



## Artificial Insemination: the Vet's Perspective

Peter E.J. Bols, DVM, PhD, Dipl ECAR

Department of Veterinary Sciences  
Laboratory for Veterinary Physiology  
Gamete Research Center  
University of Antwerp, Belgium  
[peter.bols@ua.ac.be](mailto:peter.bols@ua.ac.be)

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## Programme

- Introduction: AI in Veterinary Medicine
- Technical aspects
- Current and future challenges



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## AI in Veterinary Medicine

- AI = transfer of male gametes to the female reproductive tract by means of an instrument
- First reports on AI in animals: Arabs in 1322
- First steps in andrology: Van Leeuwenhoek (1678)
- First AI in a bitch: Spallanzani (1784)
- AI in horses: Ivanoff (Russia, 1900)
- AI procedures in horse, cattle, sheep and swine: Ivanoff (1922)
- First commercial AI cooperative: Sorenson (Denmark, 1936)
- AI and the use of artificial vaginas: Milovanov (1938)
- Since 1965: predominant use of frozen-thawed semen
- Currently: AI in all farm animals (cattle, horses, sheep, goats, pigs, chickens, turkeys, rabbits ...)

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### AI in Veterinary Medicine: indications

- AI was introduced out of sanitary reasons
  - Many cows are mated by the same bull
  - Prevention of the spread of venereal diseases (vibriosis, trichomonas etc ...)
  - Prevention of non-sexually transmitted diseases: TBC, brucellosis, paraTBC

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### AI in Veterinary Medicine: indications

- AI for the rapid dispersal of valuable genes
  - Improve genetic quality of livestock
  - Reduction in the number of lethal genes
  - Improvement of carcass quality
  - Cost-effective technology in intensive farm animal industry
- AI has been most successful in cattle breeding industry through selection and test programmes

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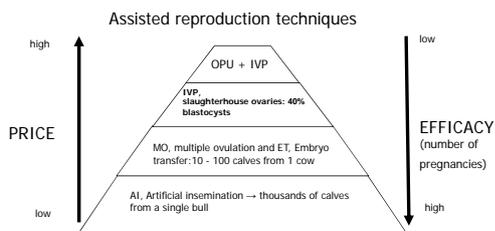
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### Assisted Reproduction in Veterinary Medicine



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# AI in Veterinary Medicine



One Million doses of sperm



Slaughter !

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# AI in Veterinary Medicine

Table 1  
Semen Collection (Cows), Bulls and Semen Doses Produced in Cattle and Swine and Regional Distribution

Region	No. of SCC	No. of semen loads	No. of Bulls	No. of doses produced (n = 1000)	Doses	Total (%)
Africa	1110	101	300	15	1454	(3.4%)
North	68	78	627	0	43 276	(43.7%)
Asia	70	138	100	0	1957	(1.9%)
Europe	100	404	4708	8075	40 910	(40.9%)
South	17	136	100	11	250	(0.2%)
Swine	107	401	10 707	2998	137 540	(137.5%)
TOTAL	1462	1431	11 414	11 414	211 731	(211.7%)

Note: The addition of the total number of doses is made to the total which explains the slight difference from the simple addition from above figures here given to the Roward.

Thibier and Wagner, Livestock Production Science, 2002.

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# AI in Veterinary Medicine

Table 2  
Semen Doses Required and Equipped and Regional Distribution

Region	No. doses required	No. doses equipped
Africa	100 000	1000
North America	1 000 000	11 500 000
South America	5 318 583	120 450
Far East	1 401 100	810 100
Other Asia	402 040	1120
Europe	4 000 000	7 000 000
TOTAL	14 000 113	19 241 540

Thibier and Wagner, Livestock Production Science, 2002.

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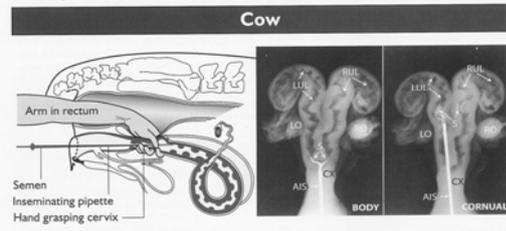
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### Technical aspects



Picture: P.L. Senger, Pathways to pregnancy and parturition.

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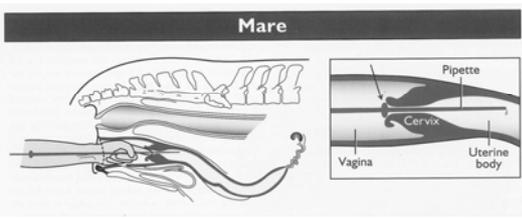
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### Technical aspects



Picture: P.L. Senger, Pathways to pregnancy and parturition.

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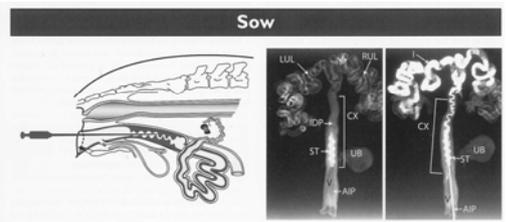
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### Technical aspects



Picture: P.L. Senger, Pathways to pregnancy and parturition.

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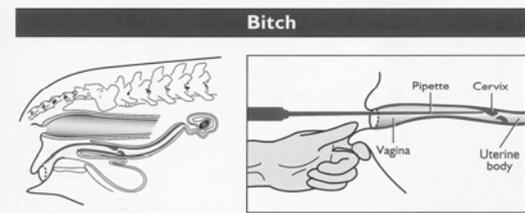
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### Technical aspects



Picture: P.L. Senger, Pathways to pregnancy and parturition.

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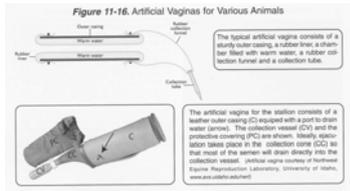
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### Semen sexing (1)



Pictures: 'Veeteelt Vlees' (May 2009).



Picture: P.L. Senger, Pathways to pregnancy and parturition.

Sperm collection using artificial vagina. Sperm is kept at 34°C.

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### Semen sexing (2)



Pictures: 'Veeteelt Vlees' (May 2009)

Ejaculate is identified by barcode sticker. First gross quality assessment checking mass motility, percentage living cells, total number of cells and concentration. Sperm is put on transport in portable incubator at 19°C.

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### Semen sexing (3)



Pictures: 'Veeteelt Vlies' (May 2009)

Ejaculate is transported to the sexing laboratory (3 hr transport). Sperm is diluted and a vital dye is added which attaches to DNA of sperm cells. 'Female' sperm cells contain 3.8% more DNA: different colour (X chromosome is bigger dan Y).

Sperm cells pass laser (36.000 droplets/ sec). Sensors measure the amount of dye. Following measurement, each sperm cell receives an electrical charge depending on gender. A magnetic field finally sorts out sperm cells. ONE EJACULATE / 8 hours.

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### Semen sexing (4)



Pictures: 'Veeteelt Vlies' (May 2009)

One straw sexed sperm contains aproximately 2 million sperm cells (straw with regular sperm: 27 million).

Chances on success (= calf has the desired gender) = 90%

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### Deep intra-uterine insemination

- AI with sexed semen: reduction of semen dosis
- AI with semen of limited stock
- Increase of the number of AI doses from one ejaculate

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### Deep intra-uterine insemination The 'Ghent device': insemination at Utero Tubal Junction



Fig. 1. Ghent device with a telescopic, flexible tip.

Verberckmoes et al., Theriogenology, 2004.

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### Deep intra-uterine insemination The 'Ghent device': insemination at Utero Tubal Junction

Table 3  
Number of inseminations per insemination and clinical success rates with different insemination techniques

Insemination	Number of inseminations	Pregnancy success (%)		
		CSI (n=20)	AI (n=20)	AIU (n=20)
1	204	21.0	26.2	22.0
2	222	28.7	31.0	26.0
3	100	30.0	35.0	28.0
4	107	37.0	35.0	32.0
5	124	38.0	38.0	32.0
6	102	39.0	36.0	34.0
7	100	35.0	40.0	33.0
8	101	38.0	42.0	35.0
9	107	38.0	38.0	36.0
10	100	42.0	42.0	35.0
11	101	38.0	38.0	35.0
12	101	38.0	38.0	35.0

Verberckmoes et al., Theriogenology, 2004.

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### Conclusions

- AI in Veterinary Medicine is the first assisted reproductive technique practised in commercial business for many decades
- Huge economic importance in developed countries
- Huge potential for application in developing countries
- 'High-tech' AI (sexed semen, deep IUI, ...) still limited

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Many thanks for your attention



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