

Efficient collection of DNA and pedigree verification/assignment

– status and plans in Denmark, Sweden and Finland

NAV workshop

Copenhagen, January 2015

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Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

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Background for pedigree verification – today and in the future

- **Microsatellites**
 - Can confirm or reject possible parents, but cannot find parents
 - Expensive test
- **SNP**
 - Find parents with 99,9% reliability with sufficient number of SNP's (≈ 400)
 - Method used today – pedigree verification of genotyped animals – handheld and time consuming

Status on common Nordic pedigree verification system

- Initial discussions in Sweden and Finland
- Discussions, technical description and programming started in Denmark in spring/summer 2014
 - Parentage database and algorithm programmed in Denmark
 - Ordering of tests and information to farmer described
- Nordic coordination will start in winter 2014/2015

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Starting point

- **Approx. 400 SNP's, of which \approx 100 are determined internationally by ISAG**
- **Previously genotyped animals from Denmark, Sweden and Finland**
- **Beef and dairy**

Collection of DNA material Denmark

Today:

- Blood, semen, tissue (TSU and ear tags), etc. today

In the future:

- Ear tags in whole herds
- TSU for single animals – "German procedure"
- Tissue is stored in cooperation between cattle organizations

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Collection of DNA material Sweden

Today:

- Blood (TEGO kit), hair samples, nose-swab, semen
- Hair samples stored at Dynamic Code from 2000 – Possible to SNP-test if found valuable!?

In the future:

- Ear tags in whole herds
- Tissue stored on lab (Dynamic Code, Genoskan or other lab used). Tissue owned by Växa Sverige

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Collection of DNA material Finland

Today:

- Blood (TEGO kit, tubes), hair samples, nose-swab, (semen)
- Old hair samples stored by Faba. New samples from 2010 stored in Genoskan, owned by Faba

In the future:

- TEGO kit, ear tags in whole herds
- Tissue stored in lab (Genoskan or other lab used).
Tissue owned by Faba

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Parentage verification

- **400 SNP's** for all animals are loaded to parentage database
- Foreign animals via Interbull service

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How to verify parentage?

Test of one parent/search for possible parents:

- **Opposite homozygotes = error**
- **Count number of errors**

Verification of parentage

- Possible parent

A . . G . . C . . A . . C . . C . . A . . A . . T . . C
C . . G . . A . . T . . G . . C . . A . . C . . A . . C

} Pairwise chromosomes

- Offspring

C . . A . . C . . A . . G . . A . . A . . A . . T . . G
A . . A . . C . . T . . G . . A . . A . . C . . A . . C

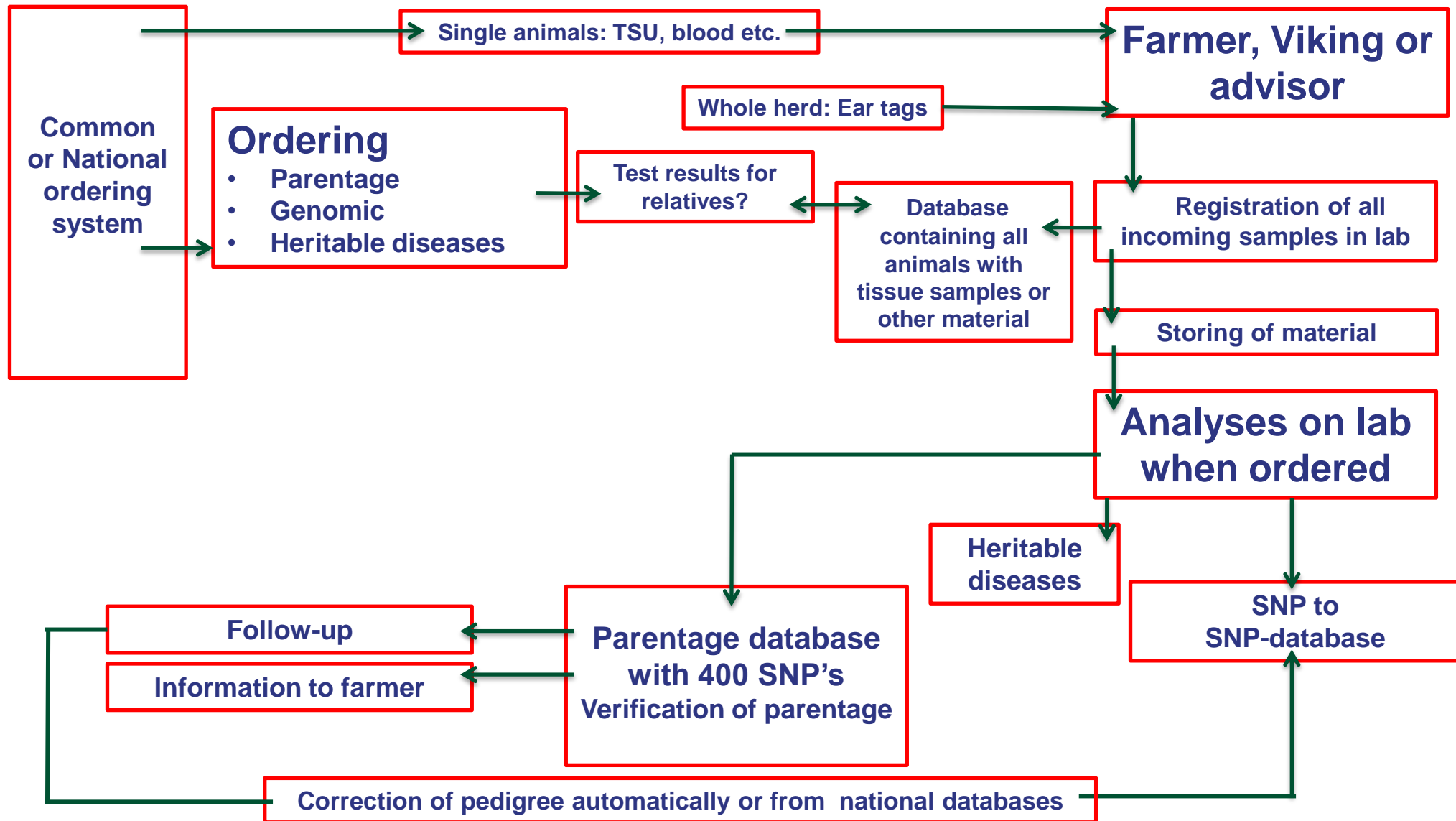
Access to parentage database

- **Ordering:** Possibility to connect to common parentage database from national clients
- **Pedigree correction:** Information from national databases back to parentage database when pedigree is corrected

Information to farmer

- **Error in pedigree**
- **Correction of parentage**
 - **More and more automatically, when more cows are being genotyped**

Overview of workflow in new system



Possible labeling of parentage

Denmark

Labeling of individual animal on database, printouts etc.:

Scenario	Sire		Dam		Remark on Danish database
	Test	Approved	Test	Approved	
1	Yes	Yes	Yes	Yes	Parentage approved
2	Yes	Yes	No	No	Sire approved
3	No	No	Yes	Yes	Dam approved
4	Yes	No	Yes	No	Parentage rejected
5	Yes	No			Sire rejected
6			Yes	No	Dam rejected

Generally pedigree is not deleted on national database, if it is not approved – but herdbook marking is deleted



Possible labeling of parentage

Sweden

Today

In database, printouts etc.: D = DNA-typed V= pedigree verified

In the future

Same but done with SNP. Maybe further developed according to Danish scheme

December 2014 decision taken that pedigree information found rejected by genomic test should be deleted in database!

Routines for updating from SNP-test, where correct ancestry found has to be established

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Possible labeling of parentage

Finland

- Every animal has a label based on insemination date and birth information (ICAR rule)
 - "Sire correct/conflict/not possible to derive"
 - Parentage is tested normally for both sire and dam (microsatellite) → label: "DNA-tested"
 - The same label even if dam is dead/not tested
- Incorrect pedigree:
 - Farmer is responsible to correct in national database



Not accepted in herd book with incorrect pedigree



Sample with minimal effort and maximal reliability!

Sampling - part of
normal work flow



Unique connection
between tag and sample



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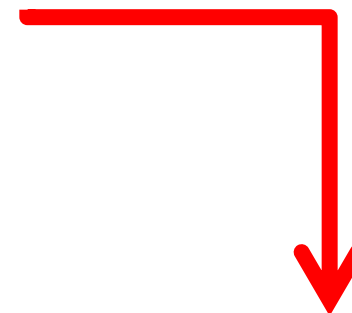
Danish pilot study

- Started November 2013
- Test ear tag and collection procedure from stable to lab
- Goal 5.000 ear tags used
- Frozen samples are genomic tested by Genoskan – tissue quality
- Status
 - 2,500 ear tags used now – rest in 2015
 - 40 herds – all breeds

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Procedure for collection



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Lessons from Danish pilot study

- **Farmers are very satisfied with ear tags and applicator**
- **Modification of ordinary applicator**
- **Allflex has more focus on production process**

In the future – test of ear tags from more manufacturers

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