Exploring Factors Influencing Serum Selenium Levels in Adult Cows: Implications for Livestock Health Management and Antibiotic Reduction

Delhez P.[1], Verhulst V.[2], Rao A.-S.[1], Hansen P.[3], Minne D.[3], Theron L.[1]
[1]RumeXperts; [2]Gembloux Agro-Bio Tech, ULiège; [3]Synlab Belgium SRL

Implications

Tracking cattle selenium levels is useful to guide nutritional strategies, ultimately enhancing immune health, and potentially reducing antibiotic usage in livestock. Our study sets the foundation for the creation of a long-term observatory of serum selenium in cattle.

Materials and Methods

Animals

- **1280 serum analyses** from dairy and beef cows
- Belgium
- January 2020 – June 2023

Measurements & data preparation

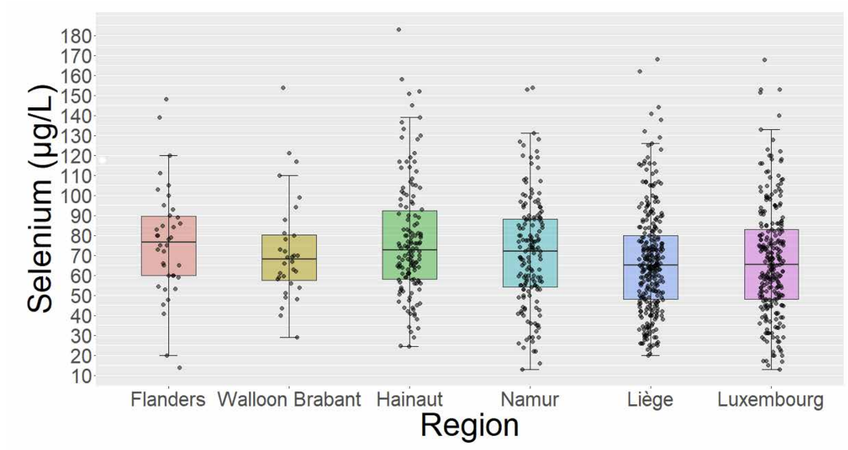
- Lab analyses: serum selenium levels (µg/L)
- Calculation of 947 aggregated observations: average serum selenium concentrations by postal code and date

Statistics

- **Generalized Linear Models (GLM)** to assess factors influencing serum selenium levels, including region, year, quarter, season, laboratory site, and their interactions
- **Various visualizations**

Results

Evolution by region



Significantly higher average selenium concentration in the Hainaut province compared to Liège and Luxembourg (p-value < 0.01)

Figure 1. Concentration of serum selenium by region

Temporal evolution

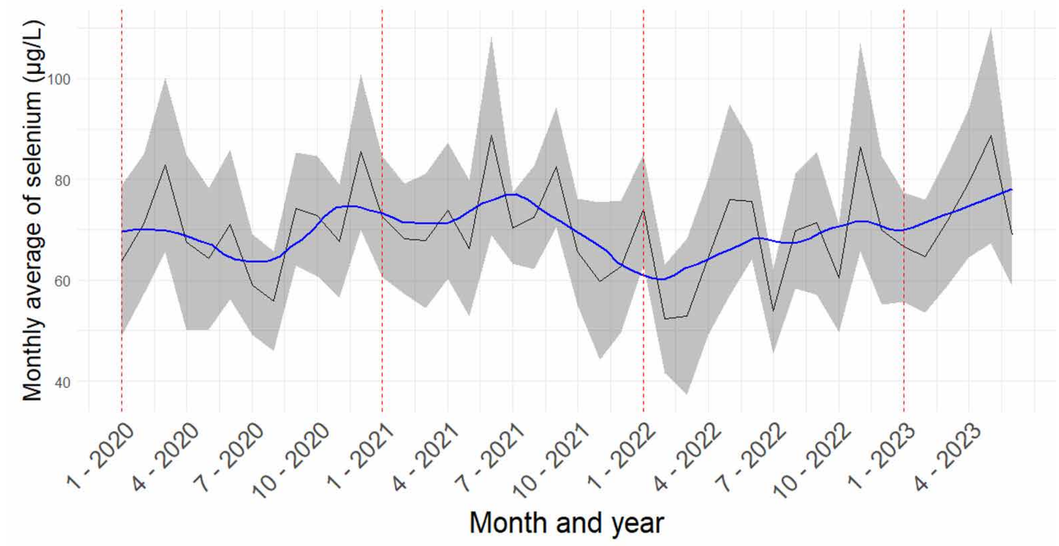


Figure 2. Concentration of serum selenium over time. Shaded area = mean ± standard deviation. Blue curve = trend.

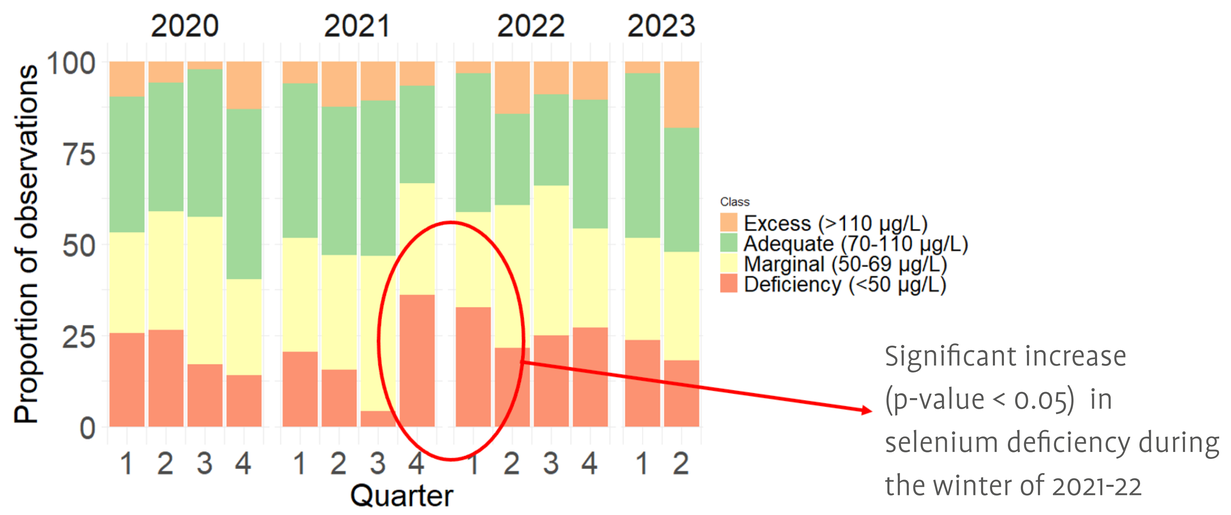


Figure 3. Proportion of observations in selenium classes over time. Class thresholds are based on field experience and veterinary advice.

Laboratory site

No significant effect of the laboratory site.

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Evaluation of a Novel Herbal Supplement for Prevention of Neonatal Calf Pathologies: A Consolidated Study

Delhez, P.[1], Hamard H.[1], Pirard, B.[1], Theron L.[1], Lhoest E.[2], El Abbas S.[2], Rao A.-S.[1]
[1]RumeXperts; [2]Miloa

Materials and Methods

Animals

- 2 consolidated studies
- **129** Belgian Blue calves – 6 farms
- 2021-2023

Experimental design

- Treatments: 1 **Placebo** (63 calves)
  2 Powder **herbal supplement** (66 calves)
- Administration from day 1 to 10 after colostrum feeding

Measurements

- Digestive and respiratory **disease prevalences** until 28 days
- **Curative treatments** including antibiotics until 28 days
- **Performance and health parameters** (e.g., serum albumin at day 28 and weaning; age, weight, and average daily gain (ADG) at weaning; death status)
- Immune transfer

Statistics

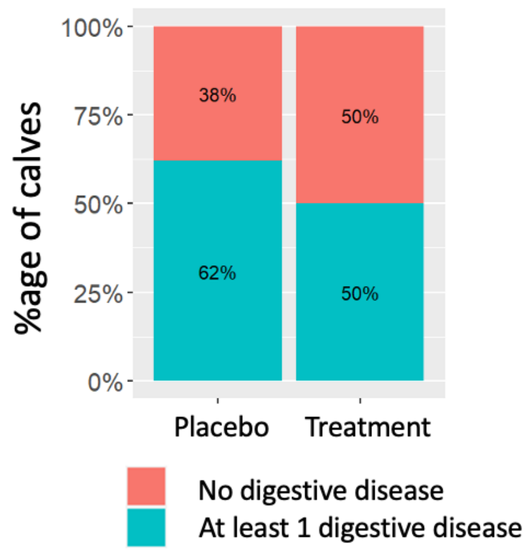
GLM to assess the effect of the treatment

*Y ~ treatment + farm + treatment*farm*
(interaction removed from the model if not significant)

Results

Disease prevalence

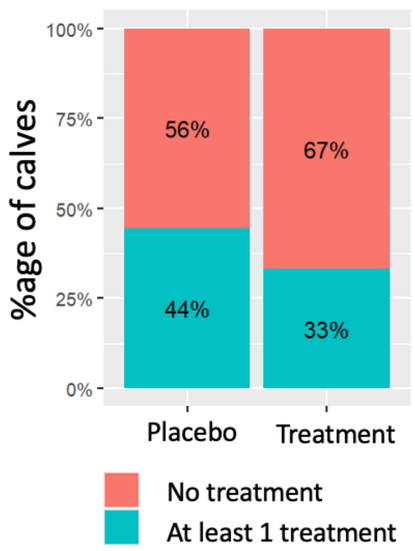
Prevalence of digestive diseases (diarrhea) (p-value= 0.06)



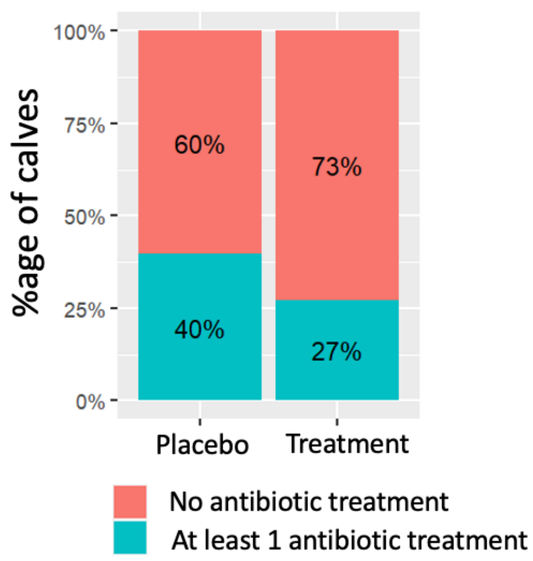
No significant difference in respiratory disease prevalence.

Curative treatments

Antibiotics + anti-*Cryptosporidium* (p-value = 0.12)

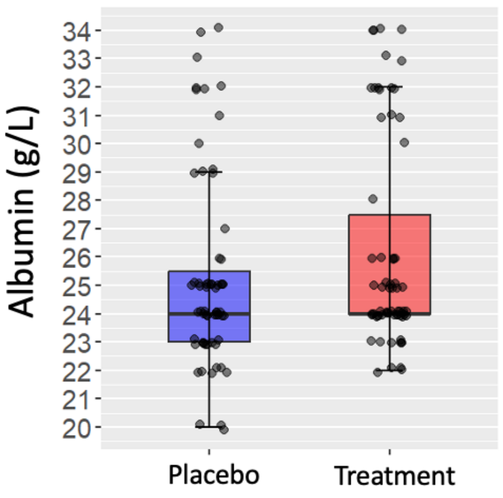


Antibiotics (p-value = 0.09)



Performance and health parameters

Serum albumin at day 28 (p-value = 0.08)



No significant difference in serum albumin, age, weight or ADG at weaning.

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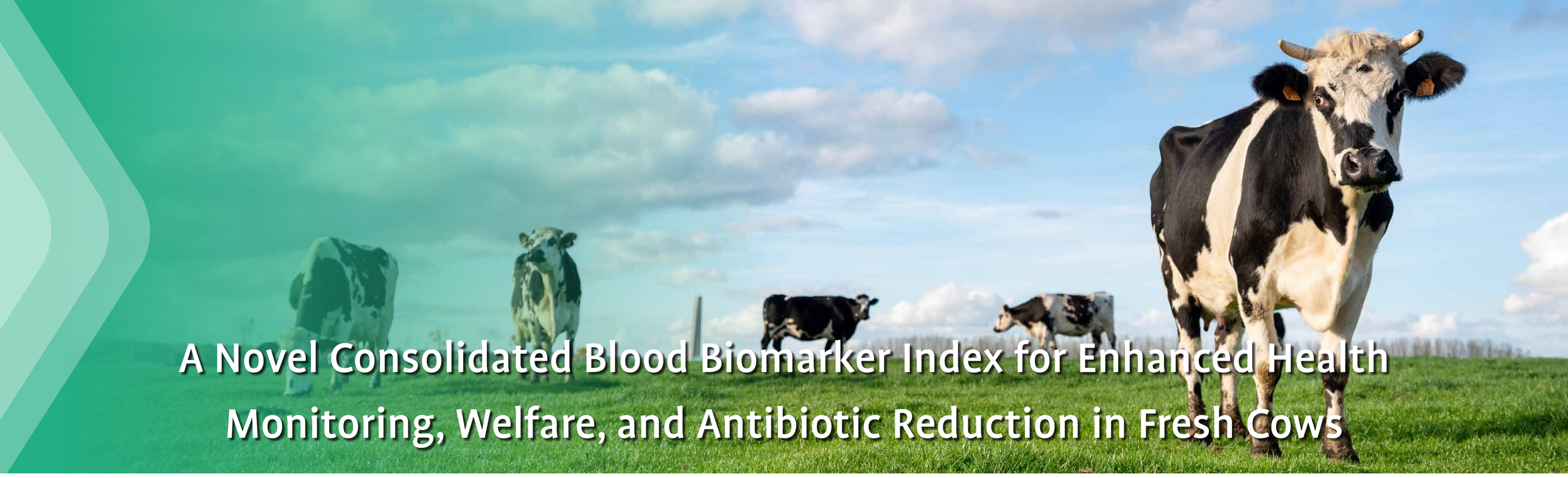

A Novel Consolidated Blood Biomarker Index for Enhanced Health Monitoring, Welfare, and Antibiotic Reduction in Fresh Cows

Delhez P.[1], Theron L.[1], Tran M.-N.[2], Christiaens B.[2], Evrard J.[3], Lemal P.[4], Gengler N.[4], Rao A.-S.[1], Bertozzi C.[2]

[1]RumeXperts; [2]Elevéo by awé groupe,[3]ARSIA, [4]Gembloux Agro-Bio Tech, ULiège

Objective

- Developing a **reliable and easy-to-use indicator** that can accurately identify cows at risk of health complications
- Primarily suited for **fresh cows**
- Useful for proactive management, improved welfare, and antibiotic reduction

Materials and Methods

Animals

- 260 cows in 16 farms
- Days in milk (DIM) from 1 to 400 days

Index definition

- Built using **blood biomarker values** (albumin, urea, cholesterol, NEFA, globulin, albumin/globulin ratio)
- Based on veterinary experts' advice and scientific literature
- Scale from 1 to 10 for albumin (1 point for albumin ≤ 25 g/L to 10 points for albumin ≥ 34 g/L)
- Penalty or bonus based on the values of the other biomarkers

Statistics

Descriptive statistics to assess the distribution and relevance of the index

Results

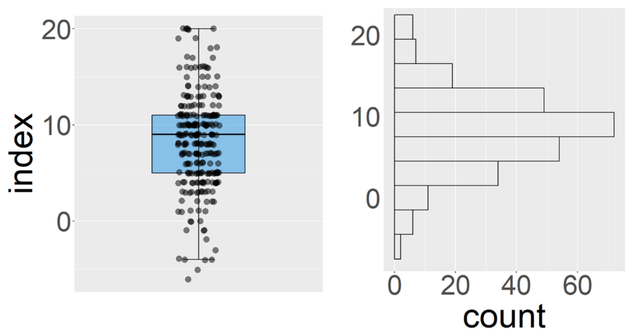

Figure 1. Distribution of the index values (all DIM)

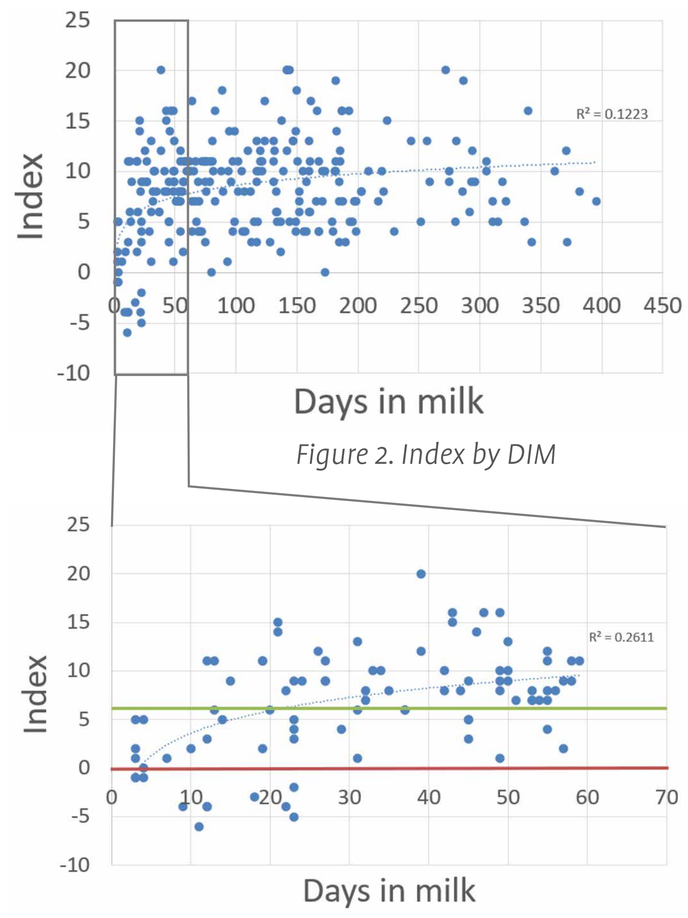

Figure 2. Index by DIM

Figure 3. Index by DIM (zoom for cows < 60 DIM)

Guidance values (0-60 DIM):
< 0: bad
0 to 6: suboptimal
>= 6: optimal

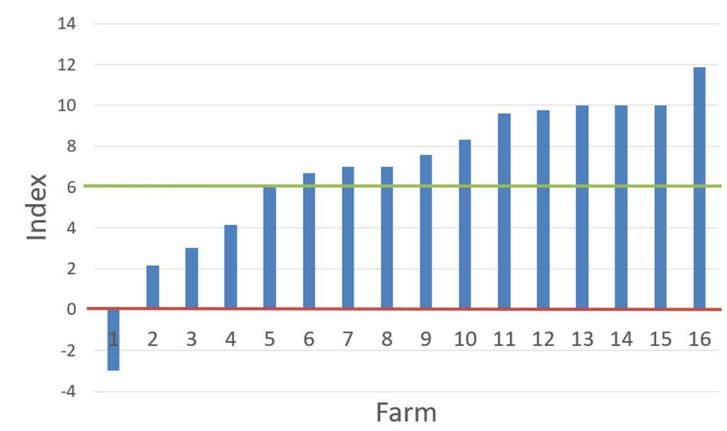

Figure 4. Average index value by farm for cows < 60 DIM (ordered from lowest to highest)

Values in accordance with field observations (incl. blood analyses, welfare assessment, and veterinary diagnosis)

Conclusion

The innovative consolidated blood biomarker index, validated through expert consultation, proves to be a **valuable tool for assessing cow health risks both individually and at the herd level**, especially in fresh cows.

info@rumexperts.vet
www.rumexperts.vet