



NÖK congress 2016 Optima

2.8.2016

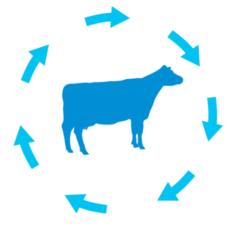
Henri Simonen

ET team veterinarian



Outline

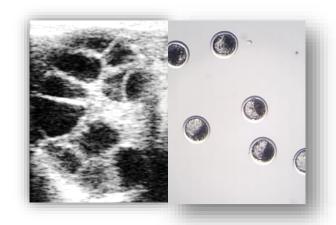


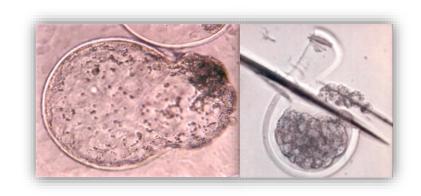




VG FEMALE PROGRAM

STATUS AT PRESENT





EMBRYOTECH PROJECT

FUTURE TECHNOLOGIES



VG Female program in genomic selection





Number of pure bred recorded cows per country 2014/2015

Breed	Denmark	Sweden	Finland	Total
VikingHolstein	360,000	138,000	96,000	594,000
VikingRed	33,000	97,000	133,000	263,000
VikingJersey	69,000	2,000	400	71,400
VikingRedHolstein	5,000	-	-	5,000
VikingNativepolled		1,000	3,000	4,000
Total	467,000	238,000	232,400	937,400

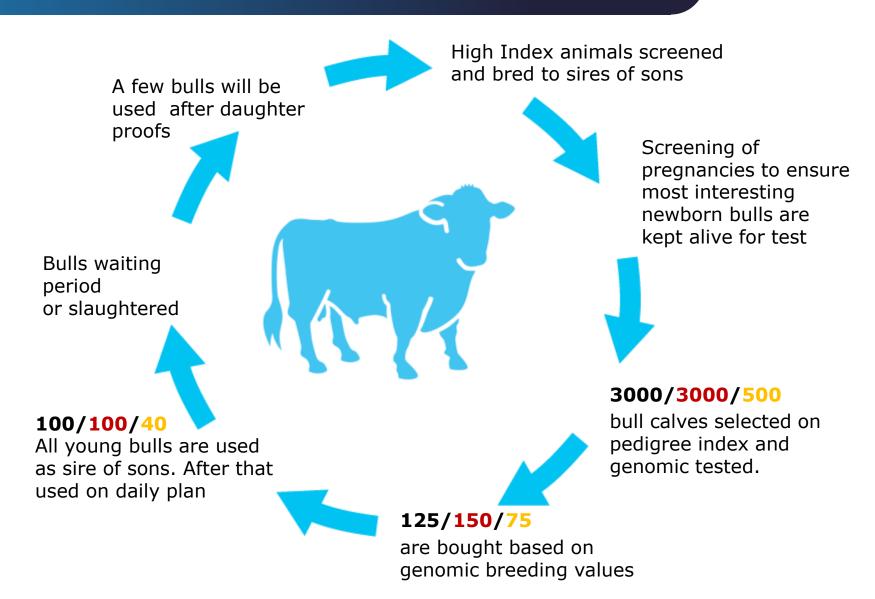
Updated 2015-11-17

Breeding programme in VikingGenetics 2016

	No. of genomic tested bull calves	No. of progeny tested sires/year	No. of flushing contracts
VikingHolstein	3,000	100	400
VikingRed	3,000	100	400
VikingJersey	500	40	50

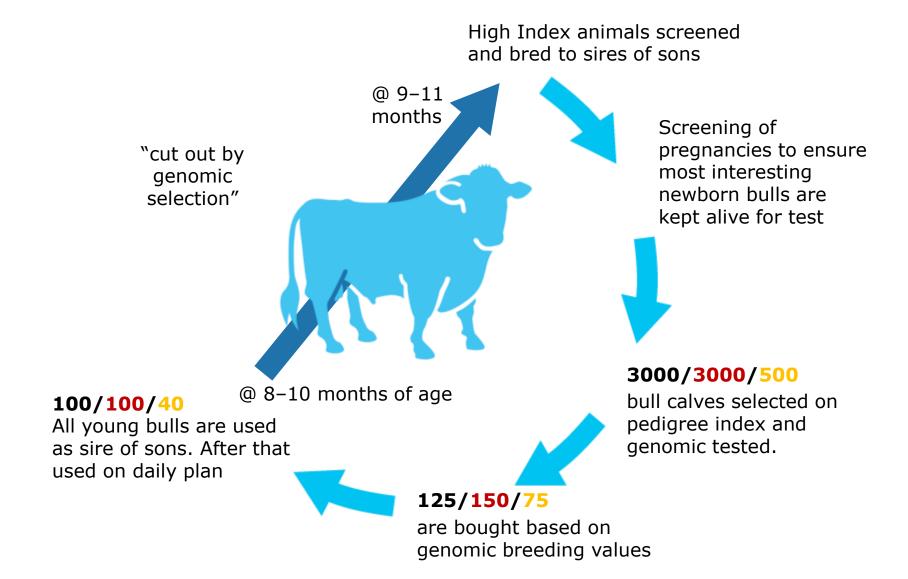


VikingGenetics bull program



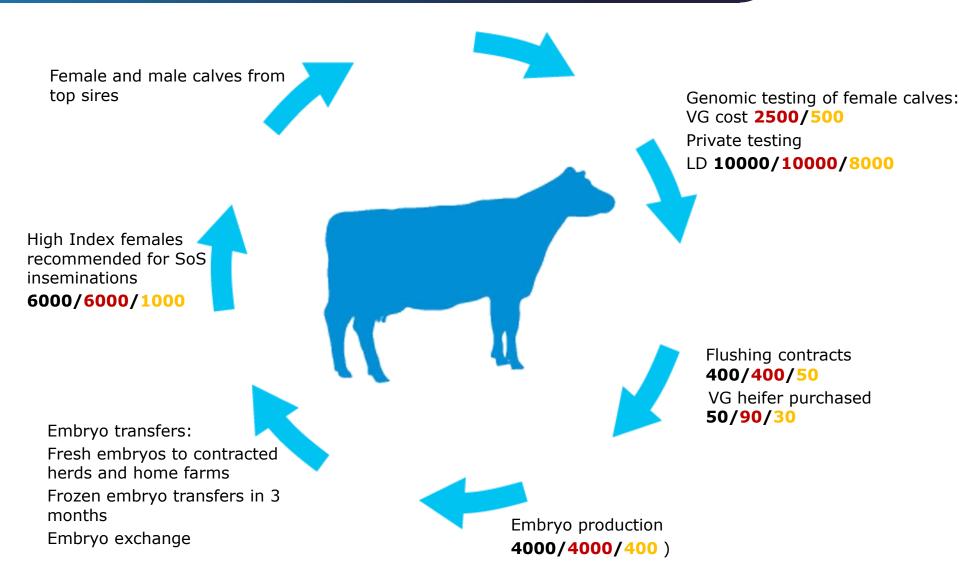


VikingGenetics bull program

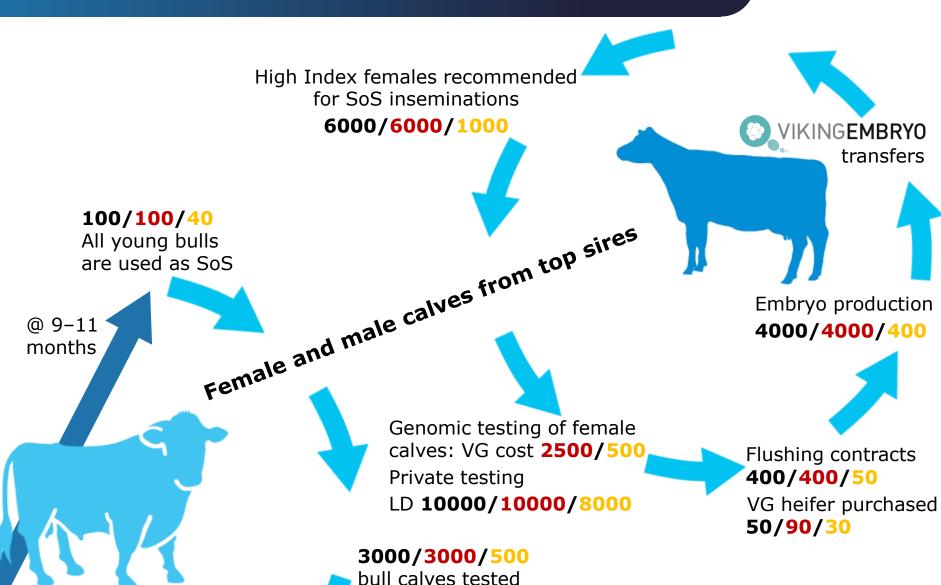




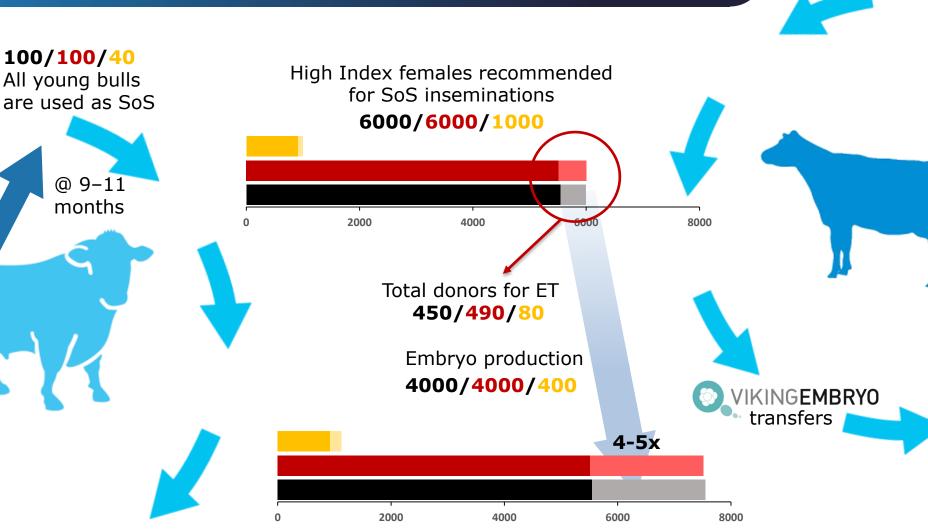
Vikinggenetics female program







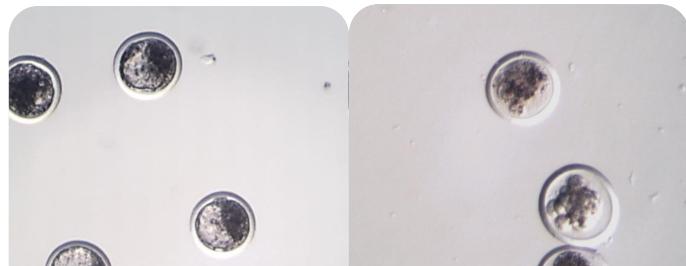
Embryo program: "natural" outcome of GS



Calves from top sires and High Index females

Status at present in Finland





What infrastructure we need to handle more than 2000 embryos per year?



Selecting from data and contracting the donors

- VikingBull program in VG

Embryo recovery service for all farms in Finland provided by Faba ET team vets



Donor station for heifers bought by VG in Hollola

- Several subsequent recoveries possible
- OPU-IVF possible



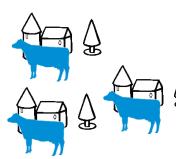
Embryo datasystem run by Faba – now relays information to VikingBull



Developed embryo market and marketing by VG and Faba – also internet based Webshop for embryos hosted by Faba

What infrastructure we need to handle up to ~2000 embryos per year?





VG embryo network farms for fresh and frozen embryo transfers = recipient network

Embryo transfer service for all farms in Finland provided by Faba ET team ET technicians



KINGGENETI



Embryo datasystem for follow up on transfer results for embryos produced by different methods and protocols

Research collaboration across organizations and borders in Nordic area to imporove results and implement new technologies

V

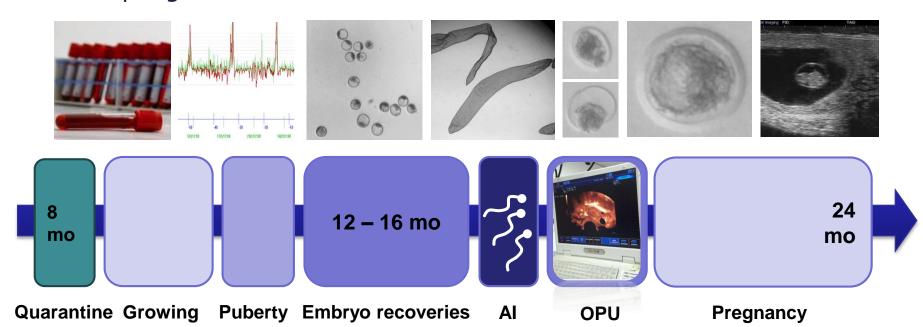
In practice "VG Flush Fee" contracts on farms

- HIFI heifer owner is contacted by VG breeding dept.
- Contract is made and sire decided (no X-vik bulls)
- Owner contact Faba ET team for planning and protocols setup
- Owner order local vet, AI technician as needed and pay expenses
- Faba team (1 vet + 1 technician) recover embryos, transfer fresh, process to freeze and book keep in national embryo database
- Owner of donor heifer own all embryos and decide future use
- Owner is paid 1000€ "Flush Fee" immediately
- First 5 bull calves selected for genomic testing by VG per sire x donor combination are paid "ET Fee" VR 500€ / VH 650 €

In practice "VG owned heifers" in Hollola



- Heifer bought in for 2500€ (VR) and 3000€ (VH) and sold out pregnant for 2000€
- Station heifer donote embryos 2-4 times and then participate in OPU-IVF production project
- VG owned heifers are also used for testing new MOET protocols, FTAI timings, follow-up on ovarian events by US and blood sampling





In practice "Fresh embryo network"

Purpose is to create permanent embryo network for any type of embryos, now ca. 70 farms participating, -100€ from normal embryo prices

Promote genetics progress by minimizing time embryos spend in cryologistics (also latest frozen embryos and IVF derived embryos are promoted in network) 0,60 0,50 0,40 0,30 Proportion of embryos 0,20 transfered fresh 0,10 0.00 helmi maalis huhti onko heinä marras tammi helmi maalis huhti onko kesä heinä loka marras joulu maalis helmi 2014 2015 2016

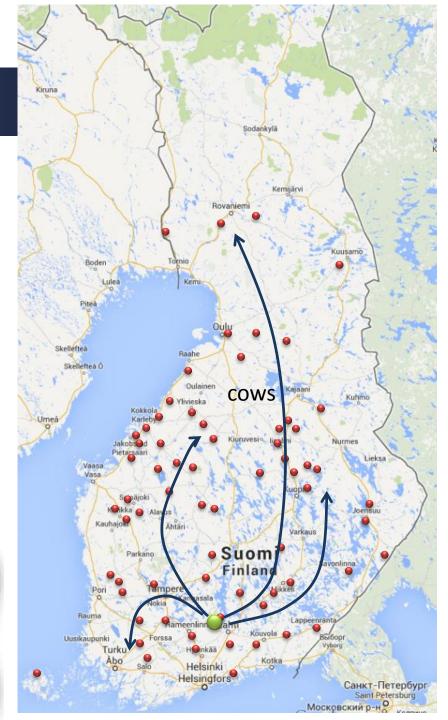
Fresh embryo network

- VGs latest breeding material available for any farmer in Finland immediately
- More use of fresh embryos for better results
- Embryos available on every Wednesday (traditional recovery + OPU embryos)
- Transfers on Wed or on Thu

Far away packages sent in special cold boxes







Co-operation with:



- = ET technician
- = ET veterinarian

heifers

COWS

Flushing of High Index Females on Farms

VIKINGGENETICS

- MOET embryo recoveries

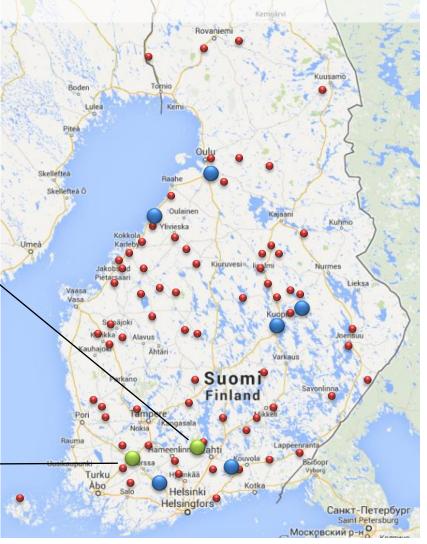
- Fresh and frozen embryo shipments
- OPU on heifers

- IVP laboratory
- Research with HighNTM cows



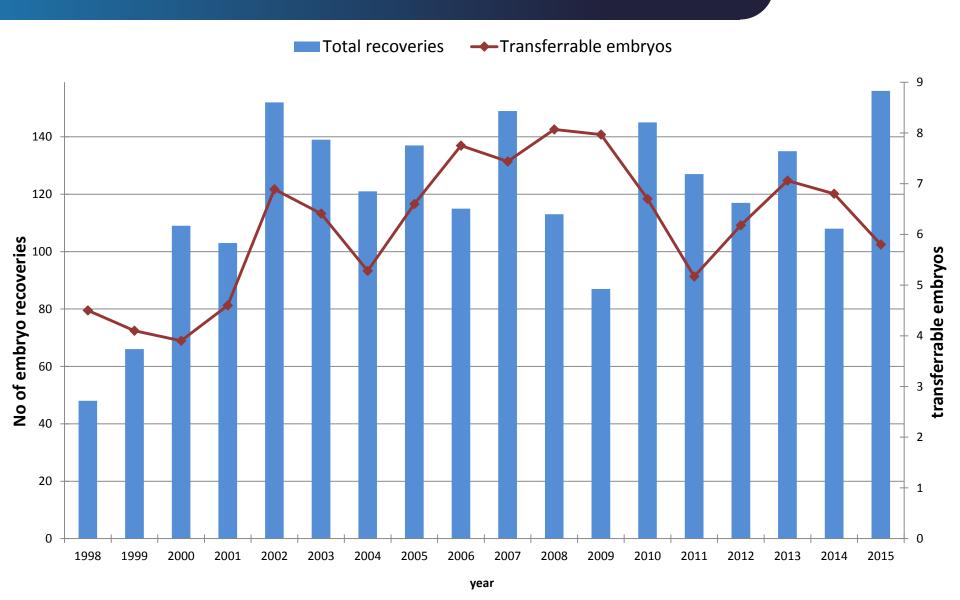
Faba ET-team:

- 6 ET-veterinarians (flushings)
- 65 ET-technicians (transfers)



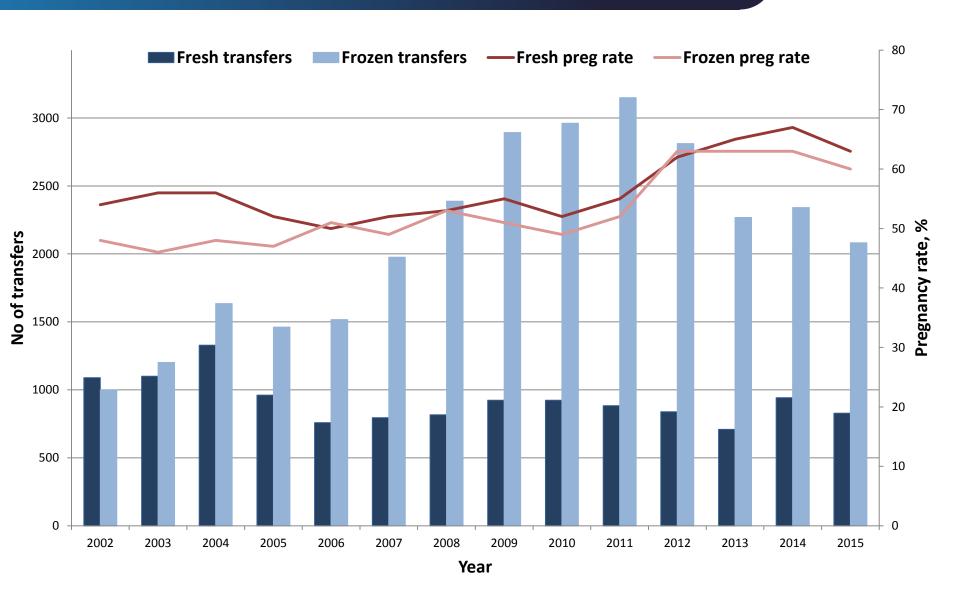


Nucleus herd heifers 1998 - 2015



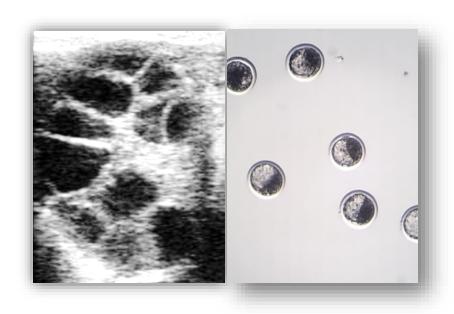


Finland – all transfers





Embryotech project

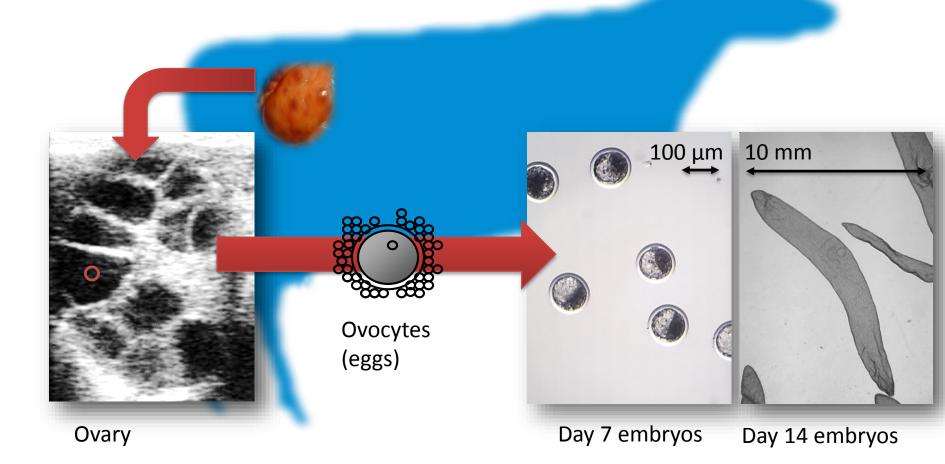




Embryotech project

Embryo technologies supporting new animal breeding strategies (2014 - 2016)

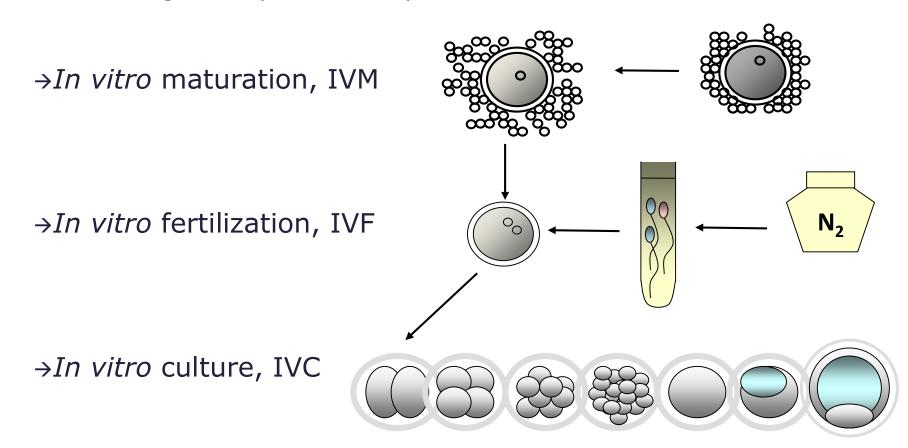
WP1 OPTIMIZATION OF OPU TECHNIQUES





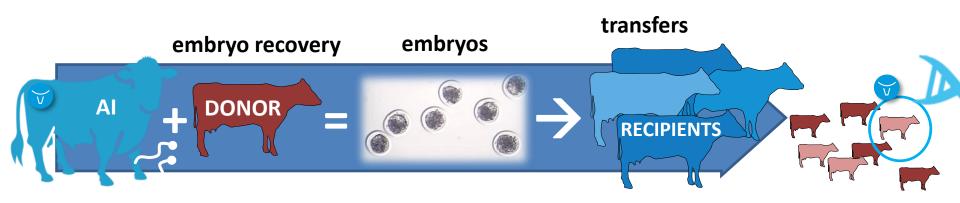
Ovum pick-up (OPU)

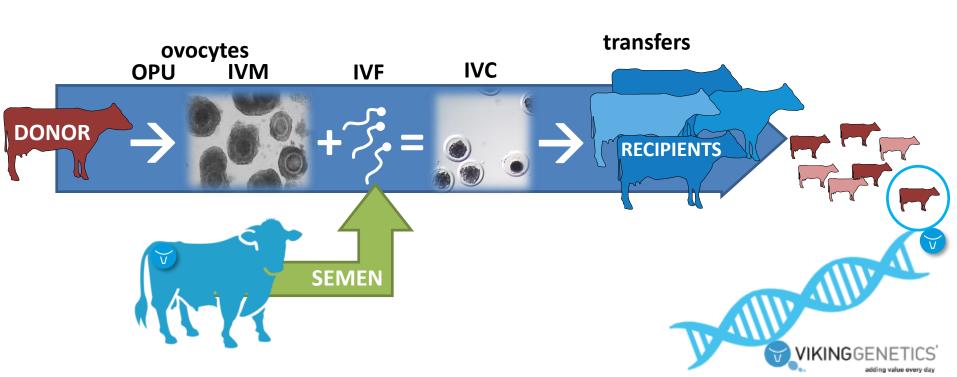
• Ultrasound-guided aspiration of oocytes from the ovaries



V

Superovulation vs in vitro fertilization





Equipment



- Ultrasound with a special holder for the probe
- Vacuum pump
- Small needles but long holders, aspiration tubes, tubings...



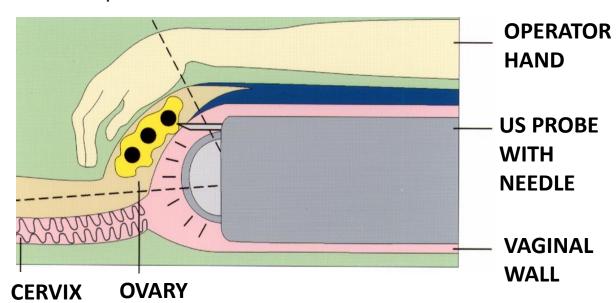






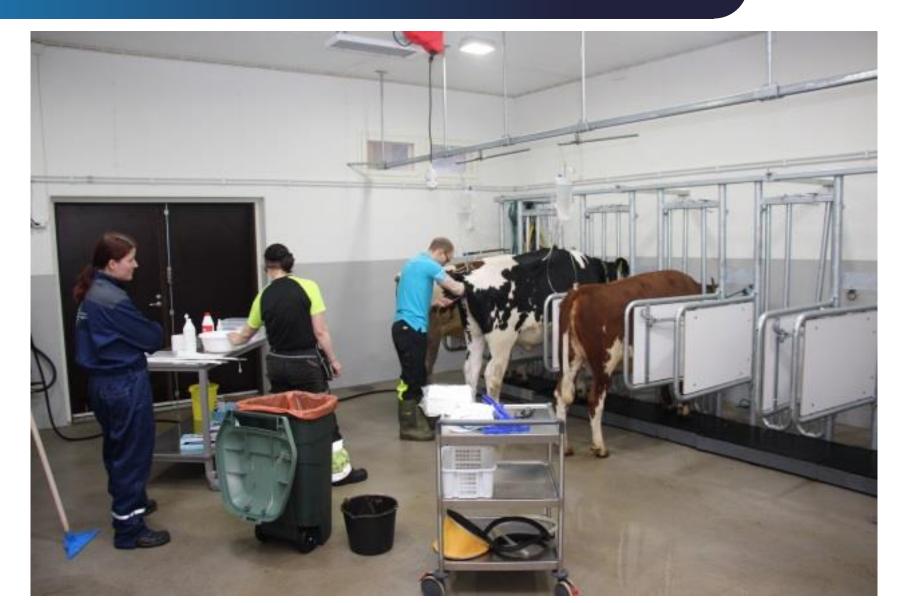
OPU procedure

- Epidural anaesthesia + (light sedation)
- Probe and needle are placed intravaginally
- Ovary is placed against the probe (manually), vaginal wall between
- Needle is introduced into follicles and they are aspirated into a collection tube









Teamwork

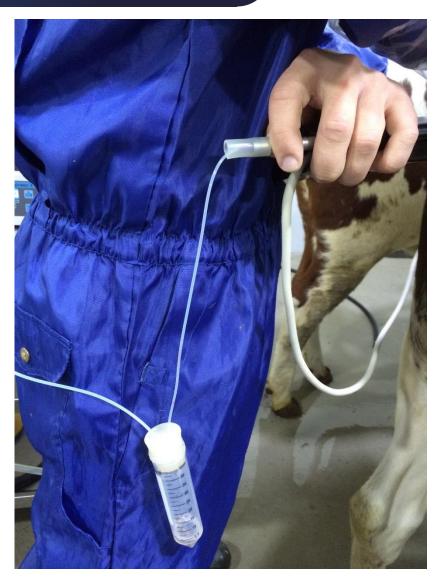


• Operator "hands are tied"





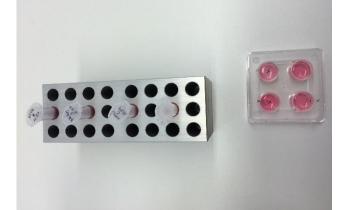




Laboratory







IVP-laboratory - Natural Resources Institute Finland

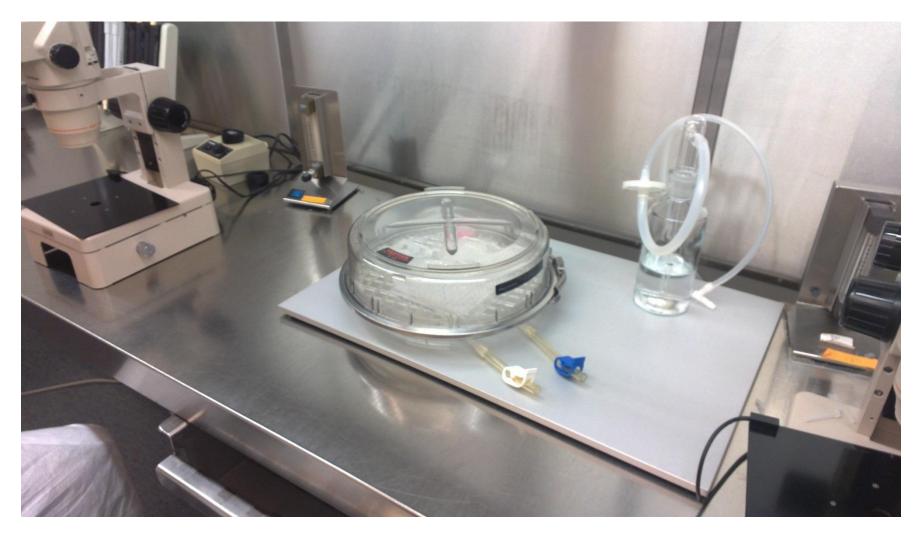






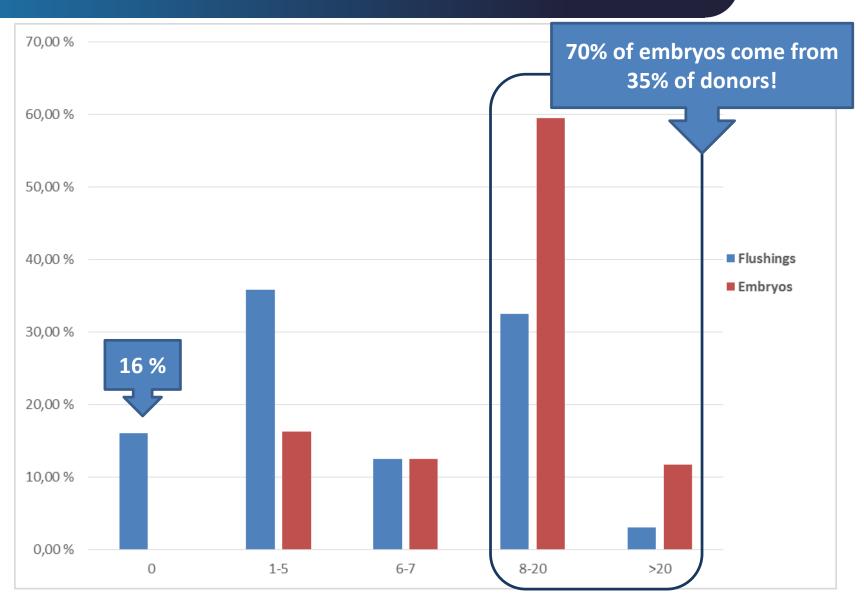








Between animal variation in MOET programs



V

Advantages of OPU

- Provides additional embryo (and calf) production parallel to traditional superovulation
- Hormonal stimulation is not necessarily needed
- Before, in between and after superovulations
- During pregnancy
- Several sires a new one(s) every week
- Sex-sorted semen: no need for high doses in IVF
- Embryo diagnostics in the laboratory



Increasing activity



Activity in Europe

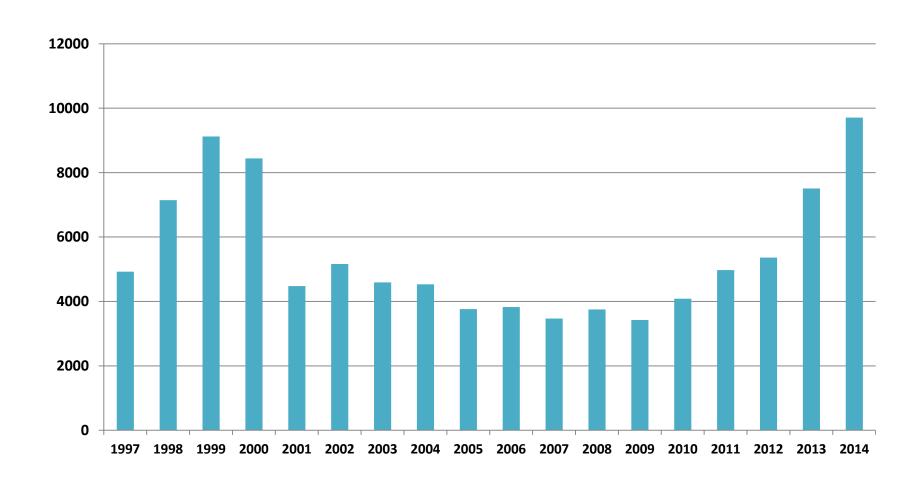
7 countries reported activity on bovine OPU 2014:

- France
- Germany
- Italy
- The Netherlands
- Portugal
- Spain
- Russian Federation



Activity in Europe

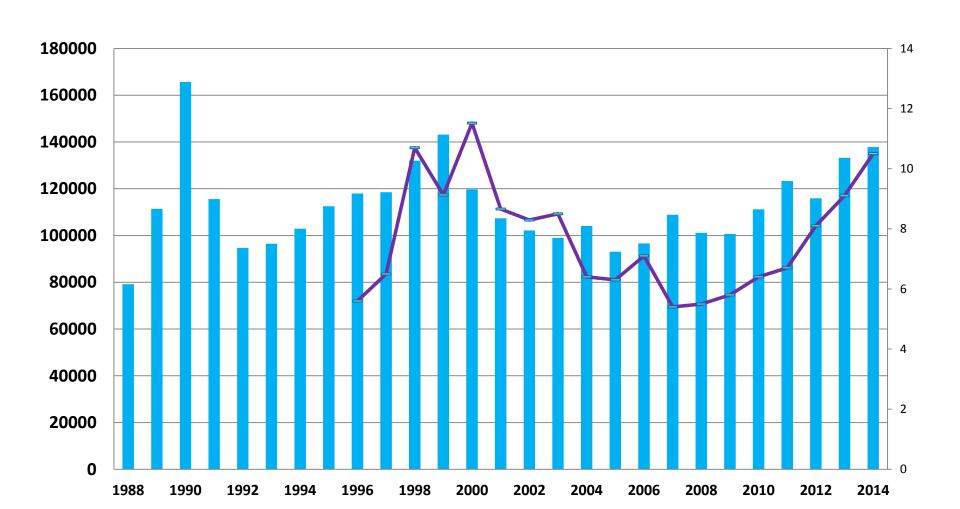
OPU sessions





Activity in Europe

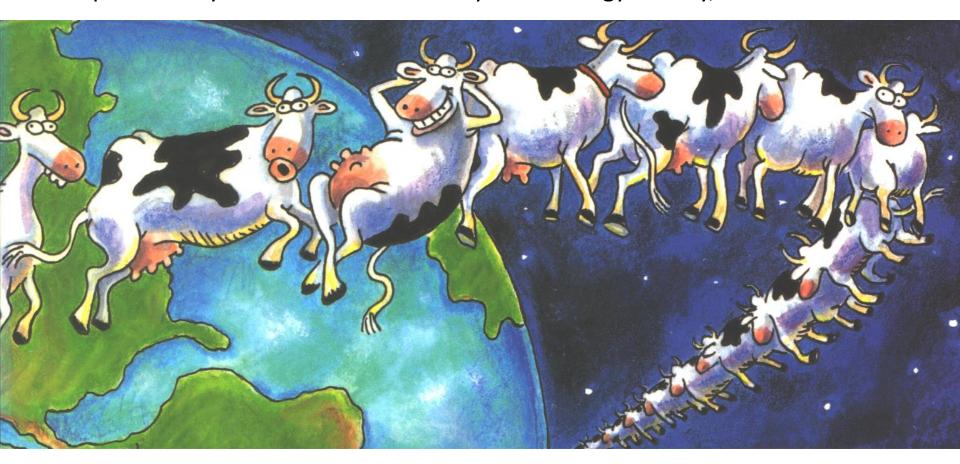
Number of transferred embryos (% IVP embryos)





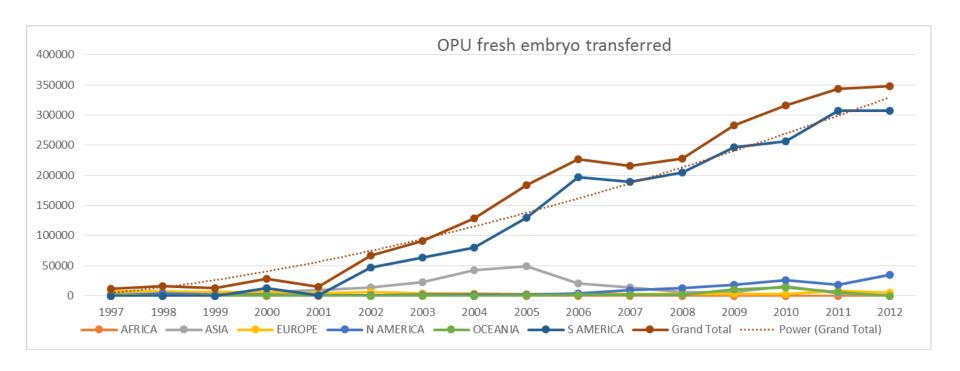
Worldwide industry

Data provided by the International Embryo Technology Society, IETS



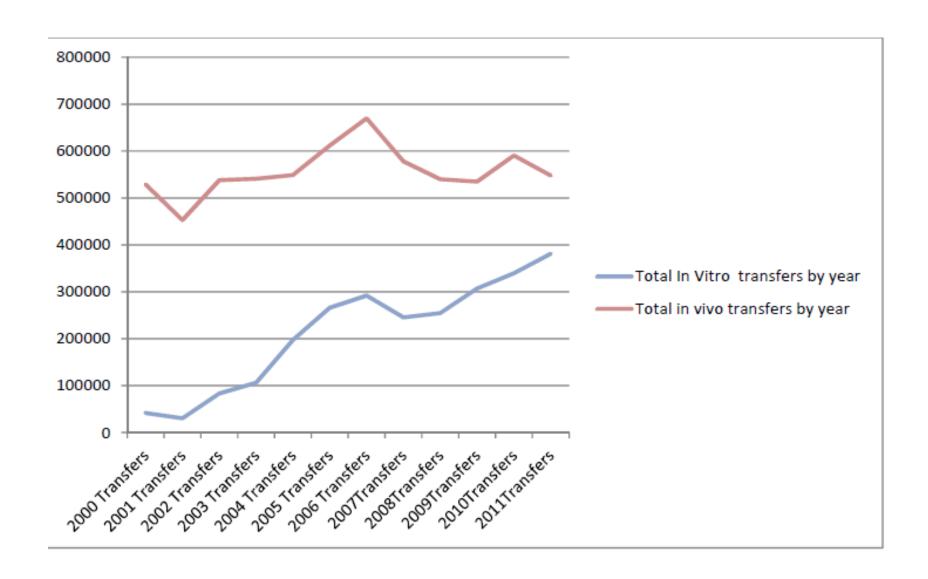


OPU embryos, fresh





Worldwide trends...





OPU in Hollola

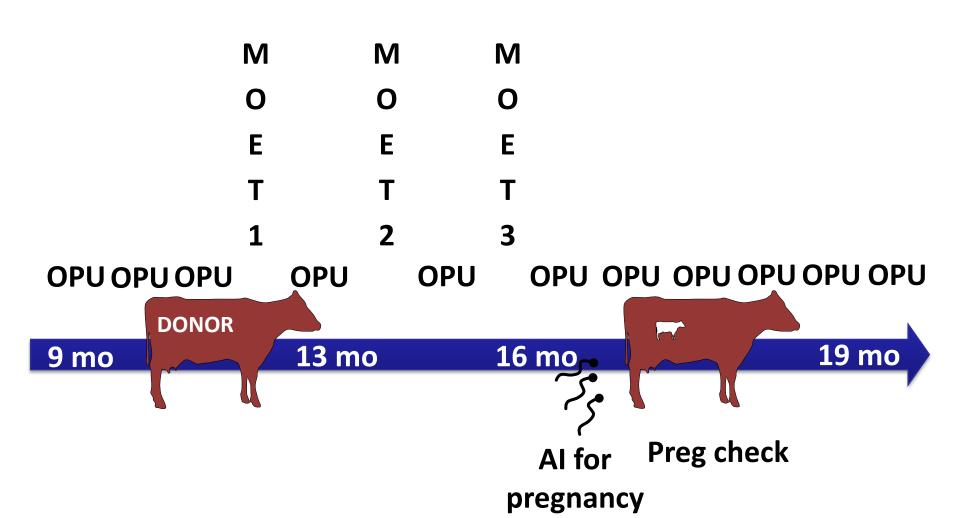


OPU in Hollola - Approach

- Since March 2015
- Performed mostly during early pregnancy
- Also possible and done:
 - before and after insemination
 - before and after pregnancy check
 - during interval weeks of ET programs
 - before ET programs
- Every one or two weeks
- 59 animals (63% of heifers)



OPU is dynamic



Key figures in Hollola OPU 2015-16

MOET	2015	OPU	2015	2016
Embryo recoveries	156	OPU-sessions	148	114
Heifers	74	Heifers	39	27
Recoveries / heifer	2,1	OPUs / heifer	3,8	3,7
Embryos	1492	Embryos	706	545
Transferrable embryos (%)	905 (61%)	Transferrable embryos	235	224
Transferrable embryos / recovery	5,8	Transferrable / OPU session	1,6	2,0

OPU in Hollola – between animal variation

● Embryos produced/ donor: min 0 max 12

- 12,8 % of donors don't produce embryos
- Performance in OPU and flushings don't necessarily correlate

La Cumparsita

- 3 superovulations:
 - $0 \rightarrow 0 \rightarrow 2$
 - = 2 transferrable embryos
- 7 OPU-sessions
 - $1 \rightarrow 2 \rightarrow 6 \rightarrow 3 \rightarrow 2 \rightarrow 1 \rightarrow 1$
 - = 16 transferrable embryos





Fate of OPU embryos

	N:o	NRR
Transferred fresh	114	47% (n=87)
Frozen	238	
Transferred frozen	117	55% (n=98)
Experimental use	105	



Transfers, calves

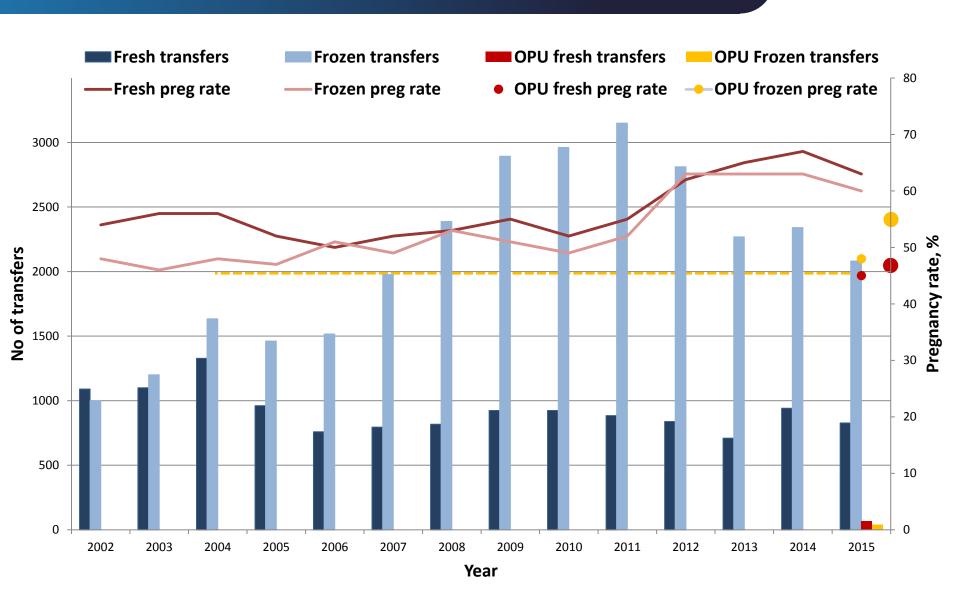
To date 9 calves born

- 3 calves from frozen embryos
- 6 calves from fresh embryos



11/4/2016 first OPU calf (female) from a frozen-thawed EG embryo

Finland – all transfers





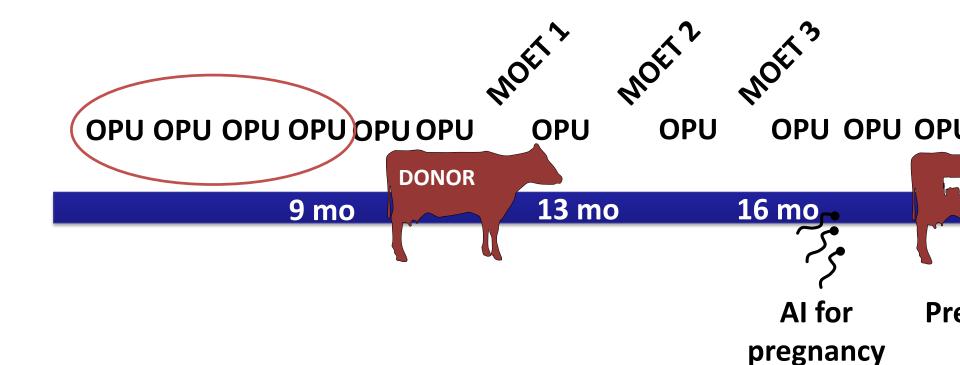
New technologies for the future





OPU of very young animals?

- Technical challenges with the equipment
- Biological challenges with developmental capacity of (pre)pubertal ovocytes



New long acting FSH products

- Heifer superovulation injections needed for one protocol may be reduced from 10 -> 2 injection only
- New ways using existing products to reach same goal (less injections)
 - In testing at LUKE / Maaninka starting this month
 - Tests planned VG nucleus heifers also



Benchtop incubators are available





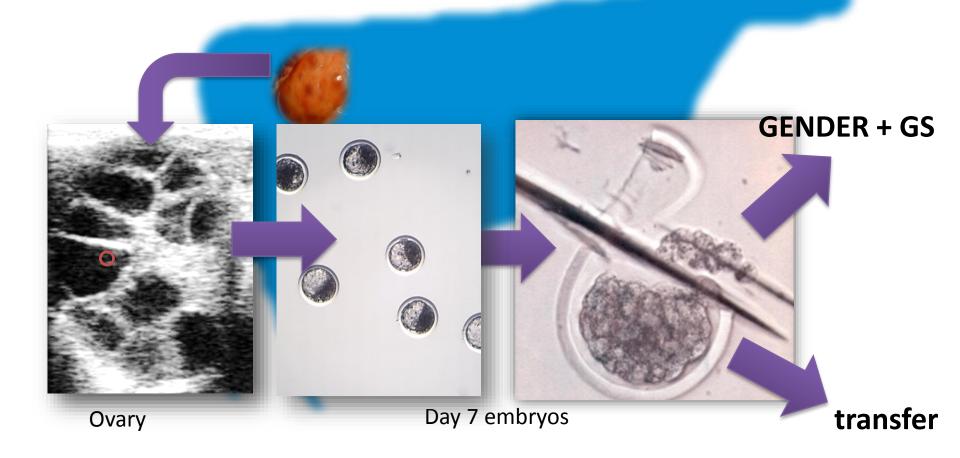




Embryotech project, WP2

Embryo technologies supporting new animal breeding strategies (2014 - 2016)

WP2 GENOMIC SELECTION IN EMBRYOS

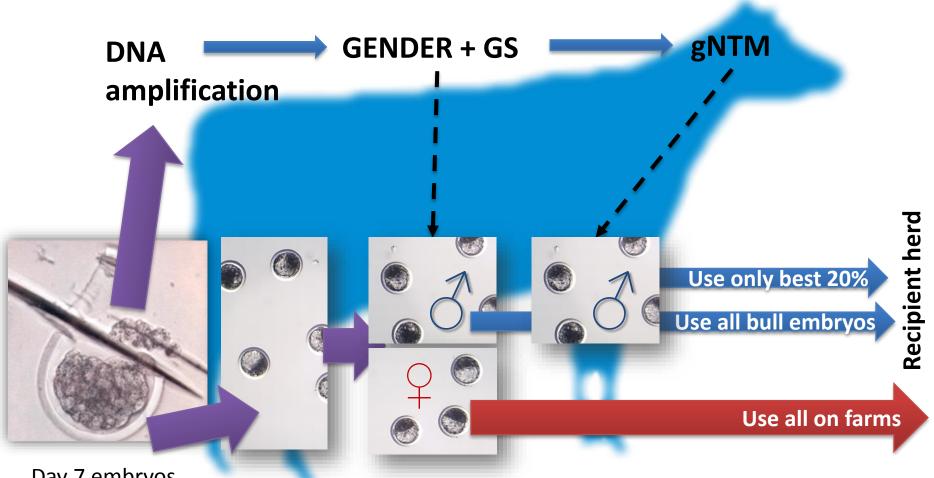


New techniques to master

- Incubators for embryo shipments between production and labs
- Biopsy tehcniques (~10 min)
 - Micromanipulator needed
 - Blade vs. needle
- Storing embryos after biopsy
 - Transfer all immediately
 - Cooling for up to one week
 - Freezing
- ♠ Amplification of biopsy genome (~8 h)
- Sex determination (~3 h)
- SNP genotyping takes minimum of one week



What could be possible in future?



Day 7 embryos

Waiting time 24 h to 7 days

What has been done so far?

- Evaluation of the whole genome preamplification method (Repli-g)
- ◆ Testing of the genomic selection protocol with in vivo embryos => to date 9 pregnancies following biopsy, overnight culture and sexing of in vivo embryos
- Following calf deliveries SNP genotypes are compared between the embryo biopsy and the corresponding calf