GÉNO SANTÉ

GÉNO SANTÉ: Improving productive health of dairy cows by genomic selection and management

H. Leclerc, A. Barbat, M. Philippe, S. Fritz, J-B Davière, L. Manciaux, F. Guillaume, T. De Bretagne, **I. Croué** and D. Boichard

AGRIAL Allice AURIVA Bretagne Conseil Elevage Ouest EILYPS élitest EVOLUTION INRA SCIENCE & IMPACT INSTITUT DE L'ELEVAGE GROUPE Seenergi

GÉNO SANTÉ

Improve competitiveness of the dairy sector by the animal health

> For consumers: food security and animal welfare

> For the dairy industry: reach consumers, differientiate from dairy sector

> For breeders: reduce production costs, improve comfort, by selection and prevention

A collective achievement

Industry partners

From upstream

- Breeding compagnies

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- Milk recording / herd support organisations

EVOLUTION
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- INRA
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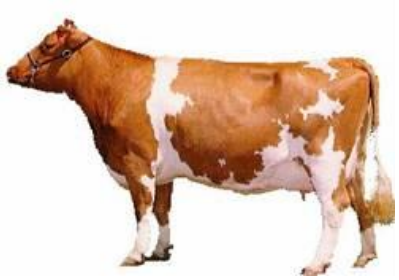
A first project bringing together in France stakeholders from all the dairy cattle sector!

Population and phenotypes available

2 (groups of) breeds:

+



Holstein

Normande

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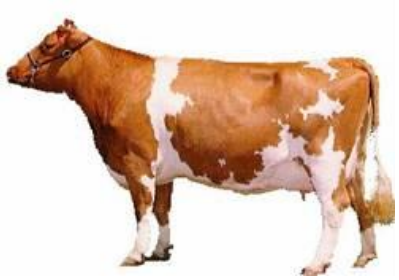

Holstein

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3 (groups of) traits

All phenotypes having a significant impact on herd health, animal welfare, and economic viability of herd:

- **Ketosis**: ketone bodies estimated from MIR analysis at monthly test-day
- **Claw health traits** recorded by trained trimmers
- **Other health traits** recorded by breeders for metritis, retained placenta, milk fever, displaced abomasum…

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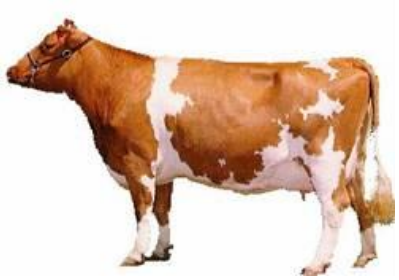

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A genetic evaluation on Ketosis

What is ketosis? How to control it?

The main metabolic disease of dairy cows in early lactation

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➔ What impacts?

- Decrease in **milk production** (-300 to -500 kg/lact)
- Impact on **reproduction** (cyclicity delayed and success at first service reduce up to 20%)
- Increased risk of **retained placenta** and **displaced abomasum** (x4 to 8)
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Aim: Prevent and reduce the risk of ketosis in dairy herd

- **Management:** From Cetodetect® indicator and specific technical services
- **Genetic selection:** a genetic evaluation of ketone bodies to improve genetic level of animals by selection and prevent risks.

1st step: a polygenic evaluation

Traits considered

- **log-transformed acetone** and **β–hydroxybutyrate (BHB)** concentrations estimated from MIR equation
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A large population

- **Population:** Herds from Western France since 2012
- **Data edits:**
  - Herds enrolled in **official milk recording**
  - **Purebred** animals
  - **Lactations 1, 2, 3-5**, **Days In Milk 7 to 120**
  - **With minimum of 5 animals** per Herd x test-day x breed

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- **Data available for genetic parameters estimation**

	Data	Nb Herd x Test-day	Nb Herds	Nb females	Nb lactations
Holstein	2 688 583	183 436	12 378	806 039	1 097 930
Normande	451 808	32 803	2 890	140 015	189 798

Genetics parameters

Model

- **Single trait, animal** model, **repeated data**
- **Fixed effects:**
  - herd x year
  - month x year of test-day
  - DIM x parity
  - age at 1st calving (or days dry x parity for multiparous)
  - milk analysis laboratory x year
- **Random effects:**
  - Genetic value
  - Permanent envt

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PE \ G	log[BHB]	log[acet]
log[BHB]	**0.12**	0.85
log[acet]	0.88	**0.10**

Heritabilities and correlations

PE \ G	log[BHB]	log[acet]
log[BHB]	**0.15**	0.89
log[acet]	0.91	**0.16**

2nd step: a genomic evaluation

Marker-Assisted (MA) BLUP Genomic Evaluation:

- Between 250 and 3000 pre-detected QTL (BayesCπ) included in the model using haplotypes

\+ SNP from EuroG10k chip for the residual polygenic part

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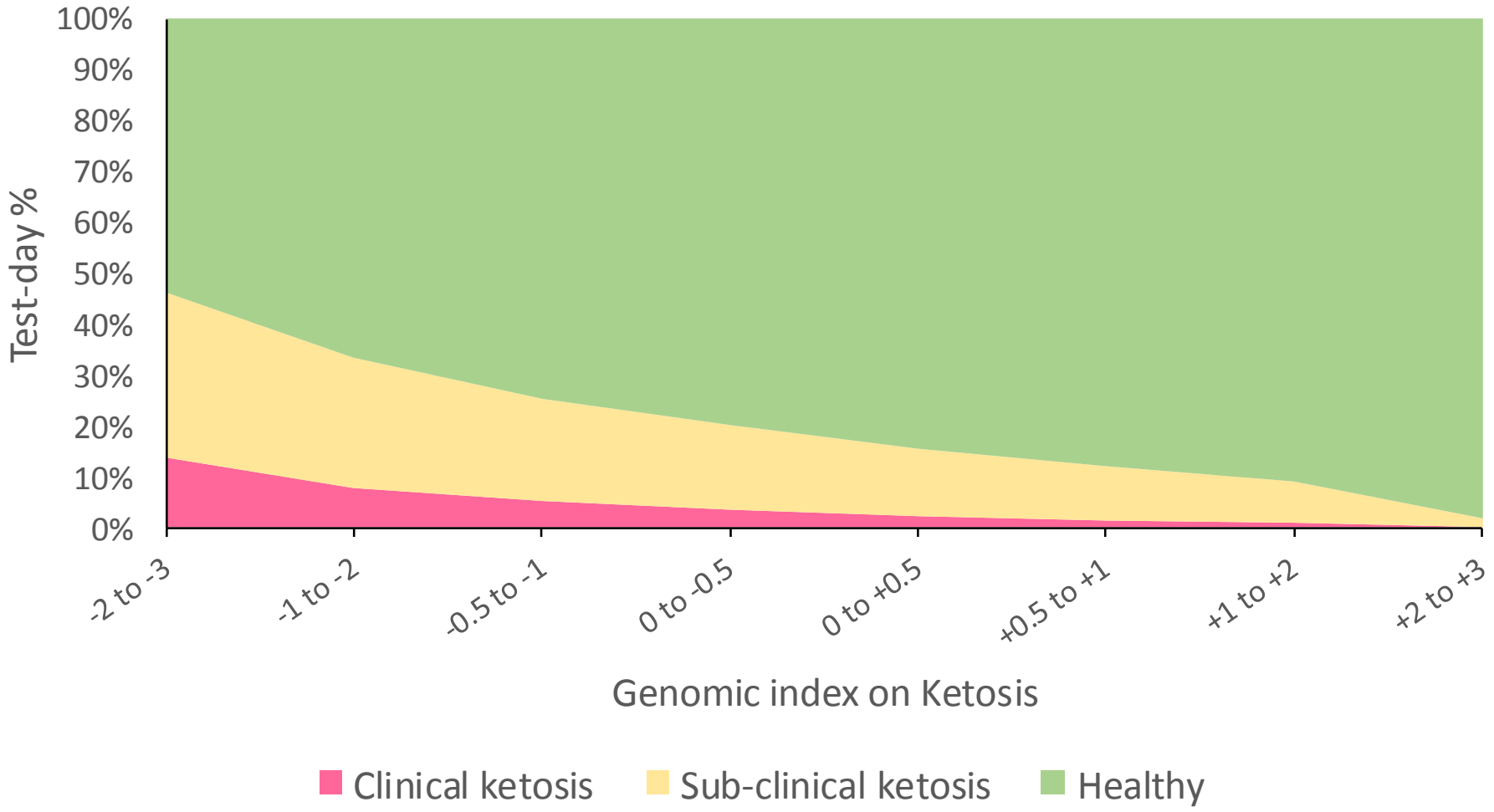
Reference population = males + females

	Holstein	Normande
Nb performances	2 999 279	487 614
Nb cows with perf	887 230	147 951
Nb sires with daughter with perf	10 355	1 577
Nb genotyped cows with performances	**26 899**	**5 832**
Nb genotyped sires with DYD of ungenotyped daughters	**4 314**	**1 038**
Nb animals in pedigree	67 613	15 623

Incidence of ketosis as a fonction of female genomic index



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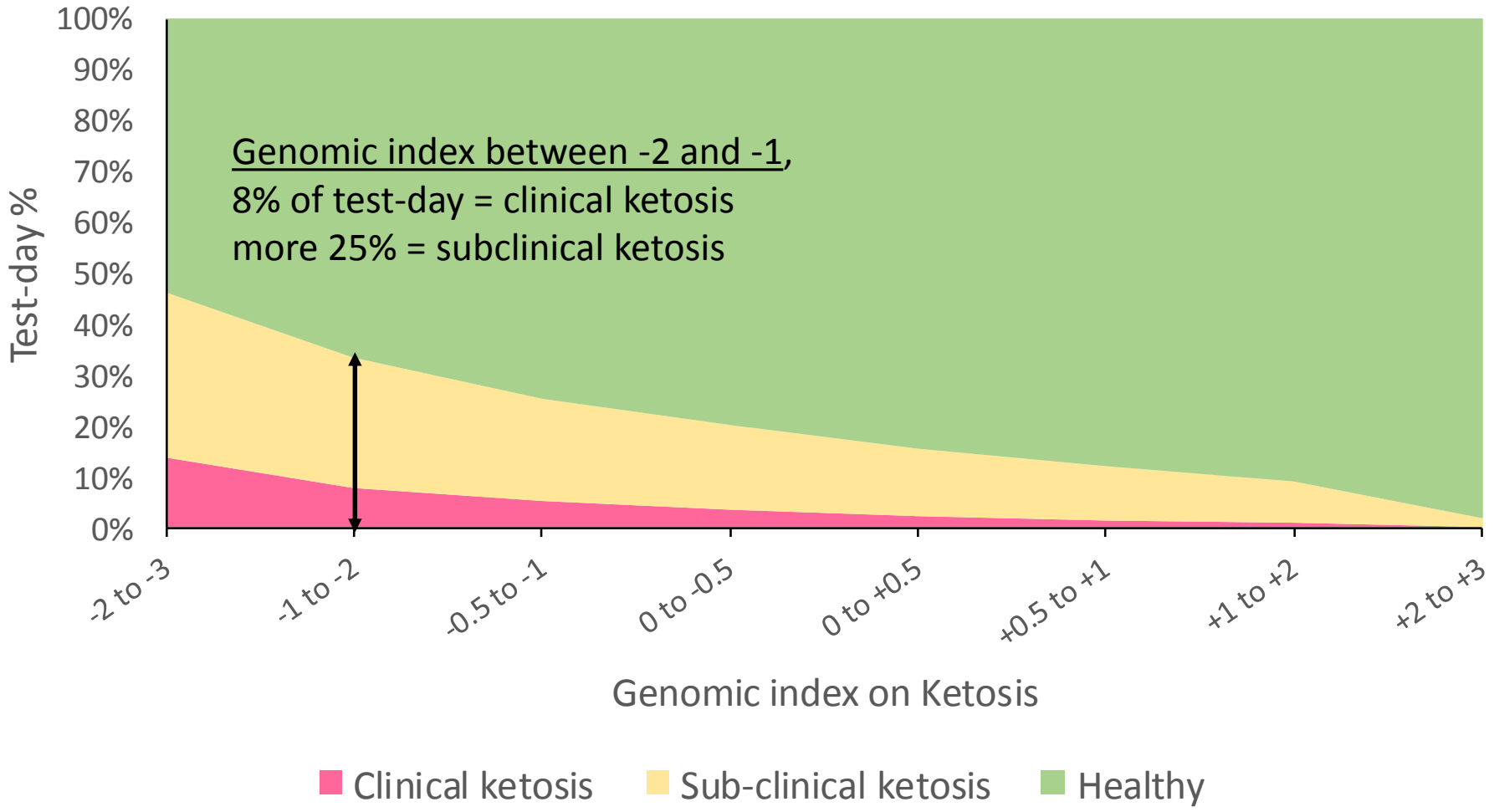

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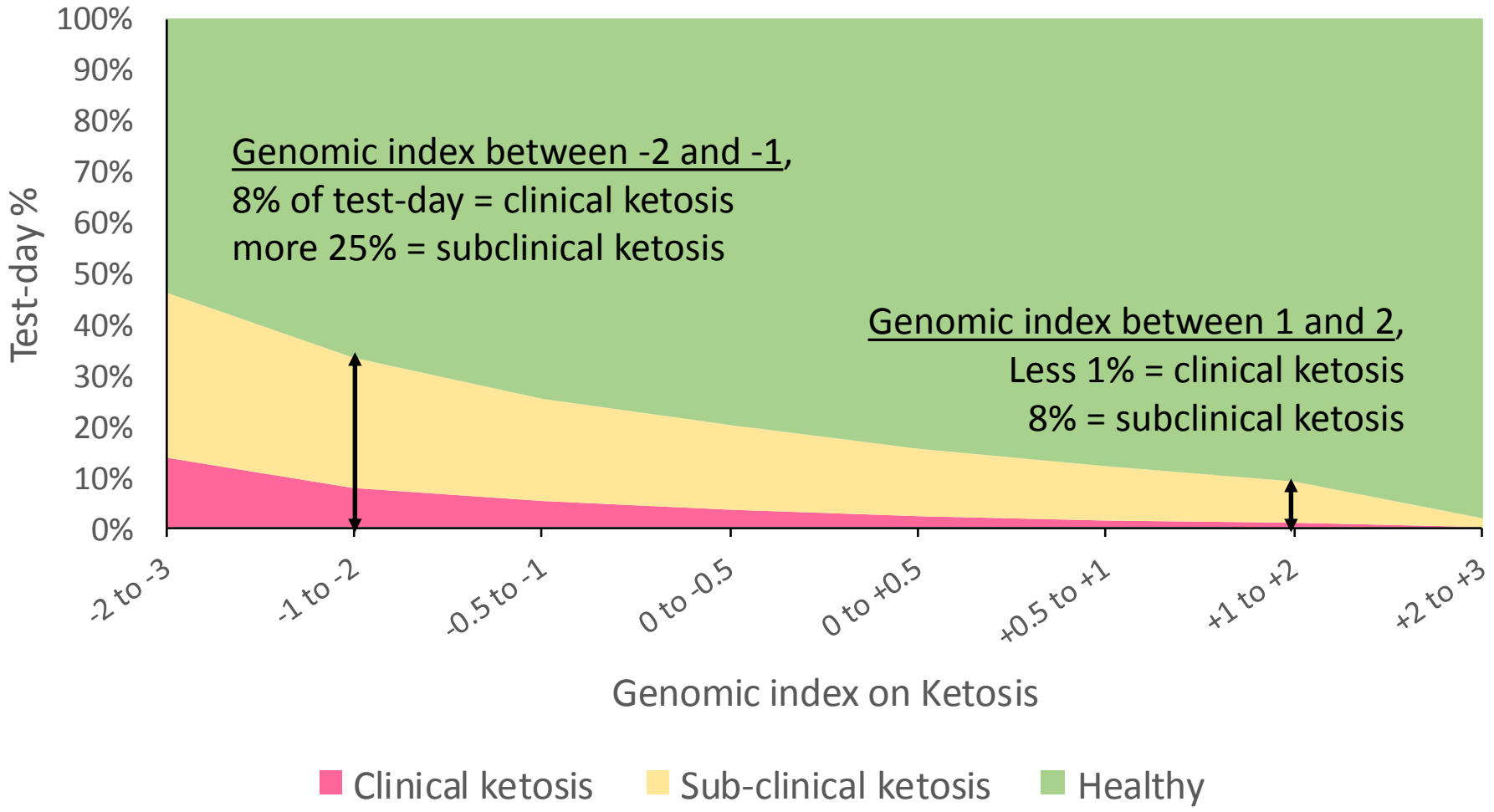

First routine evaluation in Summer 2016

Data available

- >7 million of data in Holstein and 1.36 million in Normande

	Holstein	Normande
Nb of females with polygenic index	1 394 951	257 785
Nb of males with polygenic index	6 069	1 077
Nb of females with genomic index	137 367	28 980
Nb of males with genomic index	26 200	4 811

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2 new indexes under GÉNOSANTÉ label

- **Ketosis index** = 50% BHB + 50% acetone
- **Productive health index** =
  30% Ketosis index
  30% Udder health index
  30% Fertility index
  10% Longevity

Evolution of the productive health index in the next years to **include new traits** such as claw health traits

Reliability

- **Genomic evaluation:**

	Holstein	Normande
Young animals without performance	**0.66**	**0.58**

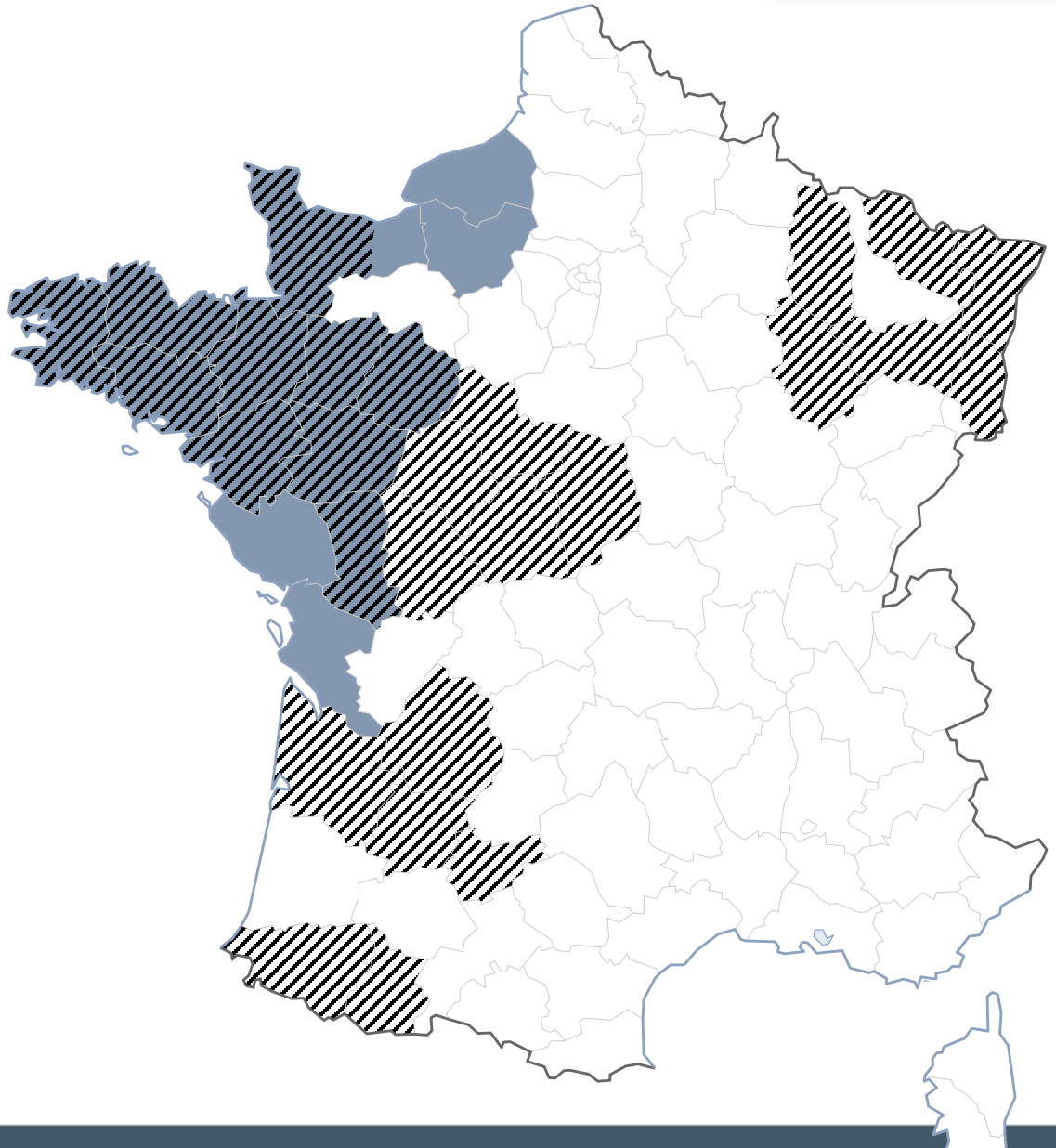
  - Reliability of Ketosis index close to that of other functional traits

- **Polygenic evaluation:**
  - Parent average reliability around 0.30
  - Cows with performances: from 0.50 to 0.60
  - Bulls: >0.90 when >100 daughters with performances

GENOSANTE label

Polygenic indexes available for herds subscribing to CETODETECT® services

Genomic indexes available for all animals genotyped by EVOLUTION and breeding compagnies partners of GÉNOSANTÉ



Conclusion

- For breeders: cows resistant to ketosis will limit the use of drugs and time spent to individual care. It will also reduce production costs / increase profitability

- For herd support organizations: the development of a genetic evaluation on ketosis enhance Cetodetect® services

- For breeding companies: a new index as a tool for differentiation in a competitive environment

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GÉNOSANTÉ is a **collective achievement** around a **joint project with shared interests** of the entire dairy cattle sector

Additional health traits are planned for next year…

Thank you for your attention