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# Tackling hereditary defects in Austria´s small cattle breeds

Two examples

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## Content

- 9 native endangered cattle breeds in Austria
  - Development of conservation breeding plans and current situation
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## Development of conservation breeding plans

- Start of subsidized conservation breeding in 1982
  - Mating plans tried to maximise heterocygosity and/or to minimize increase of inbreeding per generation (Δf)
  - Methods
    - Blood group testing until 1999
    - Microsatellites until 2023
    - Genomic analysis using SNP-chip from 2022…



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## Current situation

- 2005 tool for monitoring of conservation breeding integrated into central database rdv
  - Double-sided ancestry control compulsory for all breeding bulls
  - Task of keeping Δf < 1% - achieved in all populations (pedigree analysis)
- Populations rebuilt more or less successfully
- Estimation of breeding values started in 2016



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## New program 2024

- Extension of genomic ancestry control on both sides to all breeding animals born after 01.01.2023
- Chip customized by Rinderzucht Austria
- Preparations since 2022: Genomic analysis of all AI bulls of endangered breeds with living offspring
- Next step: Look for hereditary defects and in genetic peculiarites endangered breeds



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## Two examples of highly endangered breeds

**Ennstaler Bergschecken**


**Waldviertler Blondvieh**




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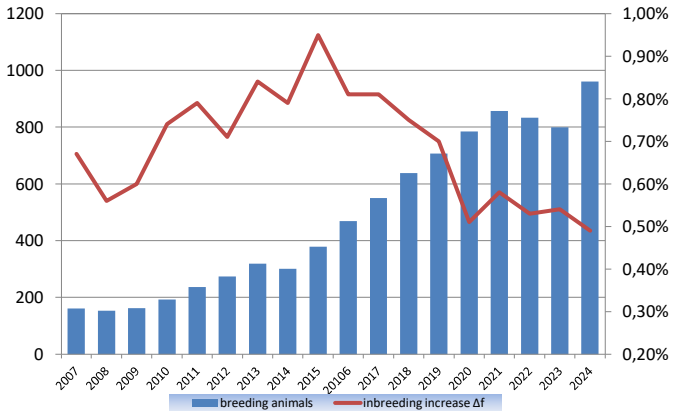
## Ennstaler Bergschecken




- Start of conservation breeding 40 animals (1986)
- 960 breeding animals (2024)
- inbreeding coefficient in active breeding population 5,38 % (2024)
- Reports of bovine Arachnomelia



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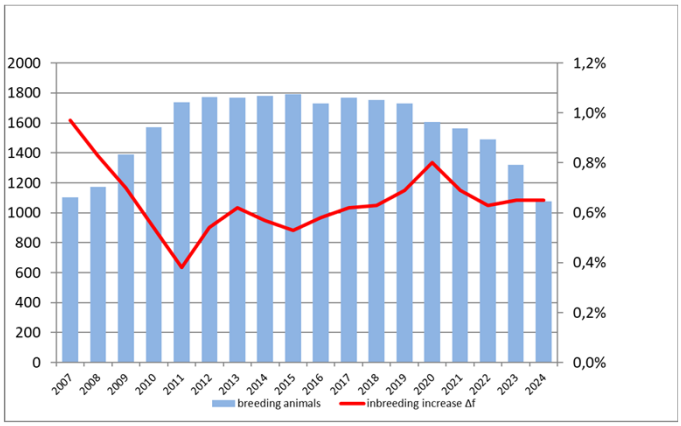
## Waldviertler Blondvieh




- 1075 breeding animals
- Inbreeding coefficient in active breeding population 4,26 %
- Reports of Brown Swiss Haplotype 2 (BH2) afflicted calves



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## Results Ennstaler Bergschecken

- Bovine Arachnomelia
  - Origin of defect can be explained by breeding history
  - 44 AI bulls tested, 10 carriers
  - 7 male carriers in natural service
  - Gene frequency in population about 6%




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Below average birth weight, higher stillbirth rate and significantly increased proportion of breeding losses due to higher susceptibility to disease (e.g. pneumonia), mostly dying within the first 50 days of life

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## Results Waldviertler Blondvieh

- Origin of gene still unclear – no introduction of Brown Swiss or Simmental known
- 23 AI bulls tested, 9 carriers identified = about one third of AI bulls
- Gene frequency in population about 20%!

- Brown Swiss Haplotype 2 (BH2)
  - Below average birth weight
  - Higher stillbirth rate
  - Losses due to higher susceptibility to disease (e.g. pneumonia)
  - Most homocygous animals dying within the first 50 days of life



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## Immediate and future actions

- All carriers in AI are excluded of current mating program
  - Avoid mating of carriers as long as status of females is unknown
  - Genotype all breeding animals (ongoing)
  - Semen of carriers conserved in long time storage for further analysis
  - Future use on non-carriers to avoid losses of genetic diversity (planned)
- All future breeding bulls are genotyped as calves



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## Conclusions

Conservation programs minimizing Δf help to increase the number of breeding animals in a sustainable way,

but do not protect against hereditary defects

Gene banking and AI is part of the problem of spreading hereditary defects,

but also an important part of the solution!



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