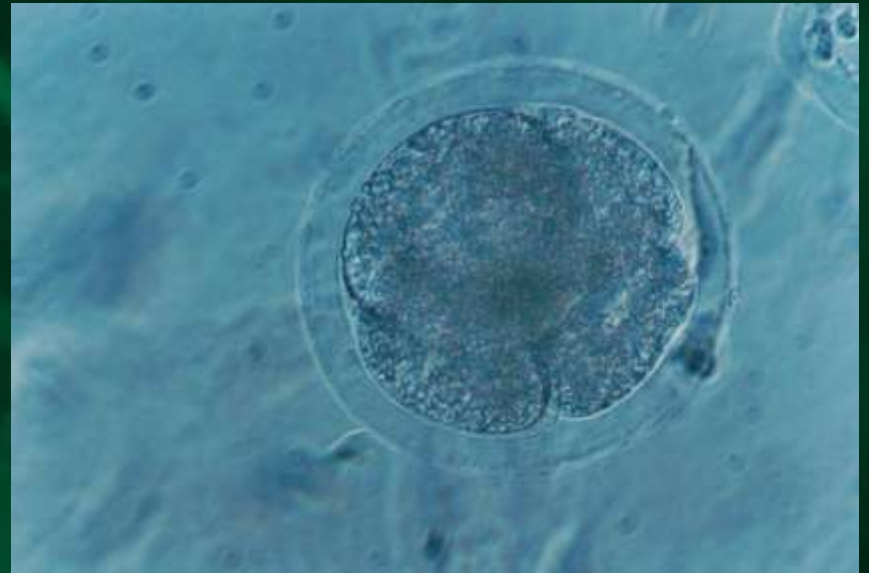
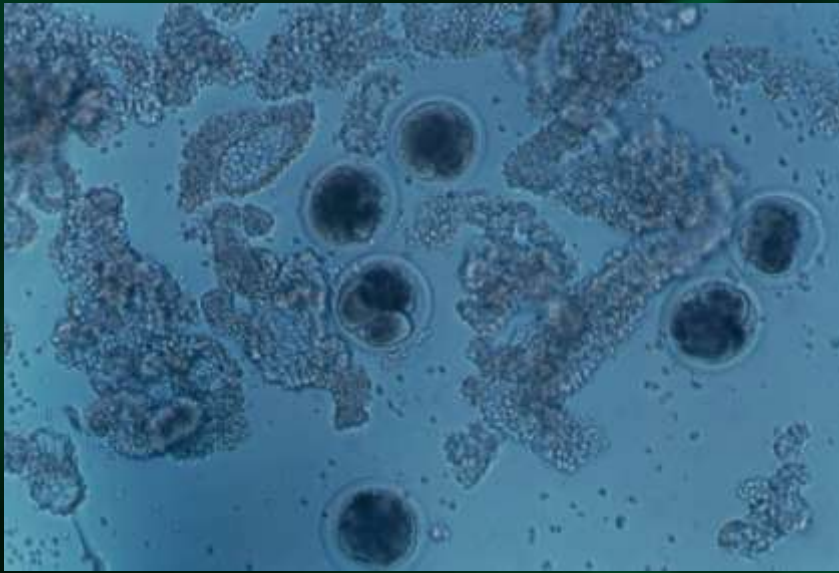


FIG. 40. Diagrams showing that hyaluronidase released from the acrosome at the zona surface depolymerizes the cumulus matrix locally to enable the proximal region of the sperm tail to move more freely. (From ref. 890.)



➔ *in vitro* Culture



OPU/IVF Growth in Brazil

- Research
- Slaughterhouse Ovaries
- Problem Donors
- High Value Donors (↑ production)
- Pregnant Donors
- Heifers/Calf Donors

Advantages:

➔ Higher embryo production

- **AI** ⤴ 1 pregnancy/year ⤴ 7 pregnancies/7 years (MAX)
- **SOV-TE** ⤴ 15 pregnancies/year ⤴ 100 pregnancies/7 years (MAX)
- **OPU/IVFV** ⤴ 2 pregnancies/week ⤴ 728 pregnancies /7 years (AVG)

➔ Shorter intergeneration interval

-Pregnancies of a 5 months old heifer

➔ Best Use of Donors

- From 5 months to 21 years old donor

➔ Best Use of Semen

-One straw is enough to fertilize up to 300 oocytes (100 embryos)

Advantages:

➔ Problem Donors

- only non-genetic/non-congenital (Cysts, Endometritis, Adhesions, Obstructions) Other acquired problems

➔ Don't use hormones !

Punctures can be performed every week

➔ Pregnant Donors

Up to 120 days, doesn't interfere on the pregnancy

➔ Dead Donors

Up to 8 hours transport

Disadvantages:

- ➔ Costs
 - 150% cost of conventional ET
- ➔ Non-freeze-ability

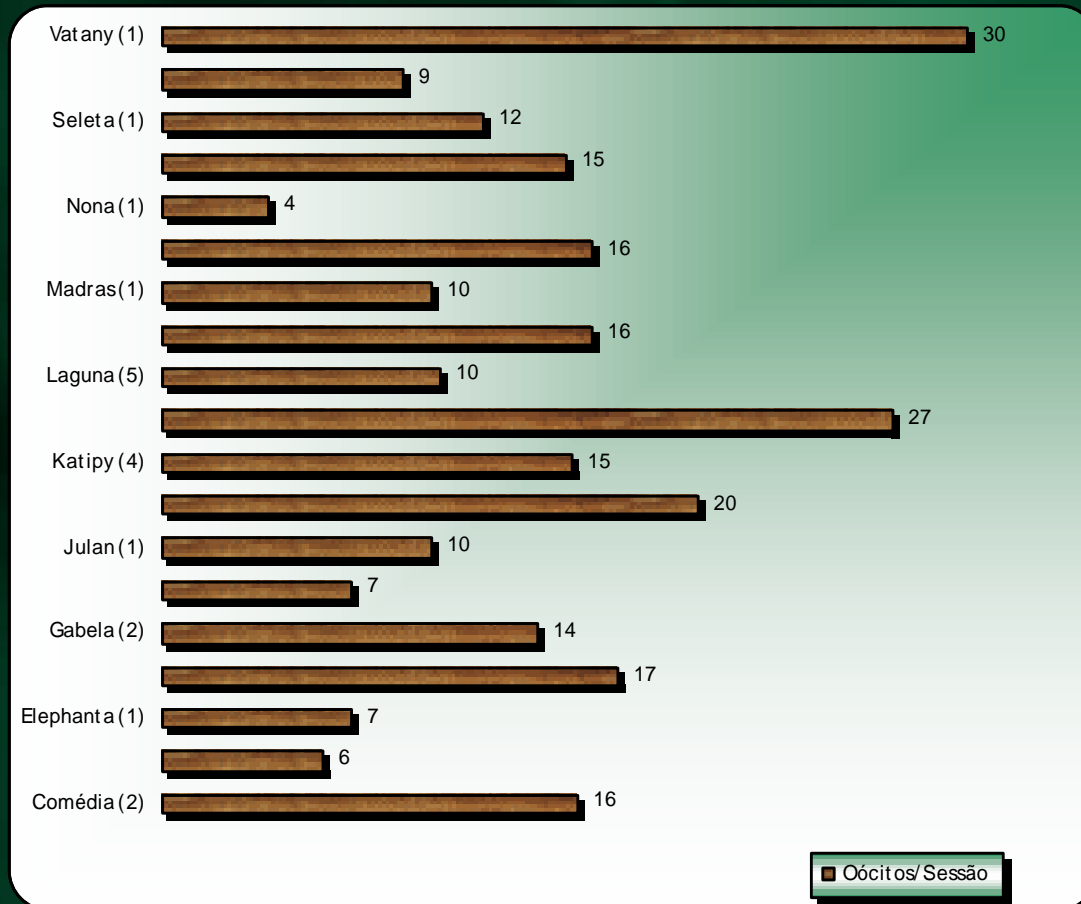
Responsability:

- ➔ Quick Spread of desired traits
- ➔ Quick Genetic improvement
- ➔ Quick Spread of undesired traits

Factors affecting OPU/IVF embryo production

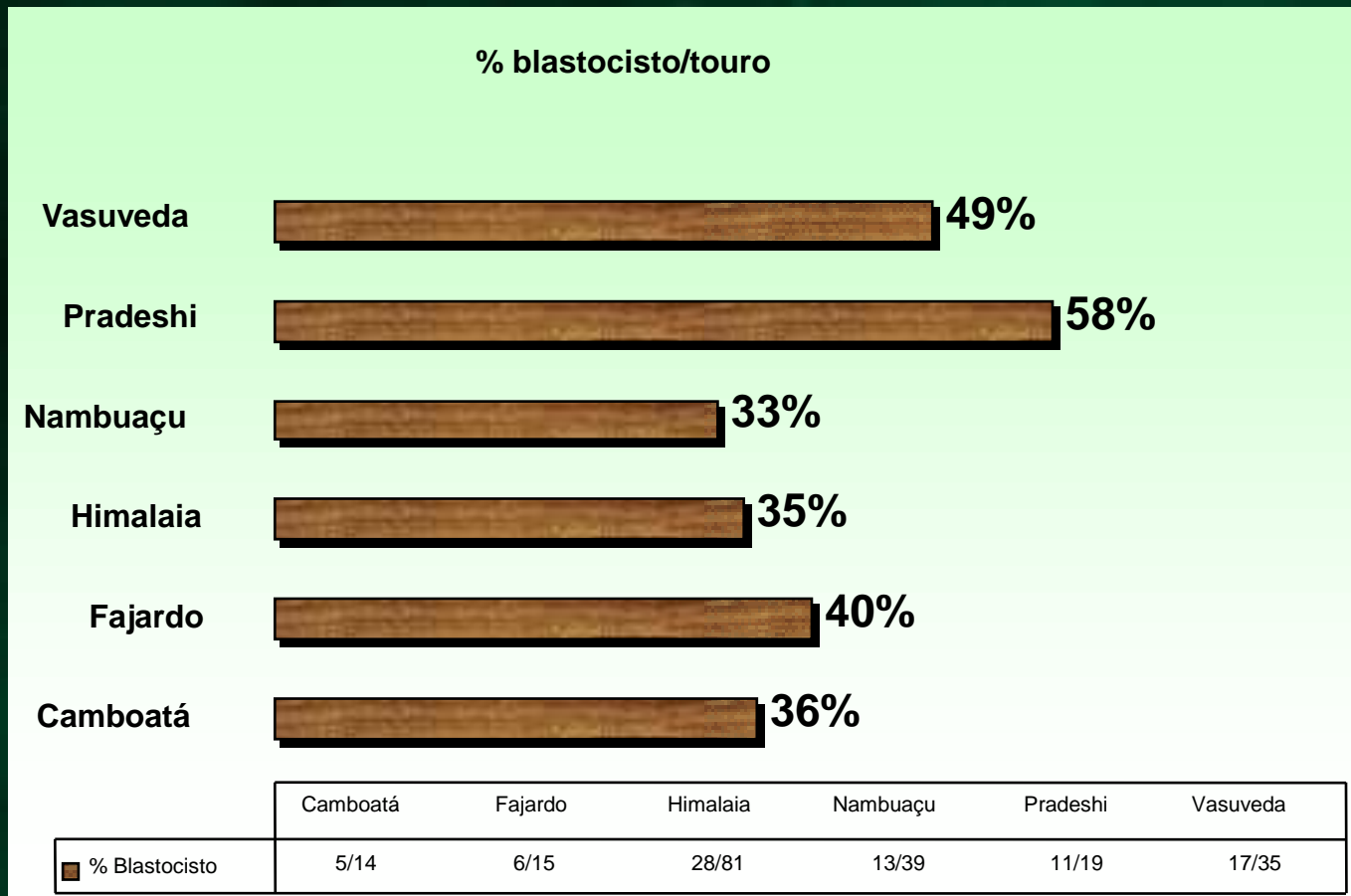
Factors affecting production

➔ Animal to Animal Differences - Donor



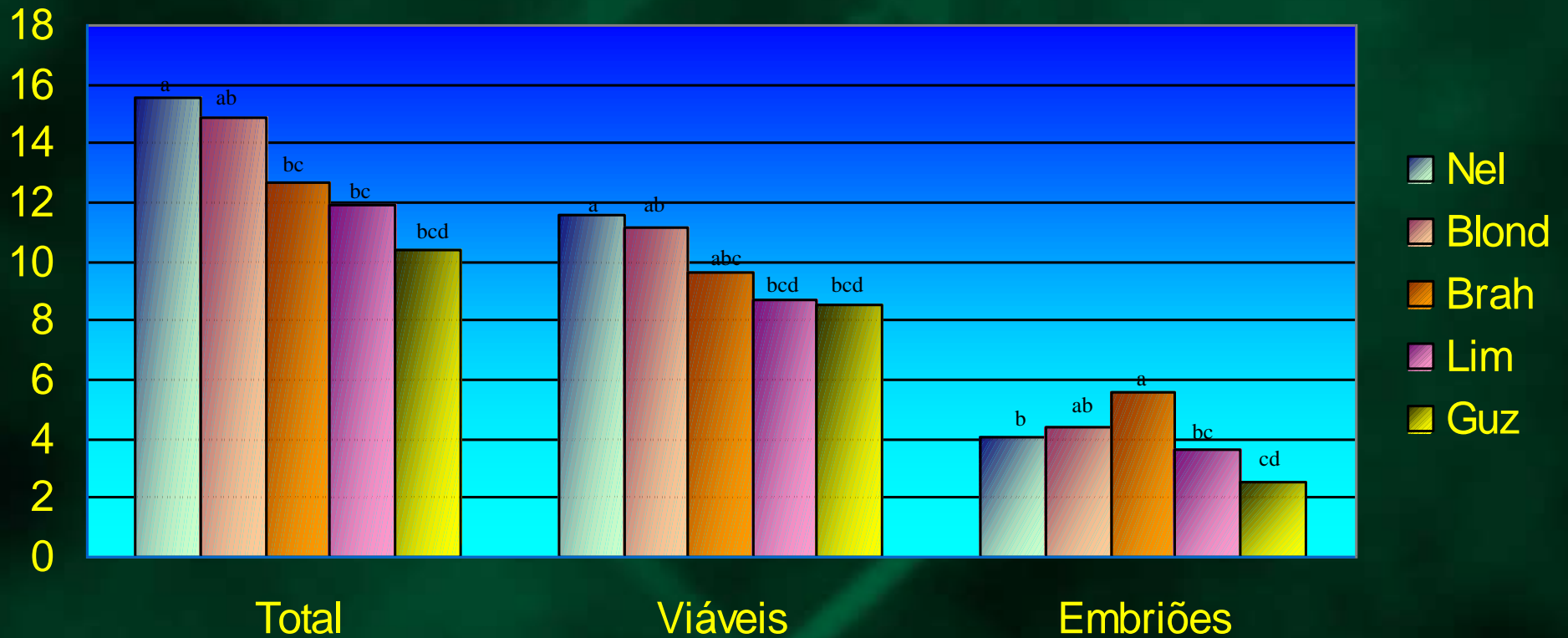
Factors affecting production

➔ Animal to Animal Differences - Sire



Factors affecting production

➔ Differences between Breeds



IVF Reality in Brazil:

Years	4
Lab Facilities	4
Donor Centers	5
People at the Team	50
Clients	312

OPU SESSIONS	10,500	
DONORS	1,100	
OOCYTES	150,000	(x=14,29)
VIABLE OOCYTES	112,000	(x=10,68)
EMBRYOS	40,880	(36,50%)
PREGNANCIES	+20,000	(39,00 %)

FAQs:

- ➔ Does the OPU damage the donor ?
- ➔ Are the offspring normal ?
- ➔ For how long can I puncture a cow ?
- ➔ How are the sex rates ?
- ➔ How long can the transport of the oocytes/embryos take ?
- ➔ How much does it cost ?
- ➔ How does the Senepol fit in all these data ?



The End