UNIVERSITEIT
GENT

UNIVERSITEIT
GENT

FACULTEIT DIERGENEESKUNDE
accredited by EAEVE

DEPARTMENT OF REPRODUCTION, OBSTETRICS AND HERD HEALTH
EPIDEMIOLOGY UNIT

# PATHOGENESIS, DIAGNOSIS AND PREVENTION OF DYSBIOSIS IN BROILERS

Nele Caekebeke
Moniek Ringenier

15 januari 2018

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN
Vlaanderen is ondernemen

# PATHOGENESIS, DIAGNOSIS AND PREVENTION OF DYSBIOSIS IN BROILERS

## Identification risk factors

- Prevalence
  - Cross-sectional study
- Influencing factors
  - Longitudinal study

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# CROSS-SECTIONAL STUDY

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# WP1. IDENTIFICATION OF RISK FACTORS FOR DYSBIOSIS IN BROILERS

## A. Prevalence of dysbiosis

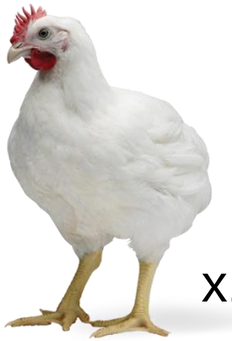
- Cross-sectional study
- 50 broiler farms in Flanders
- 28d of age

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# 39 FARMS COMPLETED



x10

D0

D28

D42

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# WATER PARAMETERS

E. Coli

Intestinal enterococci

Total aërobe bacterial count 22°C

Nitrite

pH

Total Fe

Total Hardness

Fysical appearance

Odour

Colour

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# FEED PARAMETERS

TRE

Fat

Starch

Total sugar

TMS

NDF

Moisture

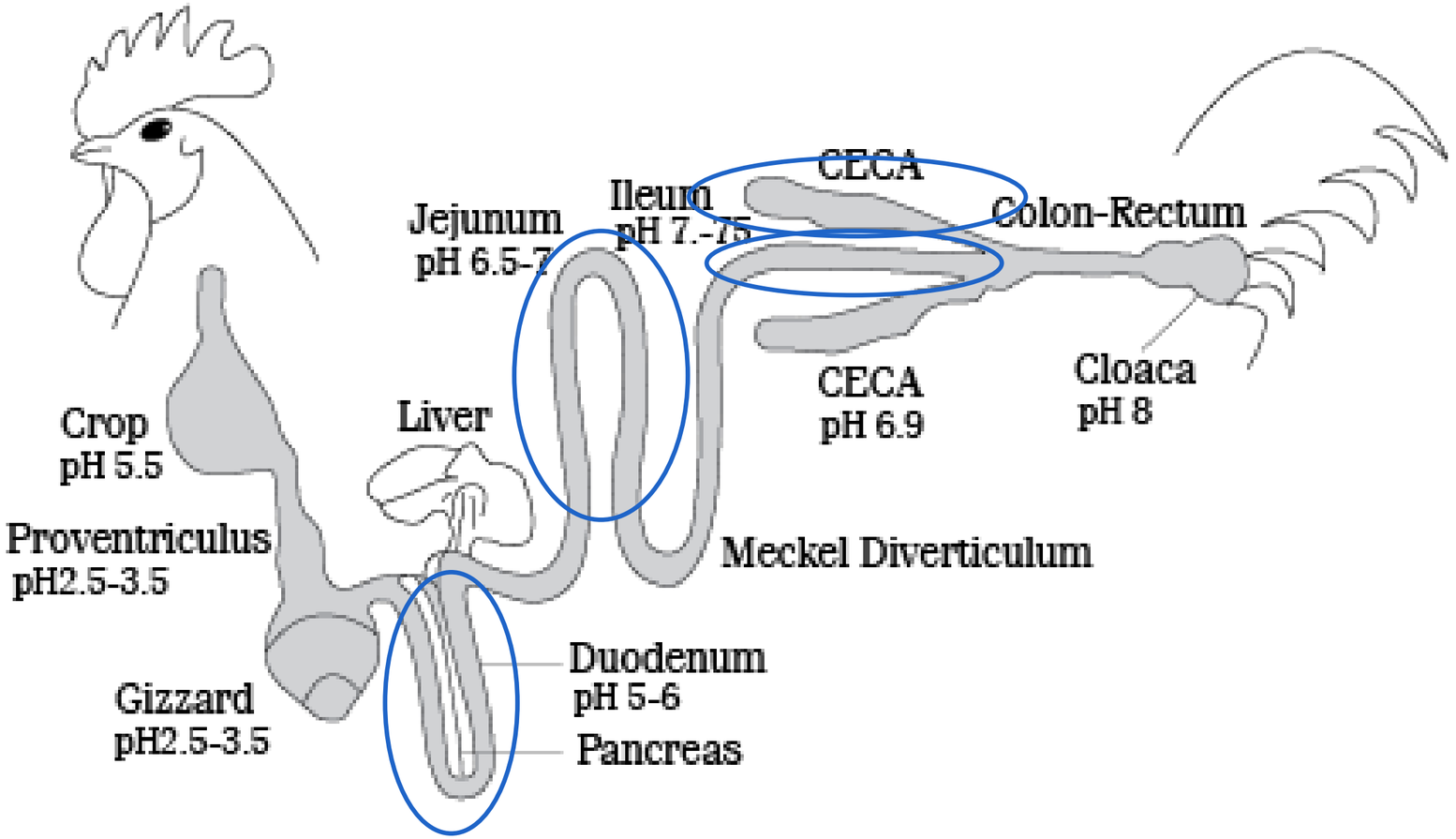
Energy

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# SAMPLE COLLECTION



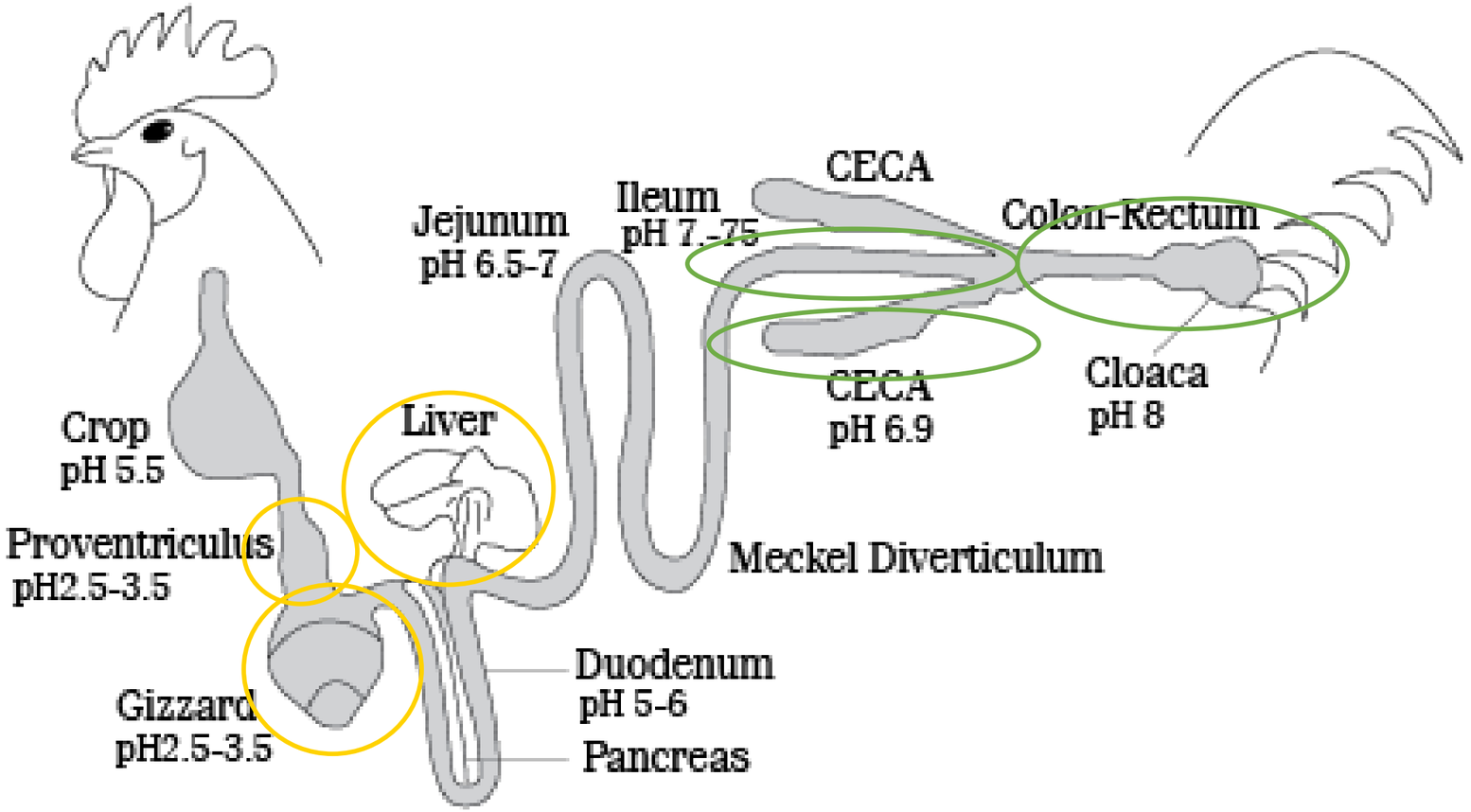

Intestinal samples (x4)

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# SAMPLE COLLECTION




Intestinal samples (x4)

Intestinal content (x3)

Weight organs (x3)

Coccidiosis scoring (3)

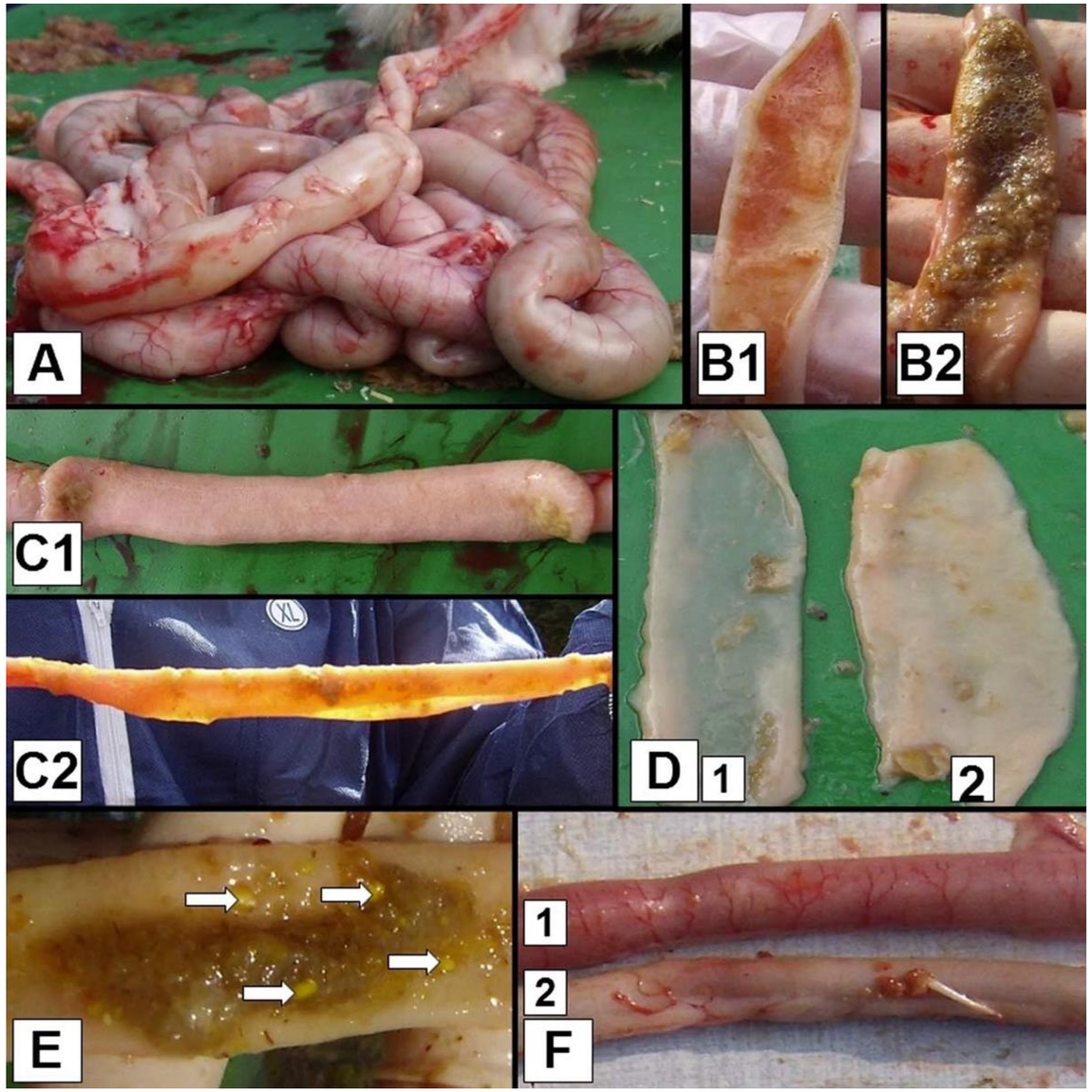
Dysbacteriosis scoring (10)

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# DYSBACTERIOSIS




A) Ballooning
B) Abnormal content cran/caud

C) Tonus cran/caud
D) Fragility cran/caud

E) Undigested particles
F) Inflammation  cran/caud

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# COCCIDIOSIS

*E. acervulina*

*E. maxima*

*E. tenella*

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# COCCIDIOSIS

*E. acervulina*

*E. maxima*

*E. tenella*

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANALYSIS

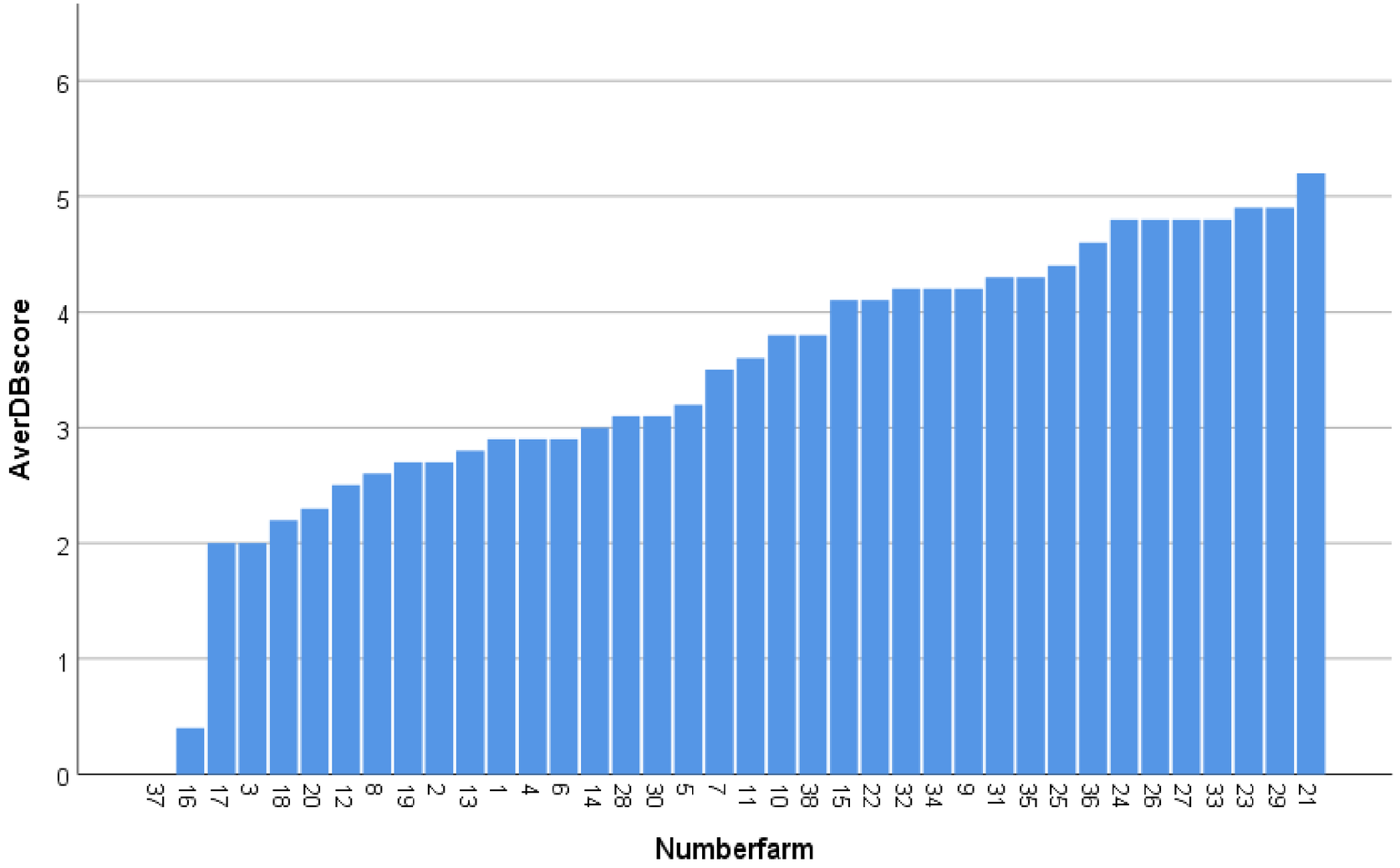
UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# CROSS-SECTIONAL STUDY





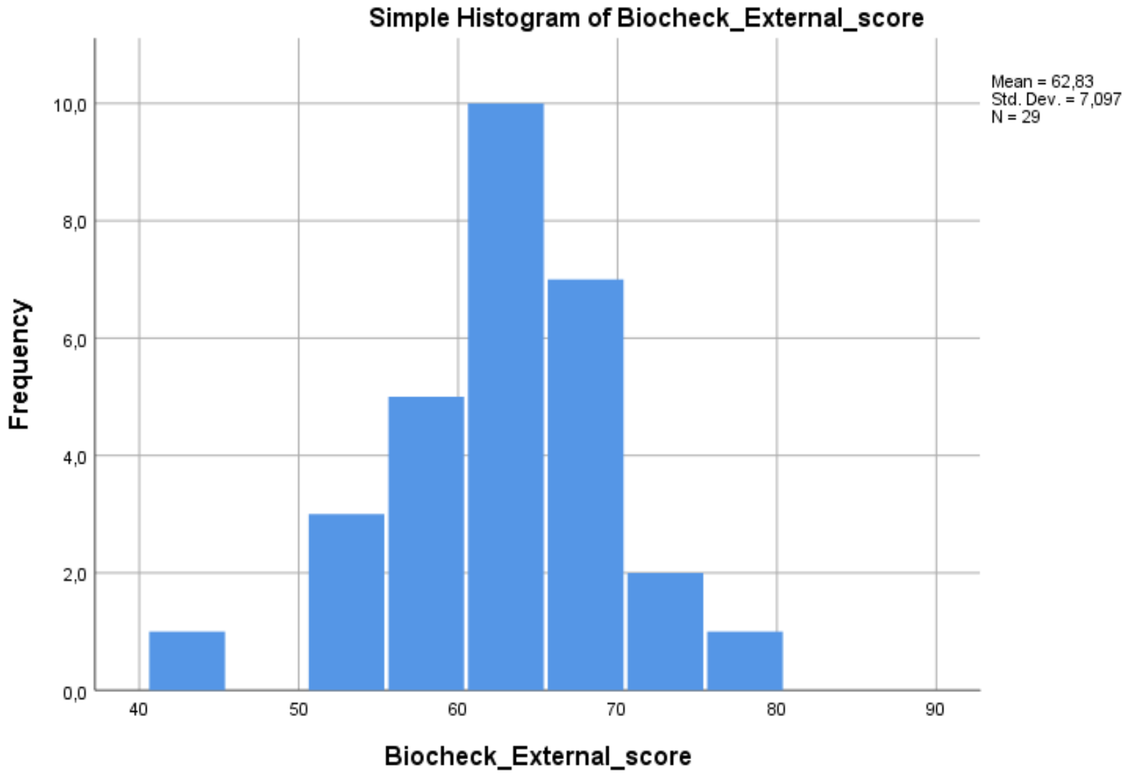

UNIVERSITEIT GENT

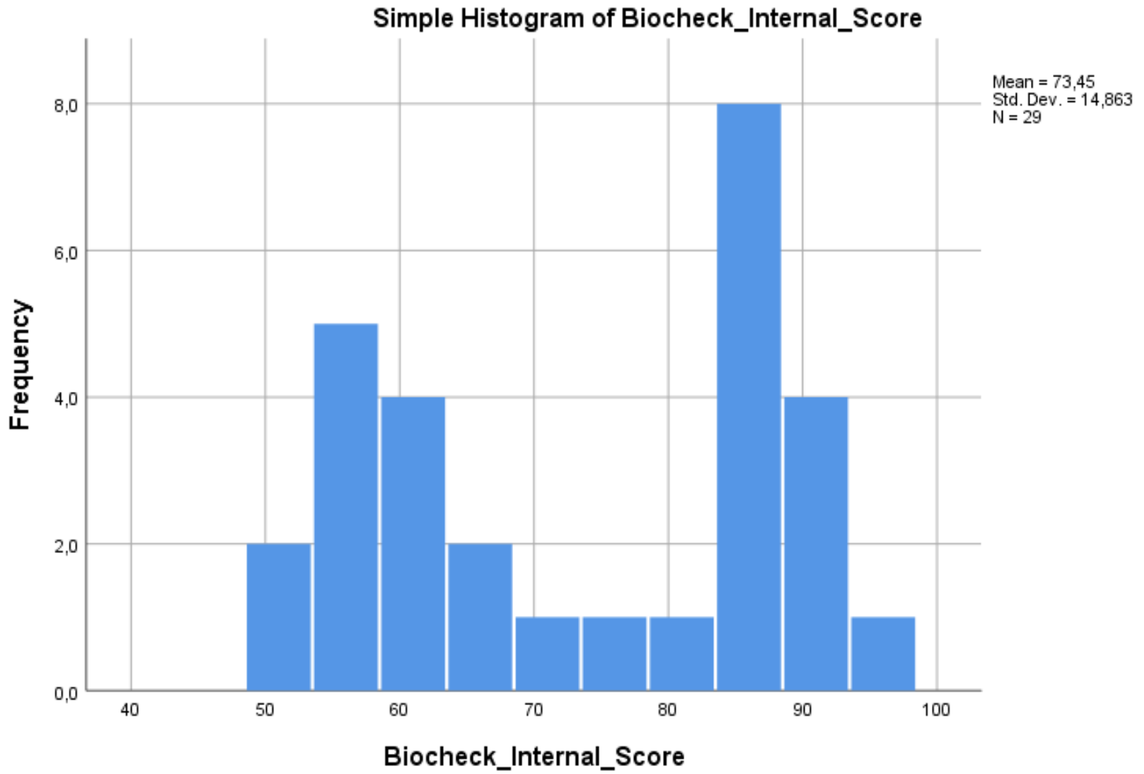
AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# BIOCHECK.UGENT®





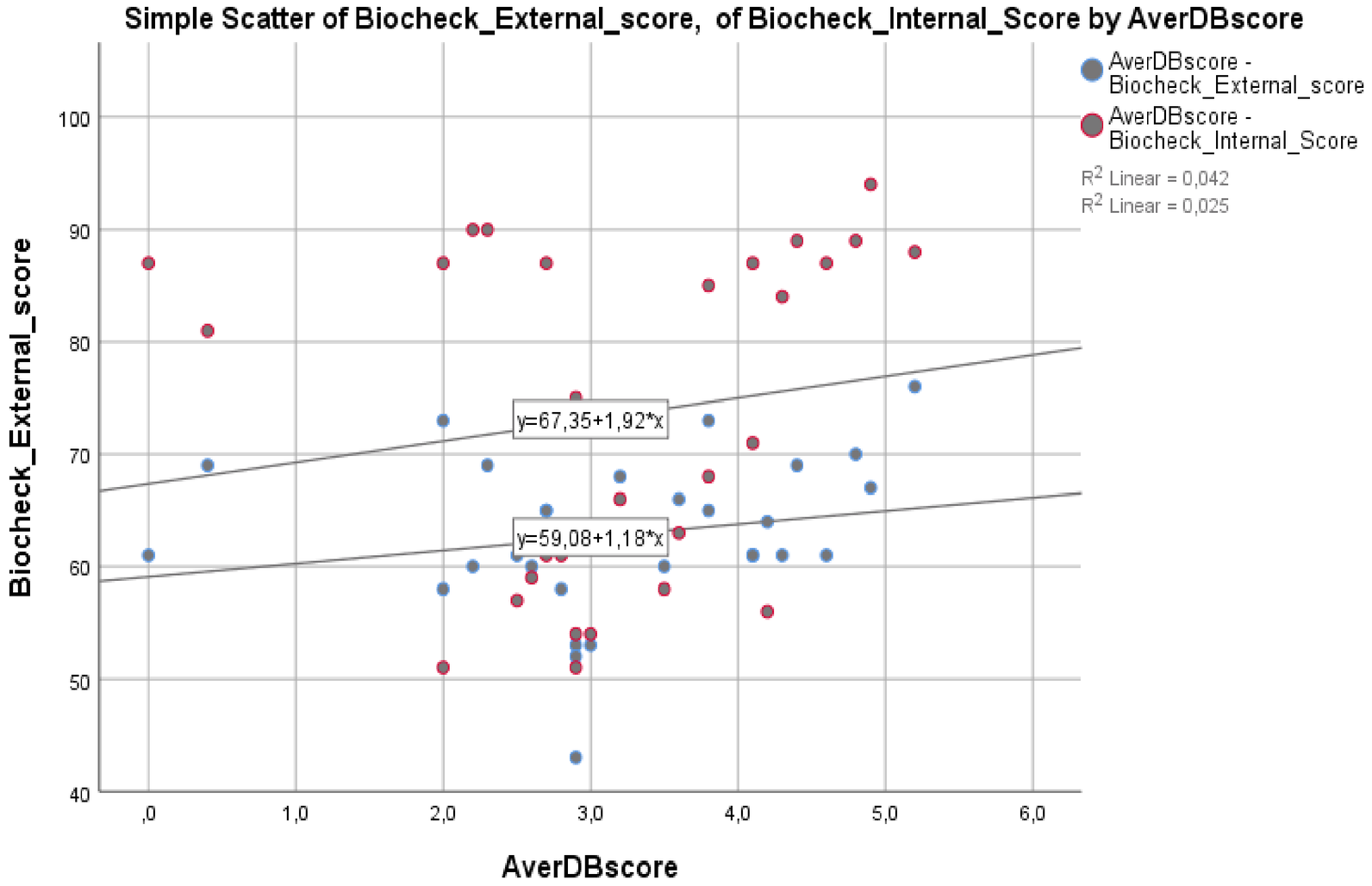

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# BIOCHECK.UGENT® - DB SCORE





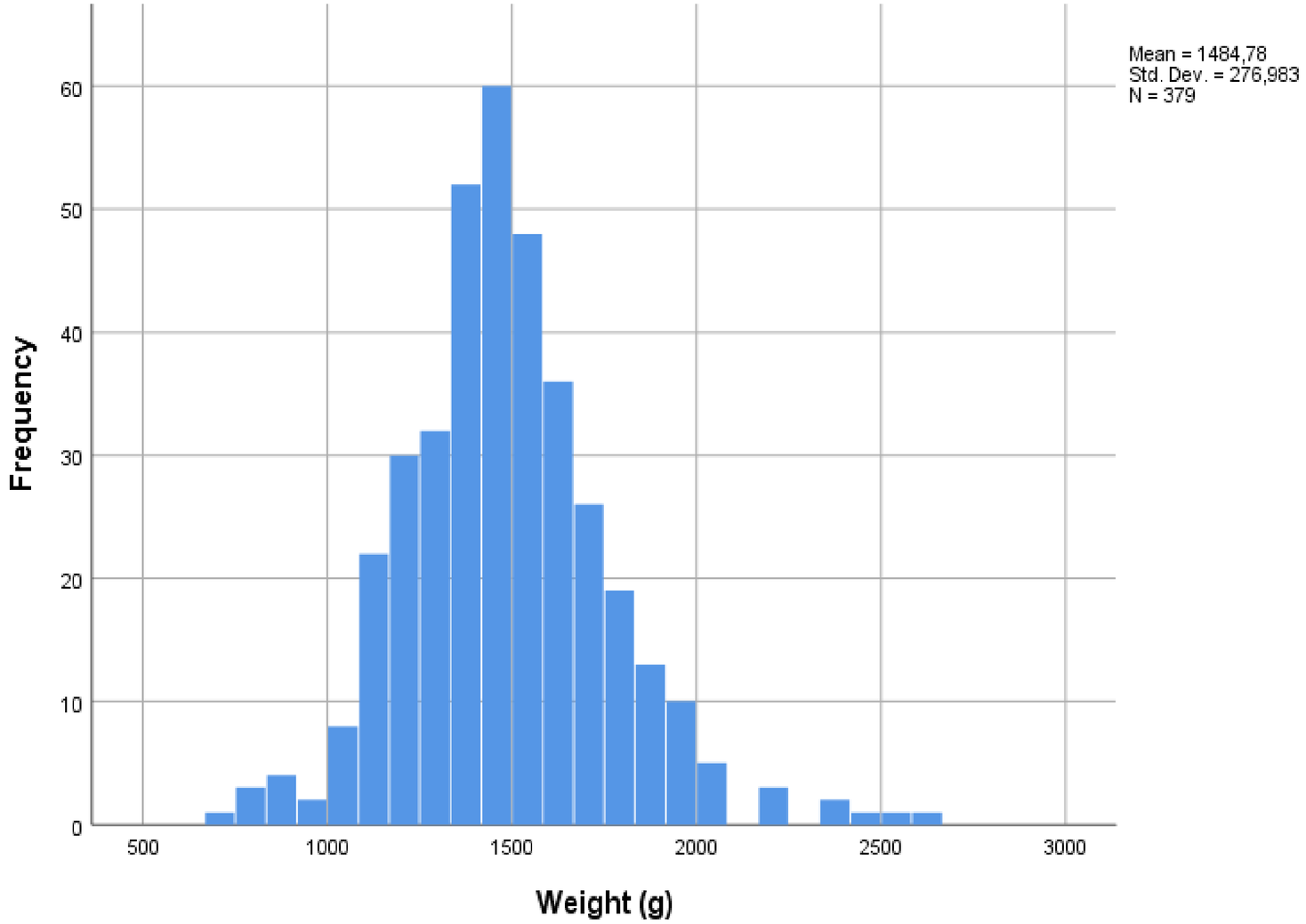

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANIMAL CHARACTERISTICS





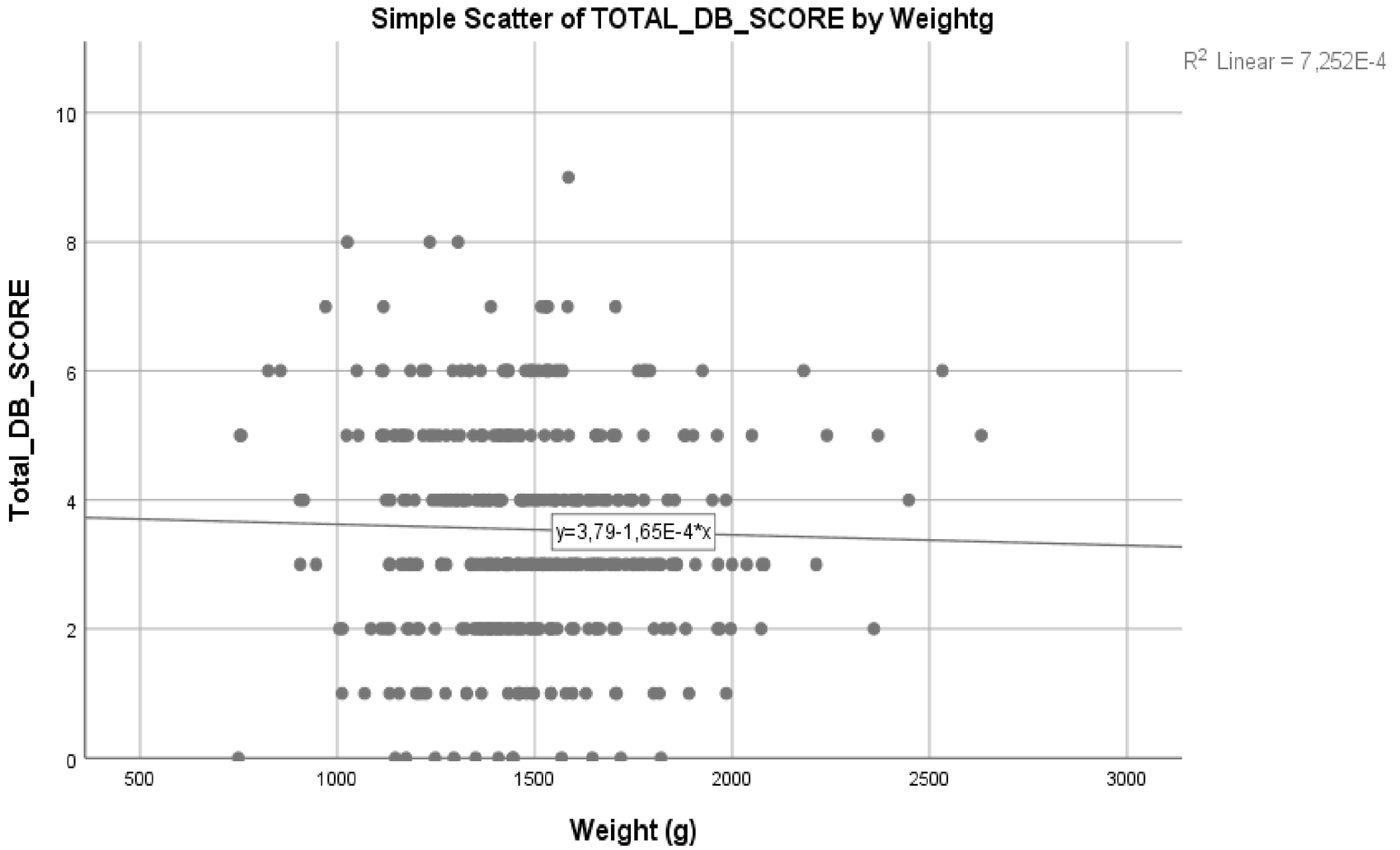

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANIMAL CHARACTERISTICS



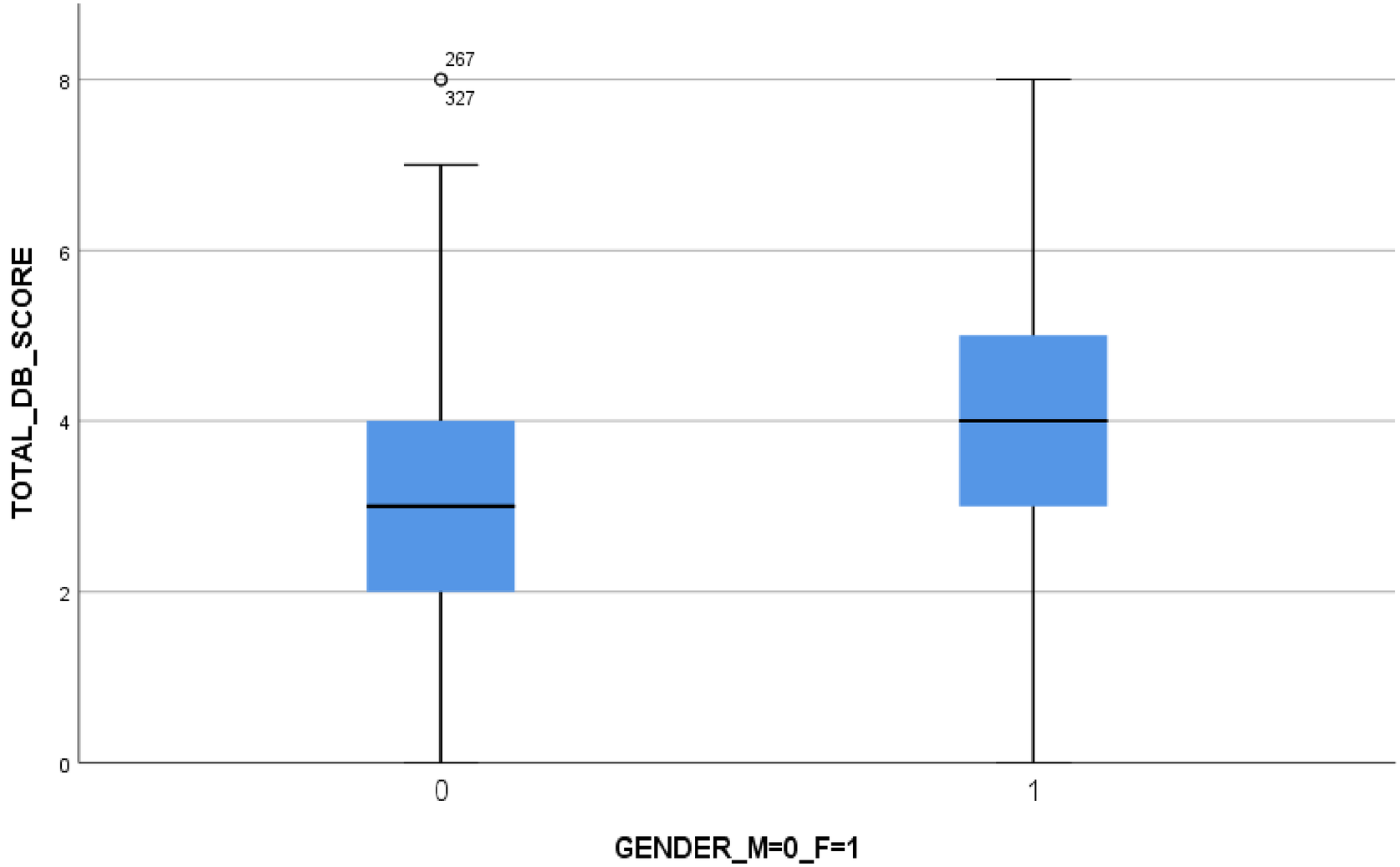



UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANIMAL CHARACTERISTICS




p=0,003

# ANIMAL CHARACTERISTICS

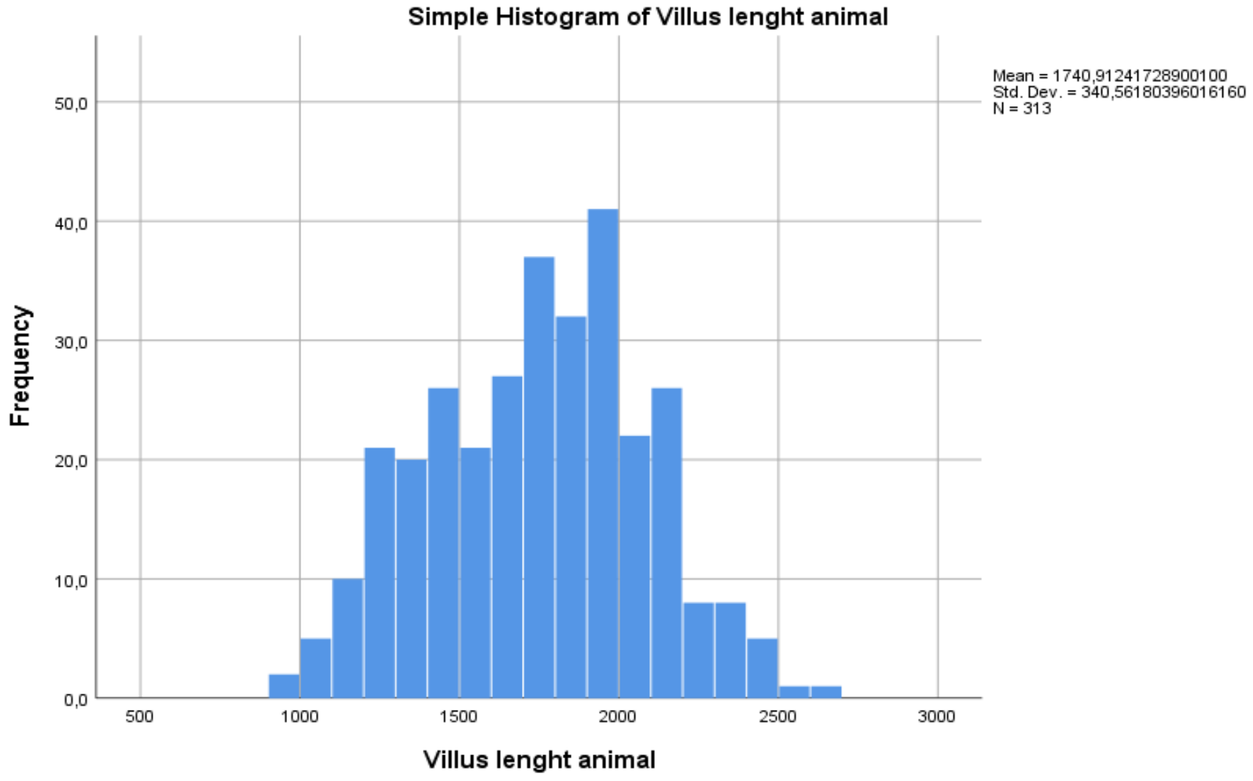
Average DB score

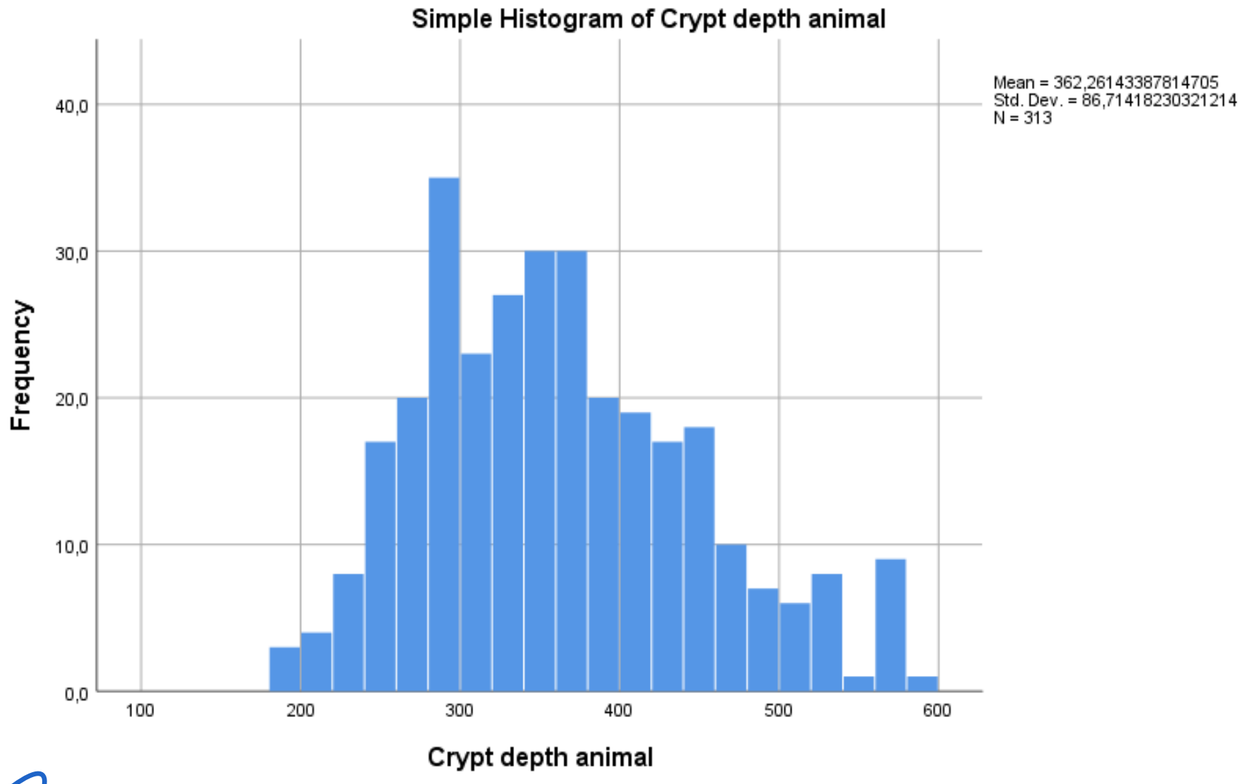
p=0,911

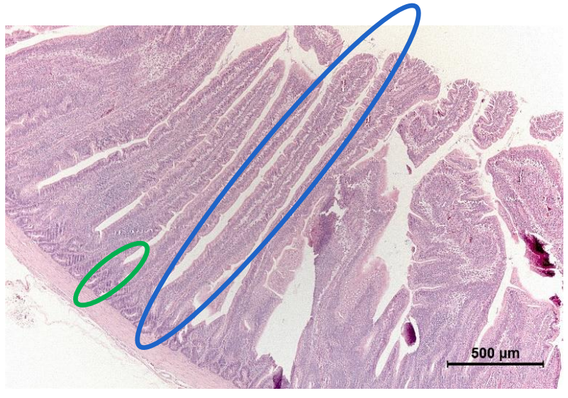
p=0,586

# HISTOLOGY





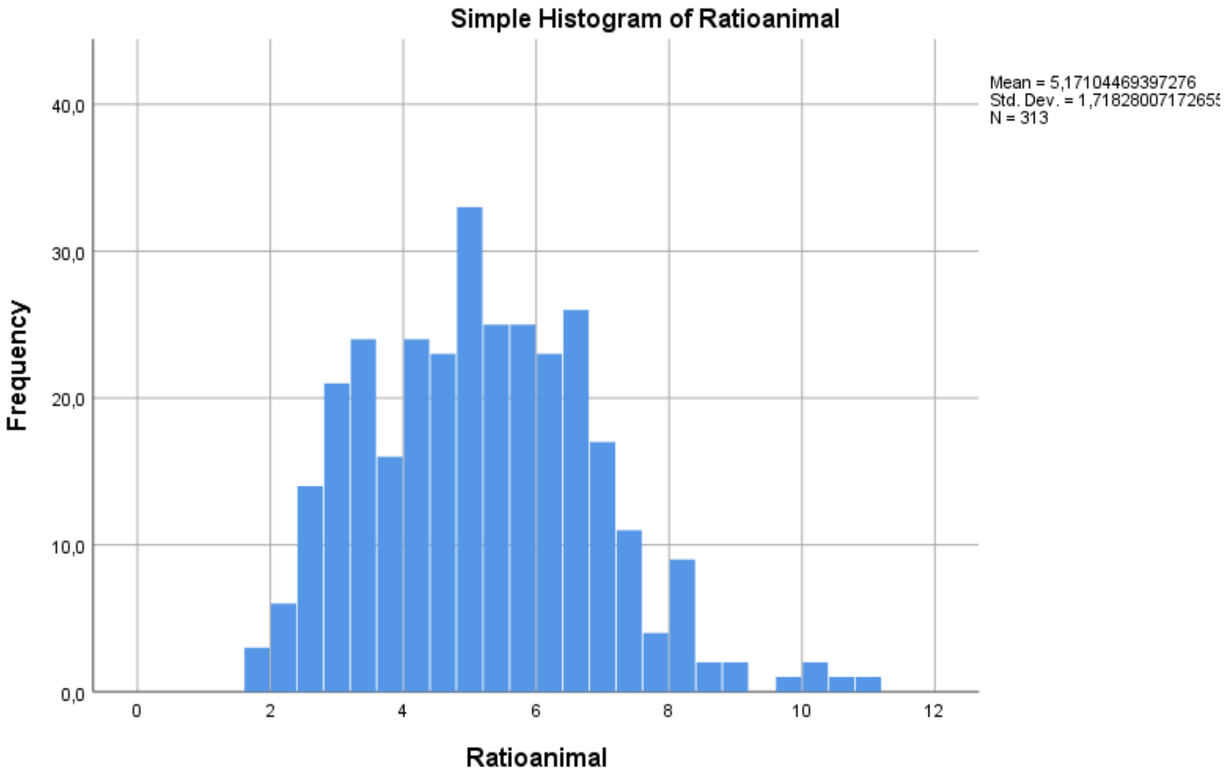

UNIVERSITEIT GENT

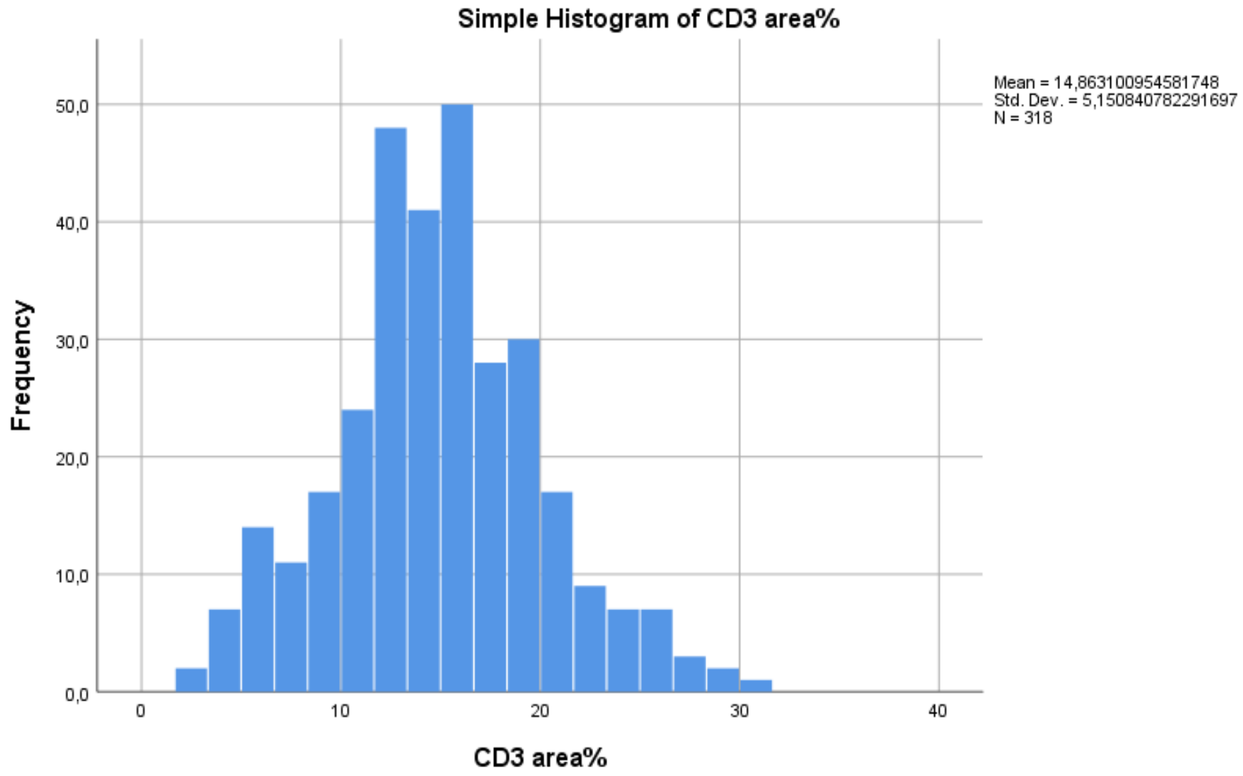
AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# HISTOLOGY





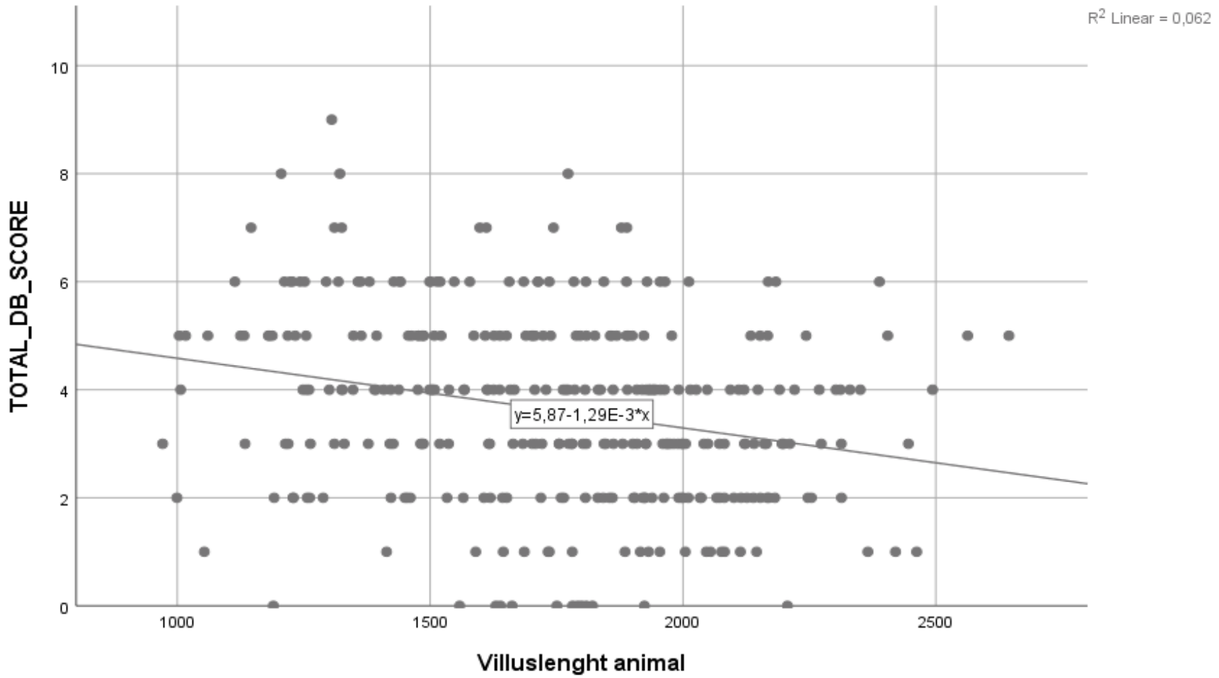

UNIVERSITEIT GENT

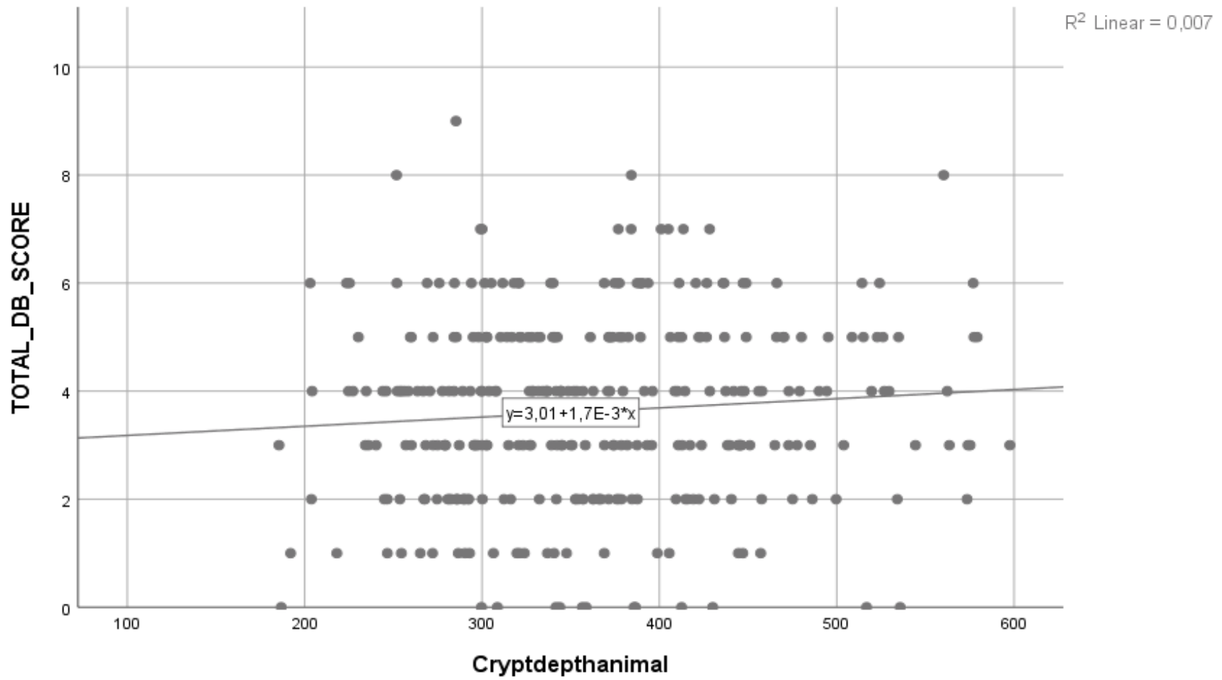
AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# HISTOLOGY – DB SCORE





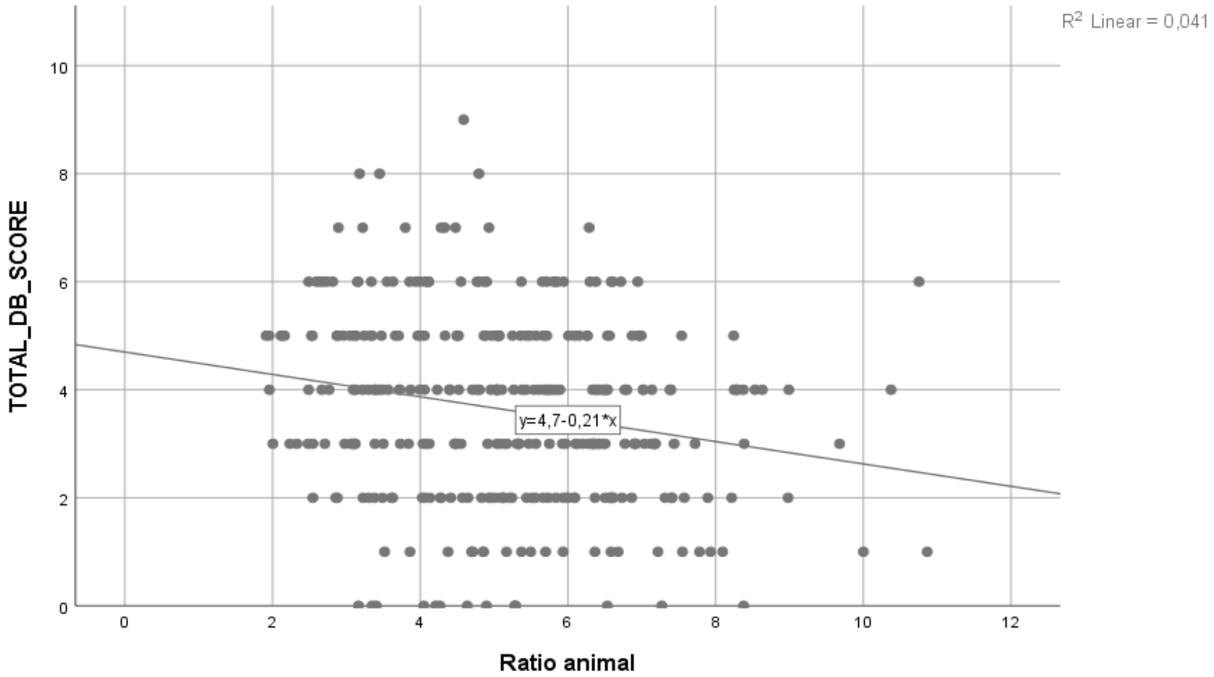

UNIVERSITEIT GENT

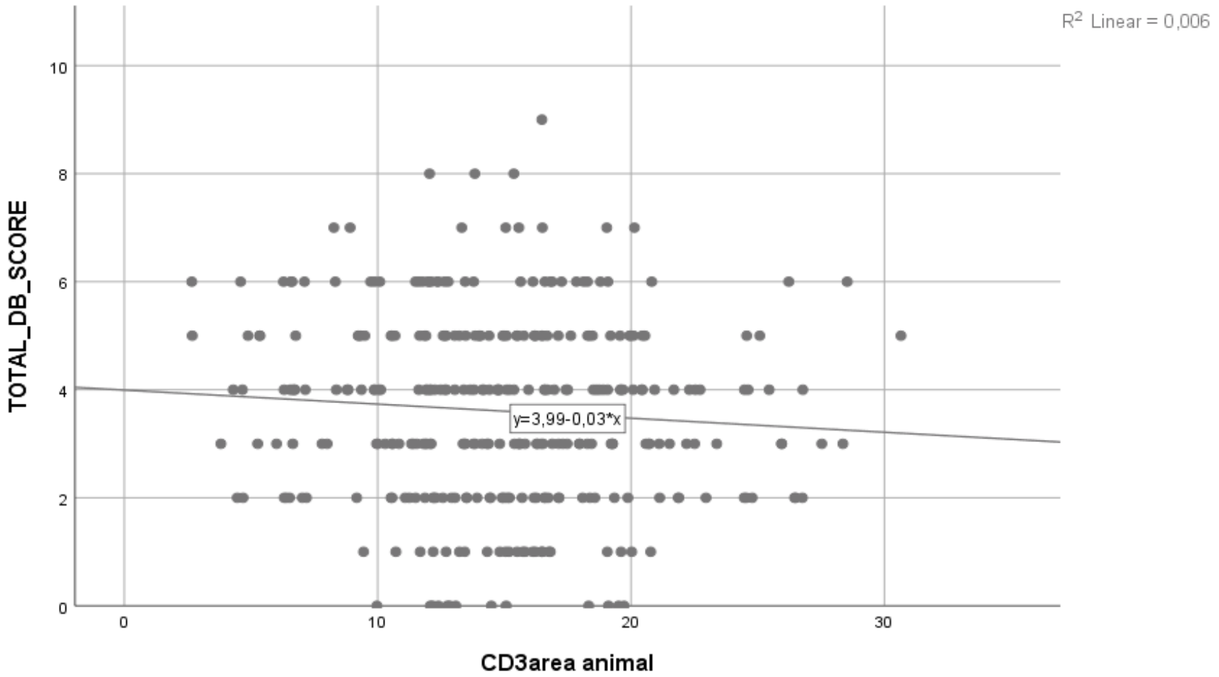
AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# HISTOLOGY – DB SCORE





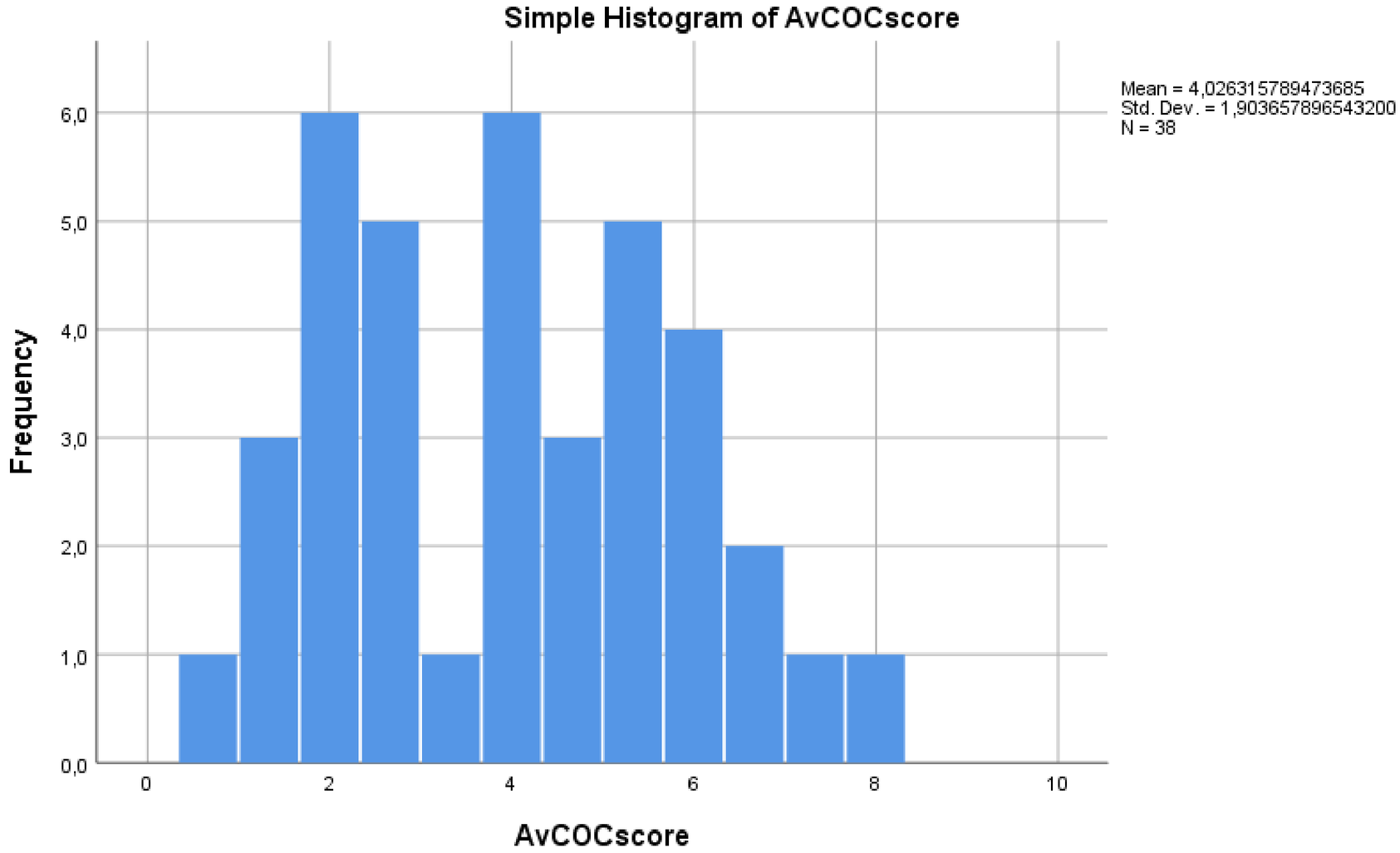




UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

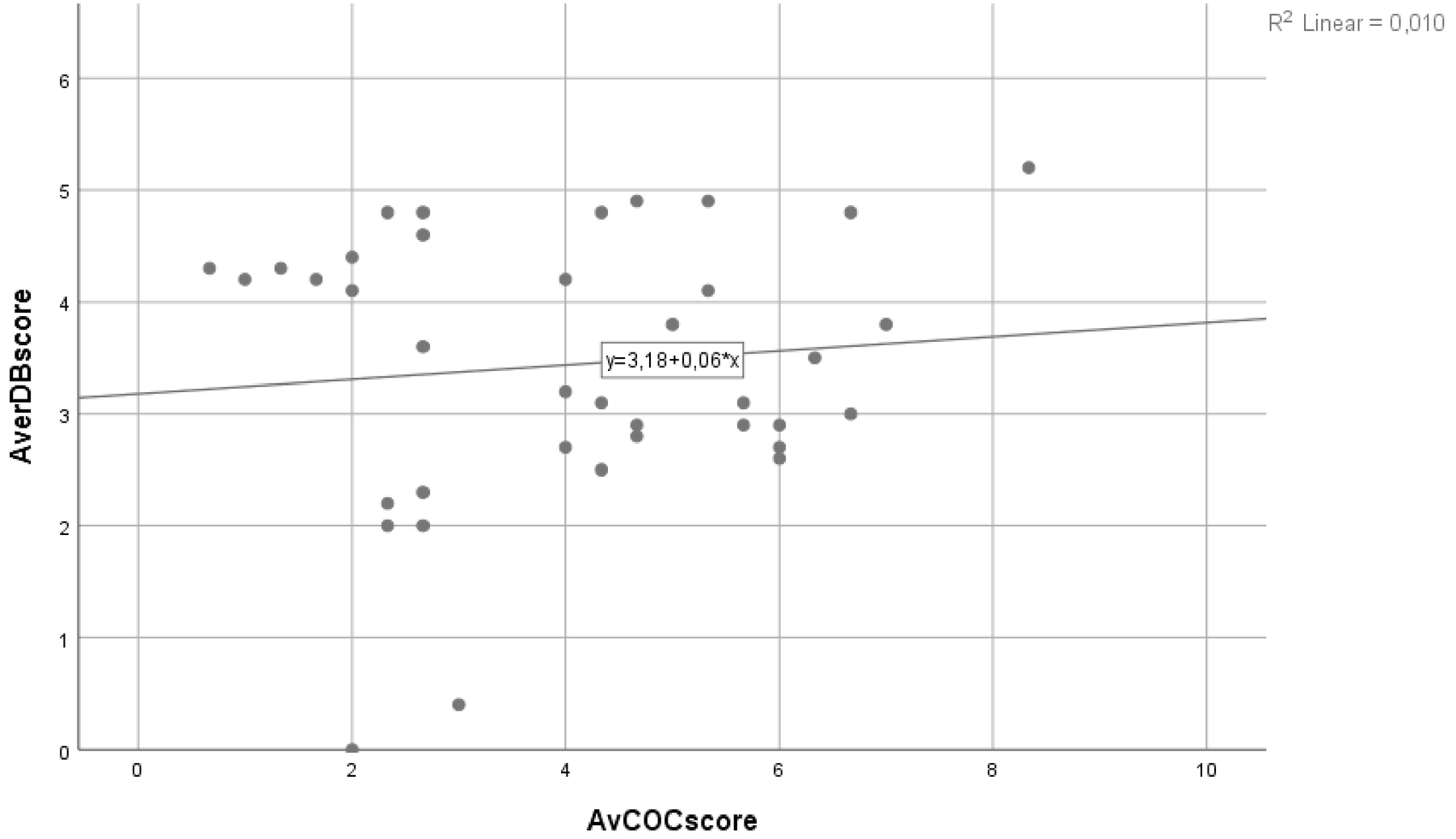
Vlaanderen is ondernemen

# COCCIDIOSIS



# COCCIDIOSIS - DYSBACTERIOSIS






UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

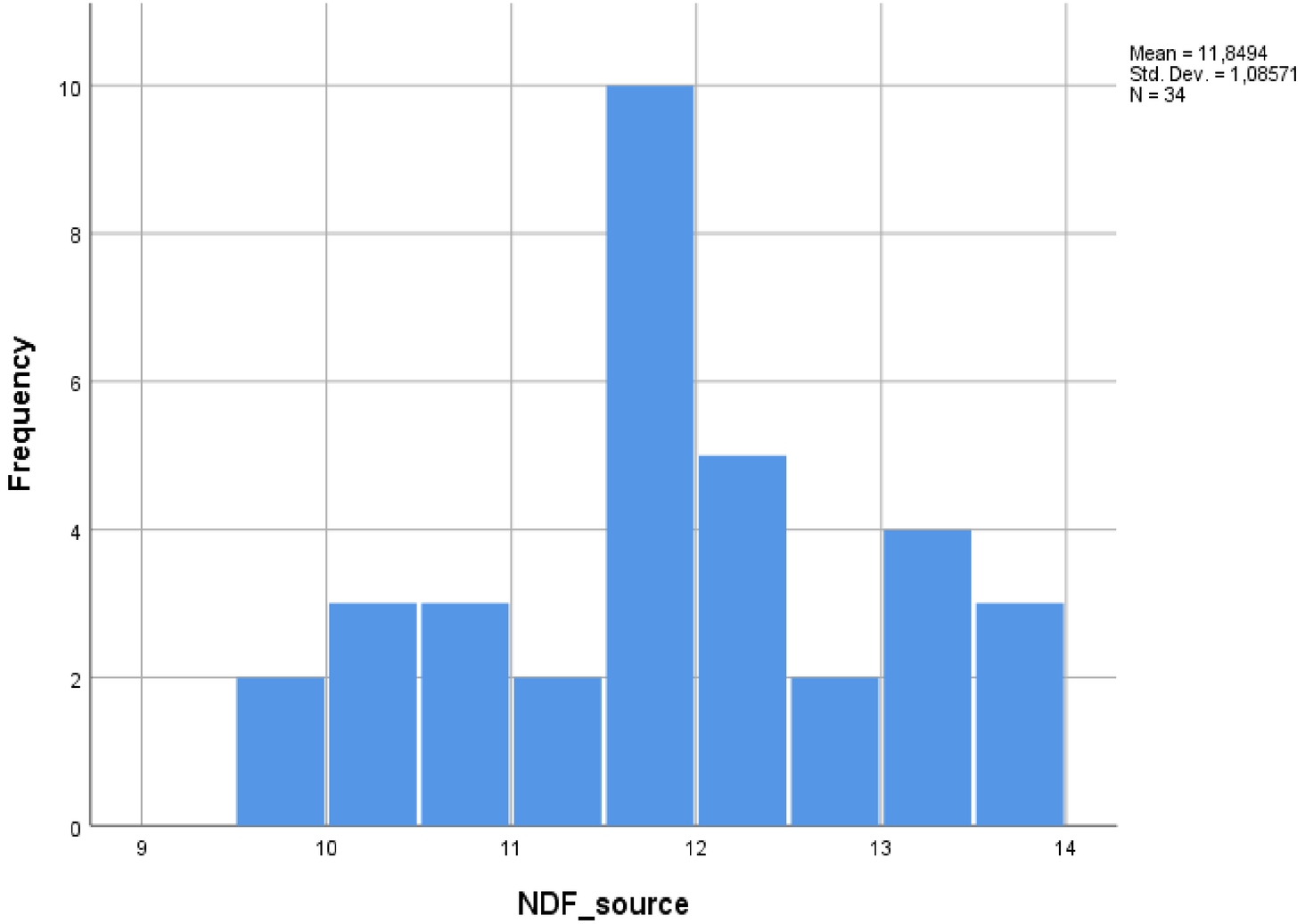
| Water parameters | Conform Source | Not-conform Source | p-values | Conform End | Not-conform End | p-values |
|---|---|---|---|---|---|---|
| E.coli | | | | | | |
| Intestinal enterococci | | | | | | |
| Total aërobe bact. count 22°C | | | | | | |
| Nitrite | | | | | | |
| pH | | | | | | |
| Total Fe | | | | | | |
| Total hardness | | | | | | |
| Fysical appearance | | | | | | |
| Odour | | | | | | |
| Colour | | | | | | |

| Water parameters | Conform Source | Not-conform Source | p-values | Conform End | Not-conform End | p-values |
|---|---|---|---|---|---|---|
| E.coli | 100% (35) | 0% (0) | | 100% (33) | 0% (0) | |
| Intestinal enterococci | 74% (26) | 26% (9) | | 29% (10) | 71% (24) | |
| Total aërobe bact. count 22°C | 100% (34) | 0% (0) | | 82% (28) | 18% (6) | |
| Nitrite | 100% (35) | 0% (0) | | 100% (34) | 0% (0) | |
| pH | 100% (35) | 0% (0) | | 97% (33) | 3% (1) | |
| Total Fe | 97% (34) | 3% (1) | | 100% (34) | 0% (0) | |
| Total hardness | 71% (10) | 29% (4) | | 64% (9) | 36% (5) | |
| Fysical appearance | 100% (14) | 0% (0) | | 50% (7) | 50% (7) | |
| Odour | 93% (13) | 7% (1) | | 64% (9) | 36% (5) | |
| Colour | 100% (14) | 0% (0) | | 100% (14) | 0% (0) | |

| Water parameters | Conform Source | Not-conform Source | p-values | Conform End | Not-conform End | p-values |
|---|---|---|---|---|---|---|
| | | | | | Confidential (CDA | C17/TT/0243) |
| E.coli | 100% (35) | 0% (0) | | 100% (33) | 0% (0) | |
| Intestinal enterococci | 74% (26) | 26% (9) | 0.469 | 29% (10) | 71% (24) | 0.708 |
| Total aërobe bact. count 22°C | 100% (34) | 0% (0) | | 82% (28) | 18% (6) | 0.539 |
| Nitrite | 100% (35) | 0% (0) | | 100% (34) | 00% (0) | |
| pH | 100% (35) | 0% (0) | | 97% (33) | 3% (1) | |
| Total Fe | 97% (34) | 3% (1) | | 100% (34) | 0% (0) | |
| Total hardness | 71% (10) | 29% (4) | 0.796 | 64% (9) | 36% (5) | 0.630 |
| Fysical appearance | 100% (14) | 0% (0) | | 50% (7) | 50% (7) | 0.916 |
| Odour | 93% (13) | 7% (1) | | 64% (9) | 36% (5) | 0.536 |
| Colour | 100% (14) | 0% (0) | | 100% (14) | 0% (0) | |

# NDF AT SOURCE






UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# FEED PARAMETERS – DB SCORE



| Correlation with DB score | | | | | | |
|---|---|---|---|---|---|---|
| **Feed parameters** | **Mean ± SD Source** | **[Min-max] Source** | **p-value source** | | | |
| TRE | 18,63 ± 1,48 | [12,7-20,5] | | | | |
| Fat | 6,72 ± 1,26 | [4,86-9,45] | | | | |
| Starch | 42,34 ± 2,78 | [36,5-49,8] | | | | |
| Total sugar | 3,82 ± 0,49 | [3,1-4,7] | | | | |
| TMS | 4,09 ± 0,63 | [3,04-6,26] | | | | |
| NDF | 11,85 ± 1,09 | [9,90-13,80] | | | | |
| Moisture | 11,82 ± 1,29 | [10,3-18,0] | | | | |
| Energy (Mjoule/kg) | 12,86 ± 0,35 | [12,14-13,40] | | | | |
| Energy (kcal/kg) | 3049,24 ± 82,22 | [2857,22-3201,52] | | | | |

# FEED PARAMETERS – DB SCORE



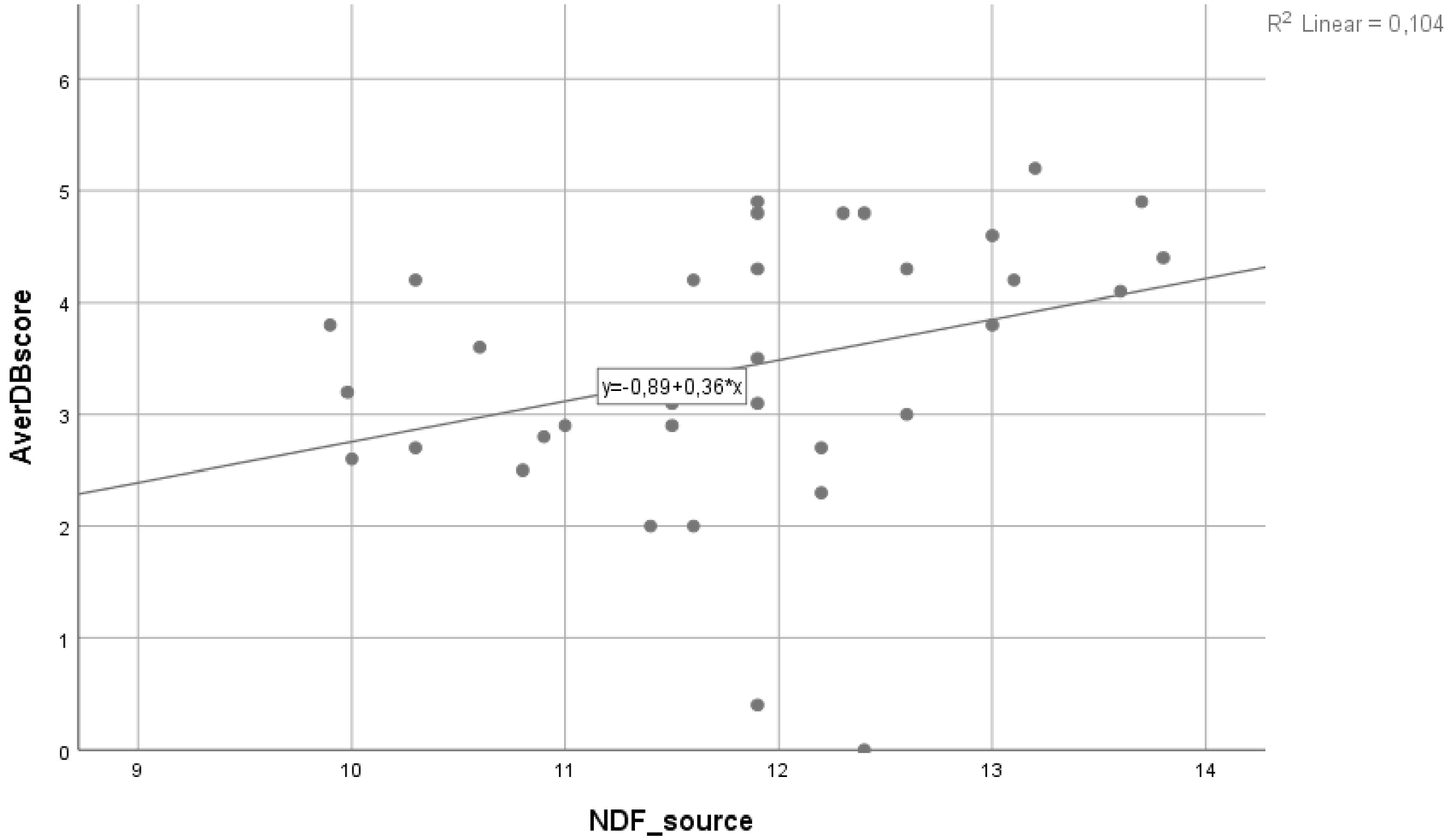
| Correlation with DB score | | | | | | |
|---|---|---|---|---|---|---|
| **Feed parameters** | **Mean ± SD Source** | **[Min-max] Source** | **p-value source** | **Mean ± SD End** | **[Min-max] End** | **p-value End** |
| TRE | 18,63 ± 1,48 | [12,7-20,5] | | 19,15 ± 1,69 | [12,6-21,5] | |
| Fat | 6,72 ± 1,26 | [4,86-9,45] | | 7,02 ± 1,31 | [4,53-9,67] | |
| Starch | 42,34 ± 2,78 | [36,5-49,8] | | 40,94 ± 3,26 | [36,1-49,4] | |
| Total sugar | 3,82 ± 0,49 | [3,1-4,7] | | 3,91 ± 0,51 | [2,4-4,7] | |
| TMS | 4,09 ± 0,63 | [3,04-6,26] | | 4,40 ± 0,87 | [2,93-6,94] | |
| NDF | 11,85 ± 1,09 | [9,90-13,80] | | 11,94 ± 1,19 | [9,32-13,90] | |
| Moisture | 11,82 ± 1,29 | [10,3-18,0] | | 11,70 ± 1,21 | [10,1-15,4] | |
| Energy (Mjoule/kg) | 12,86 ± 0,35 | [12,14-13,40] | | 12,79 ± 0,33 | [12,08-13,13] | |
| Energy (kcal/kg) | 3049,24 ± 82,22 | [2857,22-3201,52] | | 3040,39 ± 72,45 | [2879,01-3139,16] | |

# FEED PARAMETERS – DB SCORE



| Correlation with DB score | | | | | | |
|---|---|---|---|---|---|---|
| **Feed parameters** | **Mean ± SD Source** | **[Min-max] Source** | **p-value source** | **Mean ± SD End** | **[Min-max] End** | **p-value End** |
| TRE | 18,63 ± 1,48 | [12,7-20,5] | 0,135 | 19,15 ± 1,69 | [12,6-21,5] | 0,388 |
| Fat | 6,72 ± 1,26 | [4,86-9,45] | 0,761 | 7,02 ± 1,31 | [4,53-9,67] | 0,708 |
| Starch | 42,34 ± 2,78 | [36,5-49,8] | 0,143 | 40,94 ± 3,26 | [36,1-49,4] | 0,152 |
| Total sugar | 3,82 ± 0,49 | [3,1-4,7] | 0,797 | 3,91 ± 0,51 | [2,4-4,7] | 0,602 |
| TMS | 4,09 ± 0,63 | [3,04-6,26] | 0,544 | 4,40 ± 0,87 | [2,93-6,94] | 0,728 |
| NDF | 11,85 ± 1,09 | [9,90-13,80] | 0,063 | 11,94 ± 1,19 | [9,32-13,90] | 0,124 |
| Moisture | 11,82 ± 1,29 | [10,3-18,0] | 0,487 | 11,70 ± 1,21 | [10,1-15,4] | 0,541 |
| Energy (Mjoule/kg) | 12,86 ± 0,35 | [12,14-13,40] | 0,165 | 12,79 ± 0,33 | [12,08-13,13] | 0,455 |
| Energy (kcal/kg) | 3049,24 ± 82,22 | [2857,22-3201,52] | 0,593 | 3040,39 ± 72,45 | [2879,01-3139,16] | 0,258 |

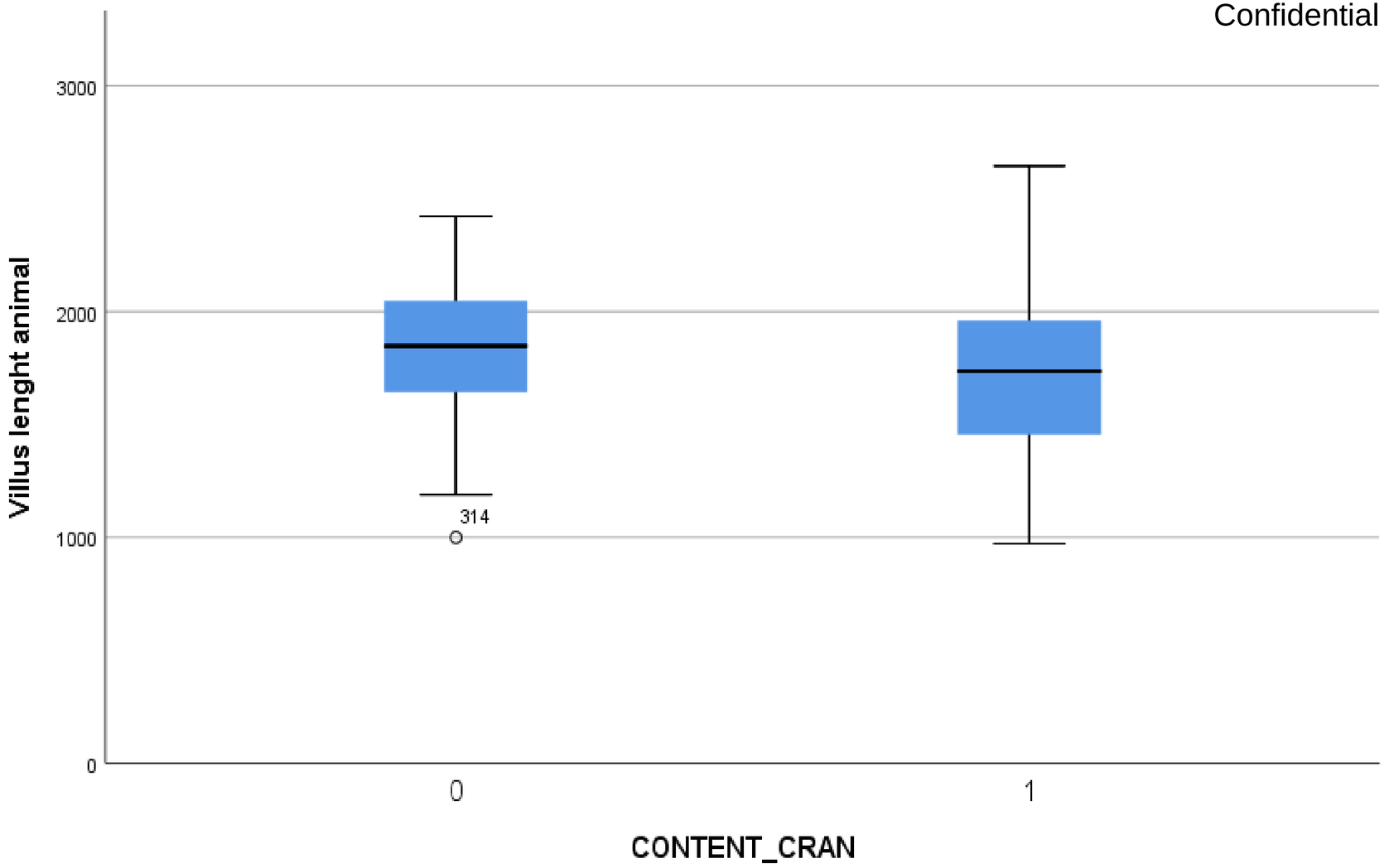
# NDF SOURCE– DB SCORE



# HISTOLOGY – INDIVIDUAL DB PARAMETER

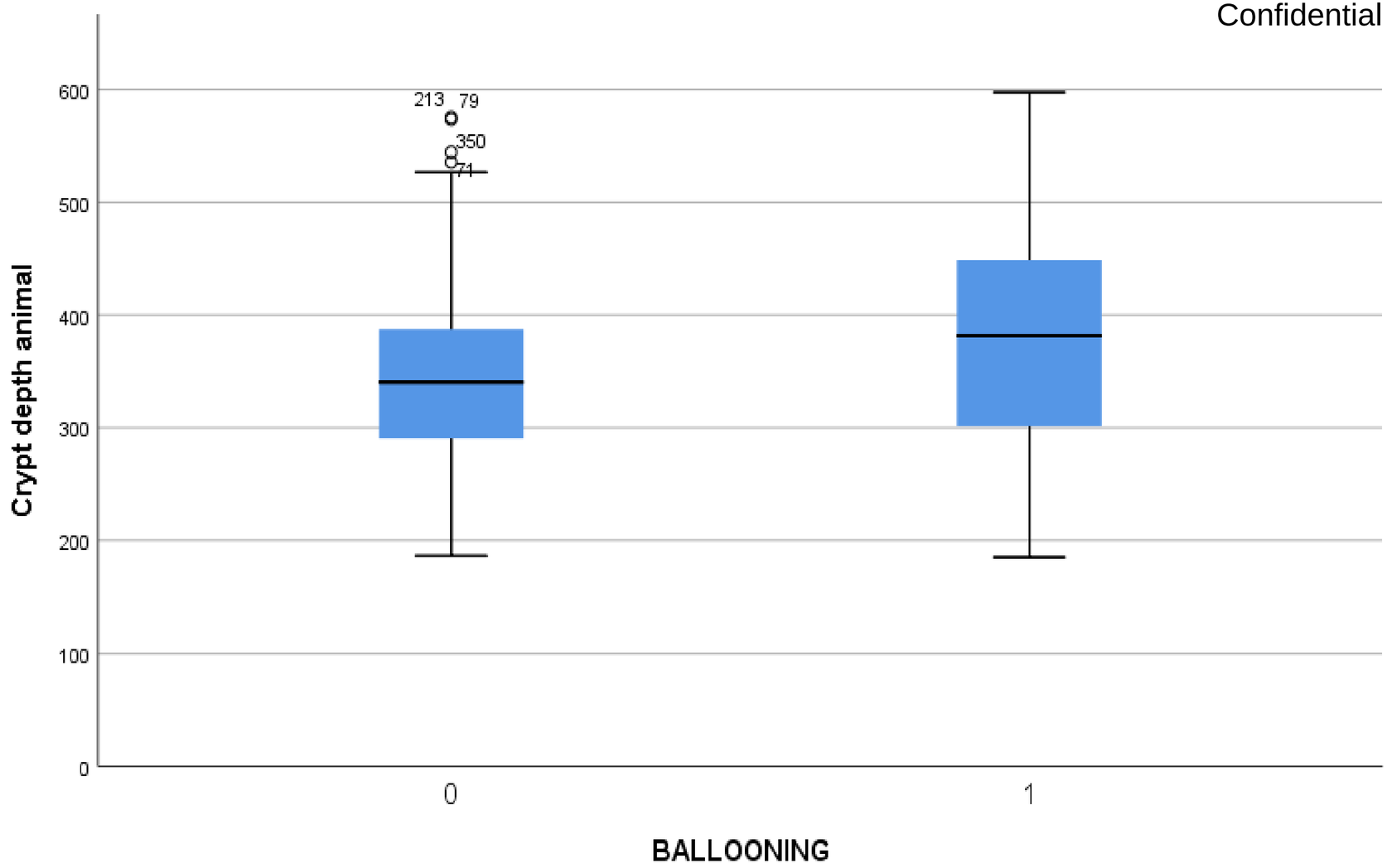


p=0,053



# HISTOLOGY – INDIVIDUAL DB PARAMETER






p=0,050

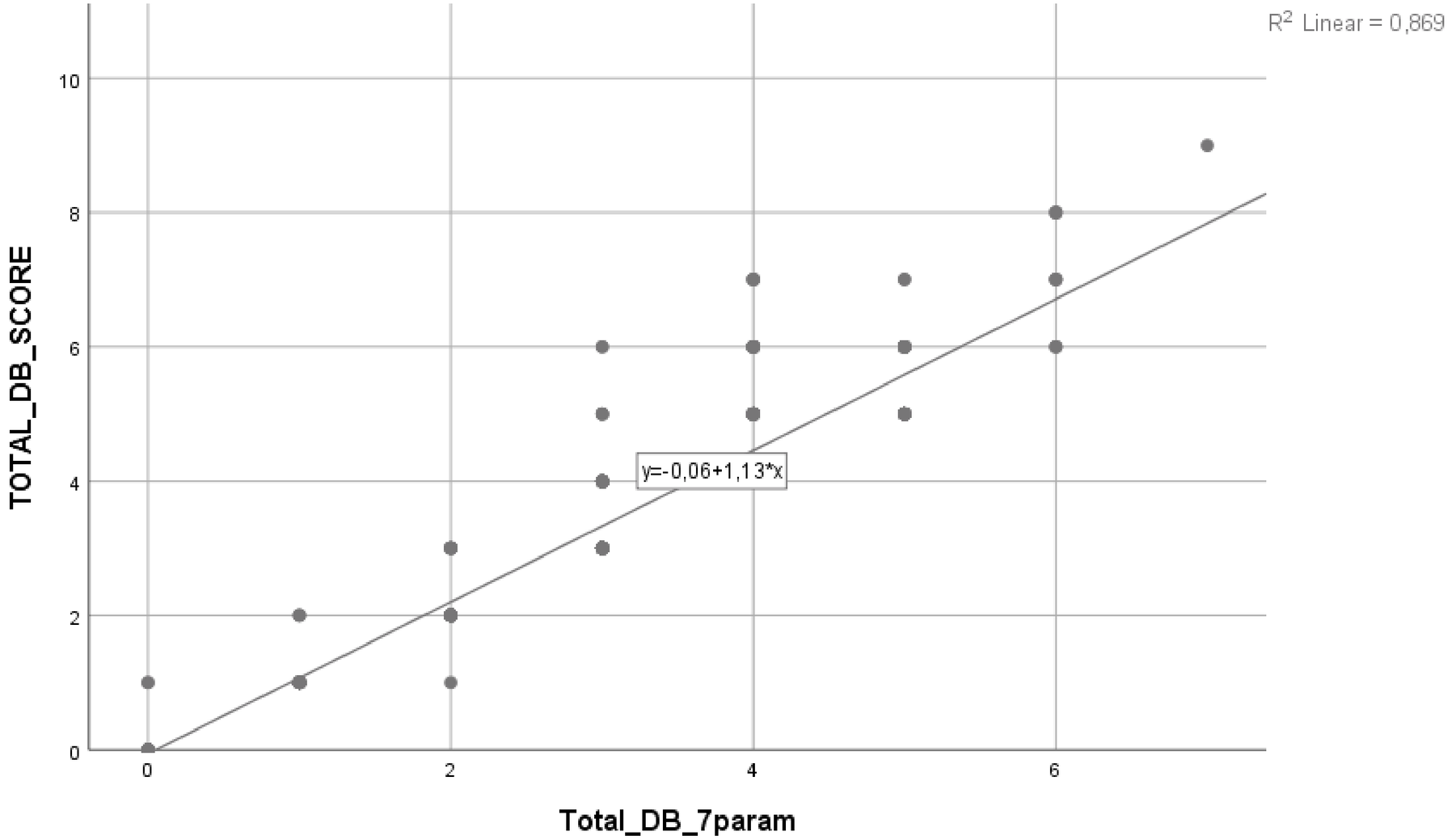
# DYSBACTERIOSIS INDIVIDUAL PARAMETERS



| Parameter | Sample size | Absent | Present |
|---|---|---|---|
| Ballooning | 378 | 245 | 133 |
| Inflammation cranial | 379 | 122 | 257 |
| **Fragility cranial** | **380** | **327 (85%)** | **53** |
| Tonus cranial | 380 | 296 | 84 |
| Abnormal content cranial | 380 | 83 | 297 |
| Inflammation caudal | 380 | 287 | 93 |
| **Fragility caudal** | **380** | **352 (92%)** | **28** |
| **Tonus caudal** | **380** | **327 (86%)** | **53** |
| Abnormal content caudal | 380 | 219 | 161 |
| Undigested particles | 379 | 193 | 186 |

# DYSBACTERIOSIS 7 PARAMETERS






UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# CONCLUSION

UNIVERSITEIT
GENT

# CONCLUSION CROSS-SECTIONAL STUDY

- Dysbacteriosis shows no association with the histological parameters on day 28

- Dysbacteriosis shows no association with coccidiosis on day 28

# LONGITUDINAL STUDY

UNIVERSITEIT
GENT

# WP1. IDENTIFICATION OF RISK FACTORS

## B. Influencing factors

- Longitudinal study
- 20 farms
- 5 visits per farm (d10, 17, 20, 24, 28)

# 15 FARMS COMPLETED

x10

D0 D10 D17 D20 D24 D28 D42

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

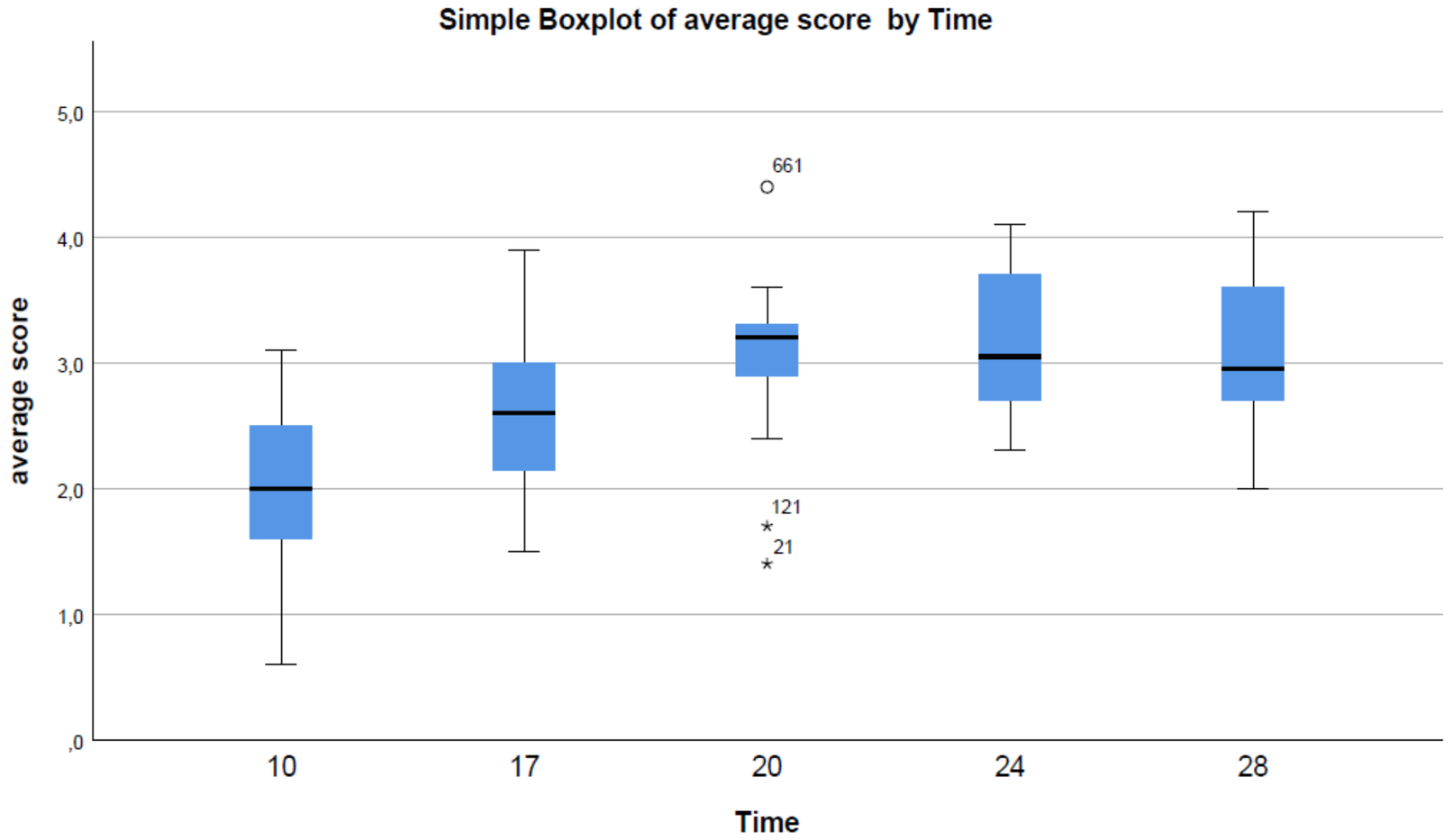
Vlaanderen is ondernemen

# ANALYSIS

UNIVERSITEIT
GENT

# DYSBACTERIOSIS - TIME



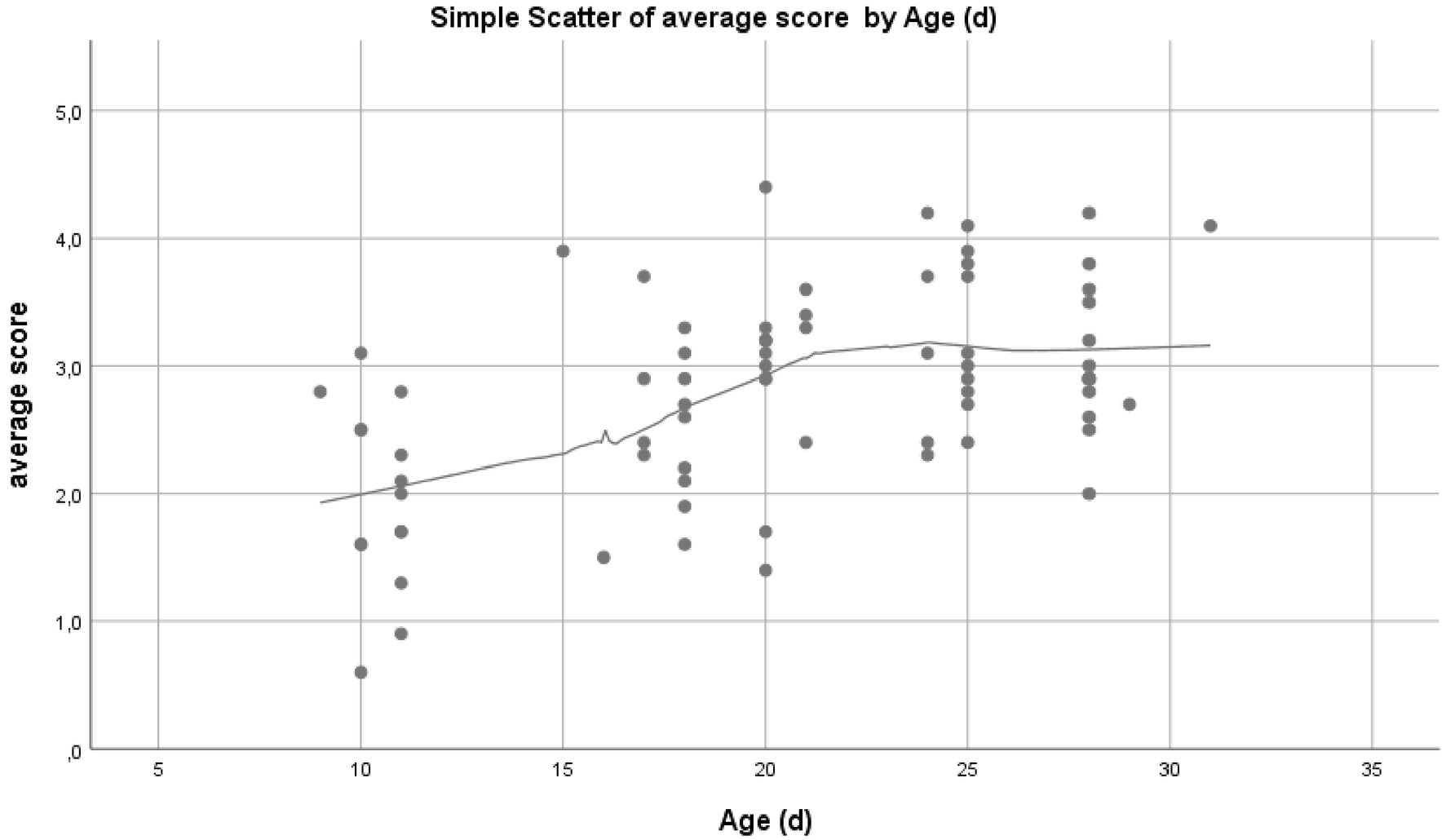



UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# AGE – DB SCORE

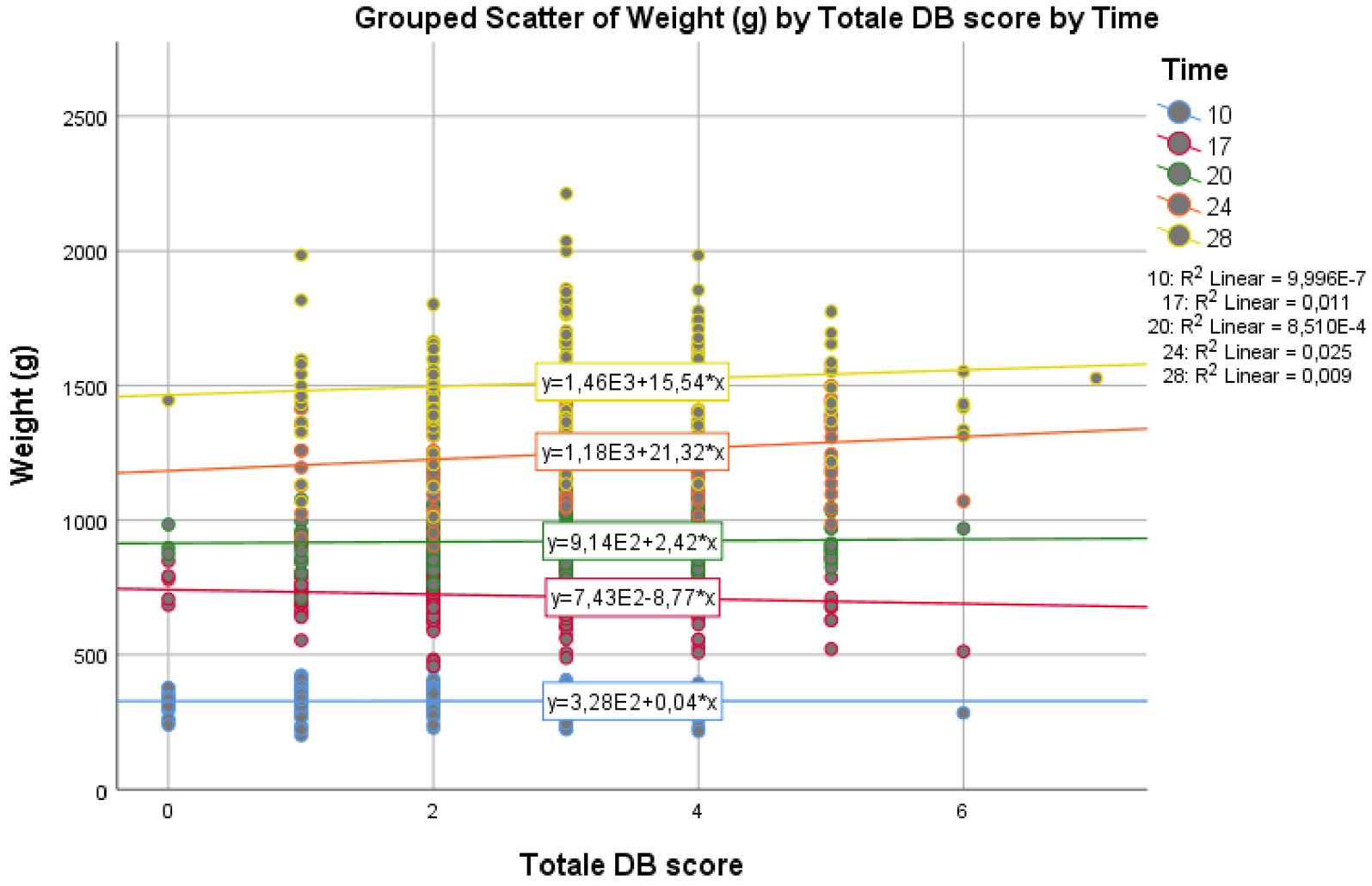



UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

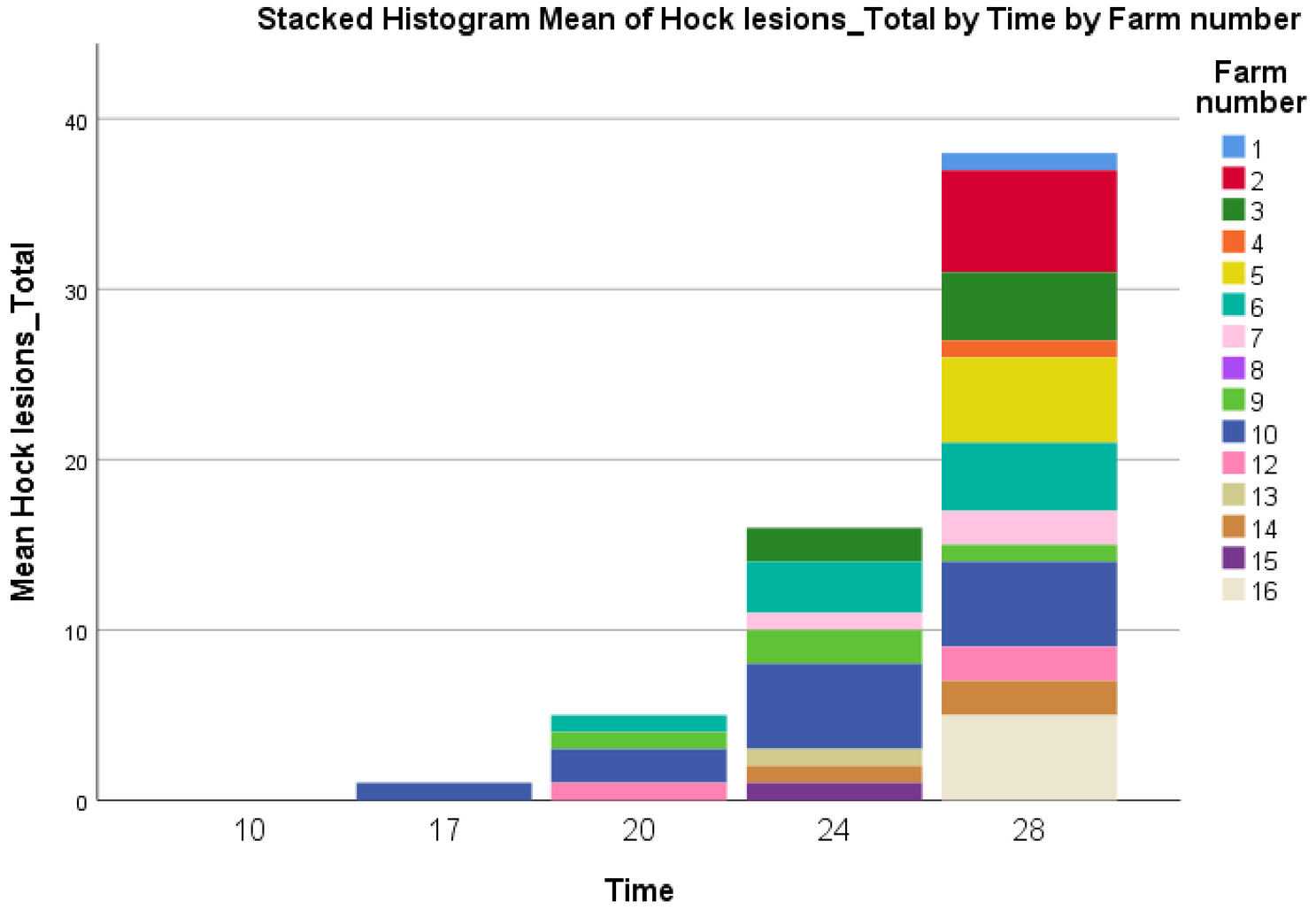
Vlaanderen is ondernemen

# WEIGHT – DB SCORE

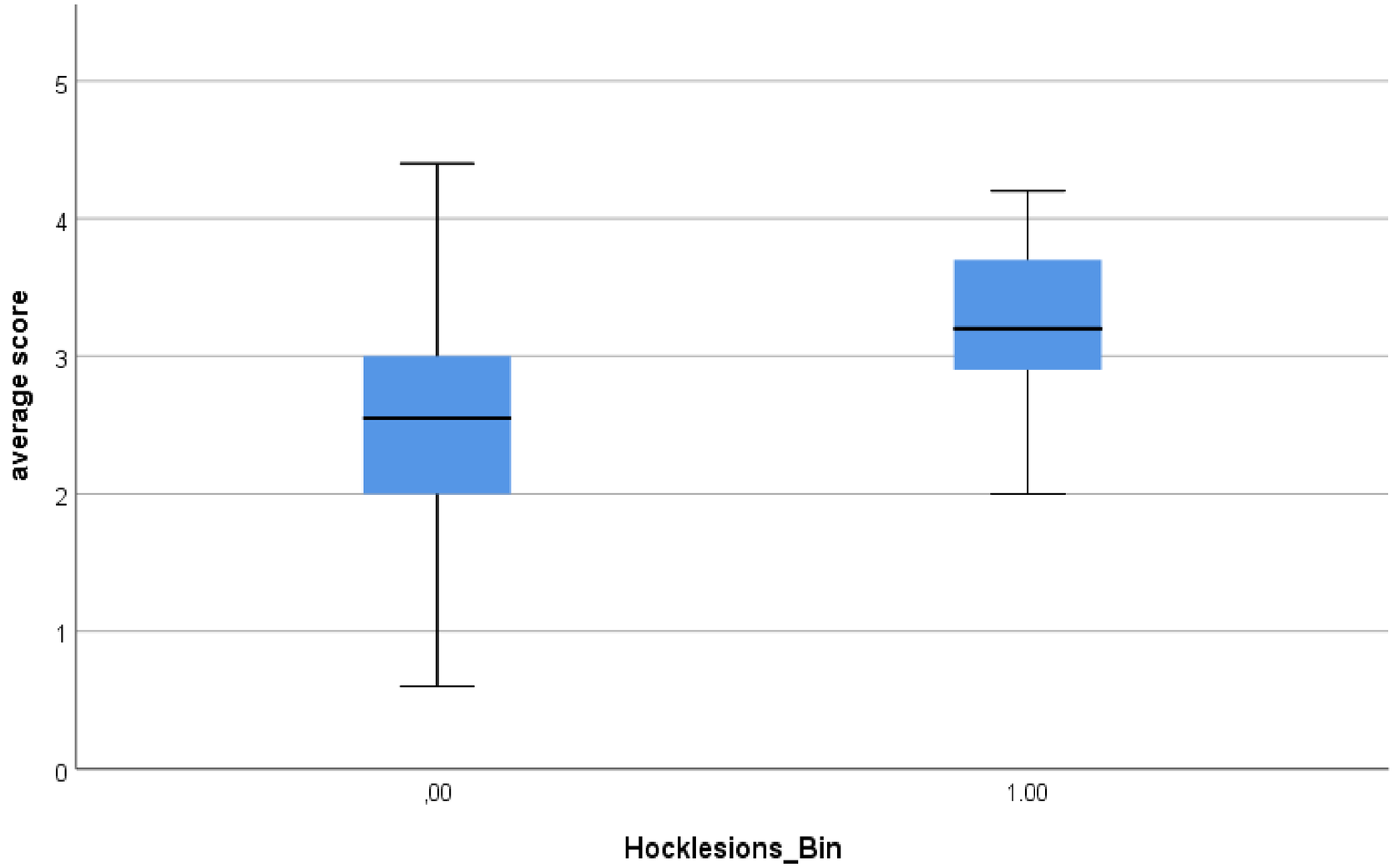


# HOCK LESIONS





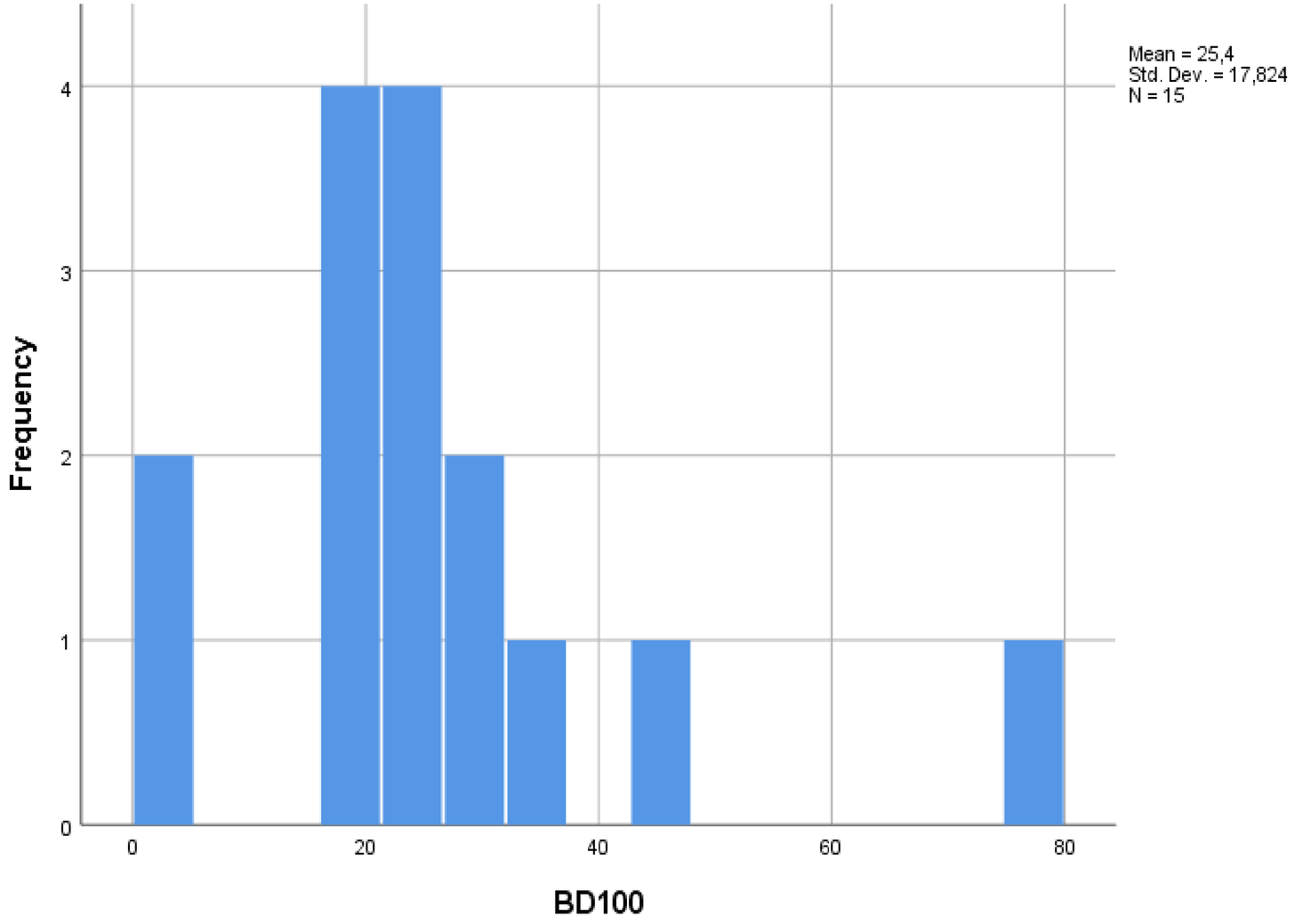
# HOCK LESIONS – DB SCORE




P<0,001

# ANTIMICROBIAL USE





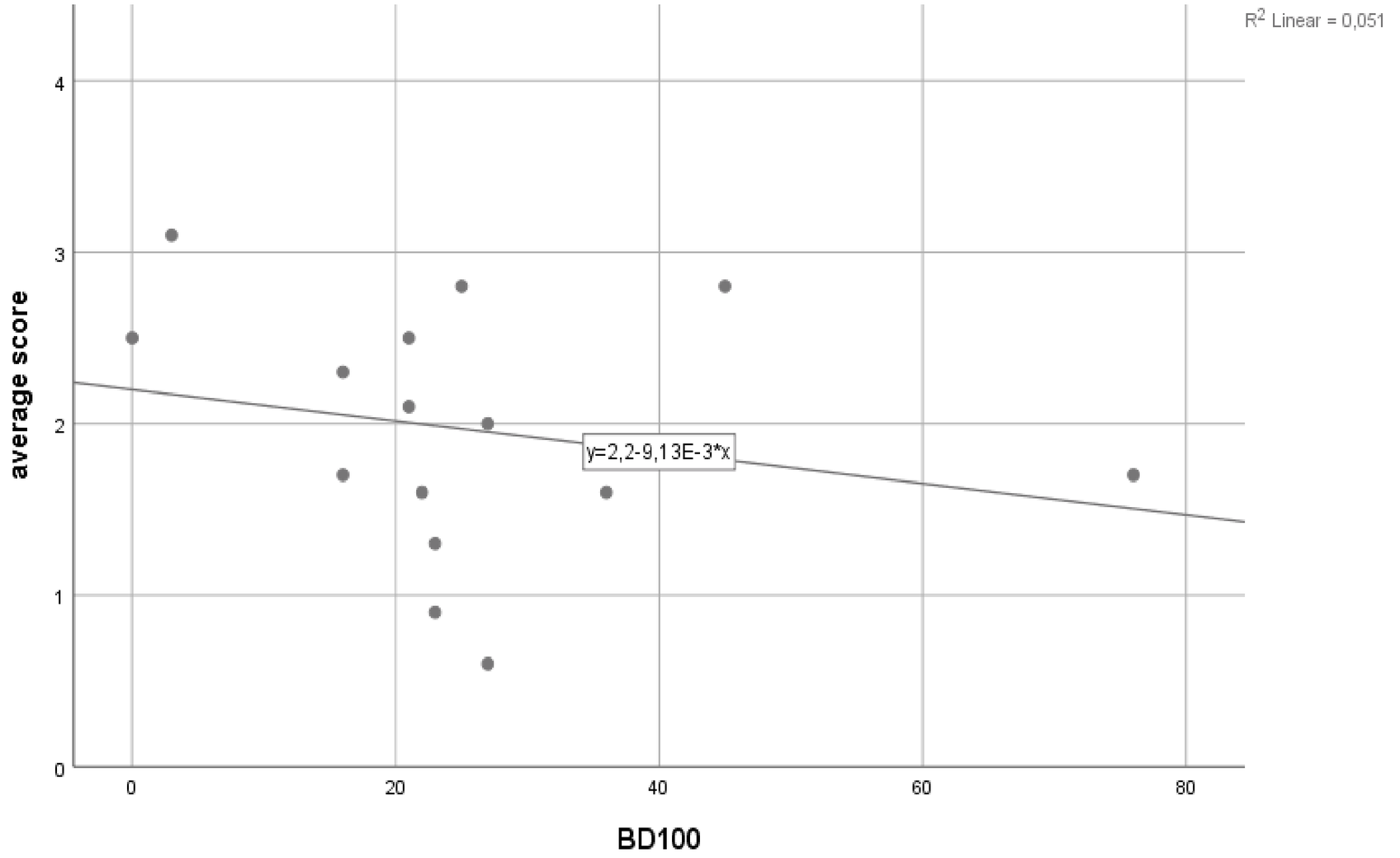

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANTIMICROBIAL USE – DB SCORE





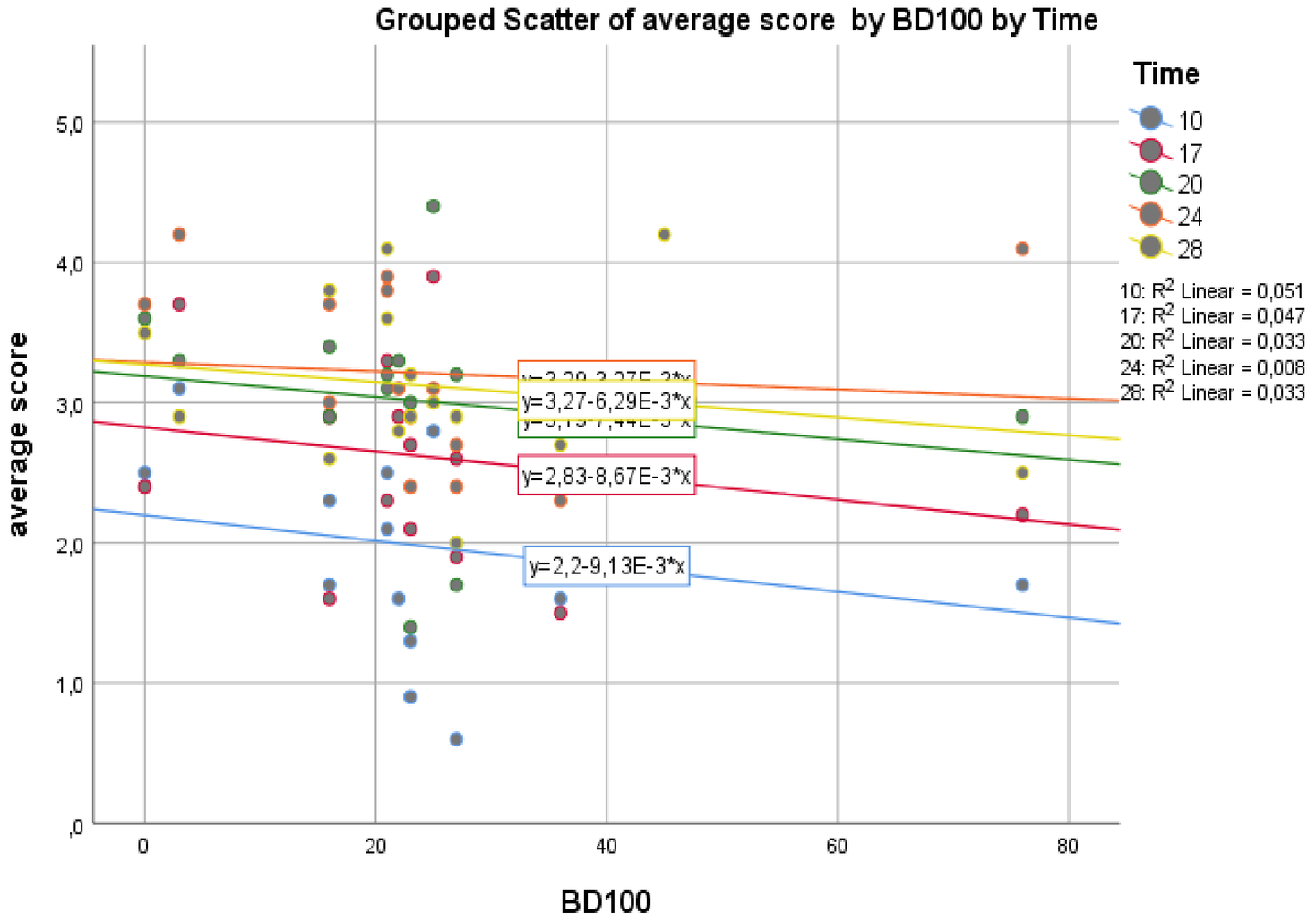

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# ANTIMICROBIAL USE – DB SCORE






UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# DYSBACTERIOSIS



Correlations

| | | AvDBS10 | AvDBS17 | AvDBS20 | AvDBS24 | AvDBS28 |
|---|---|---|---|---|---|---|
| AvDBS10 | Pearson Correlation | 1 | ,666** | ,800** | ,598* | ,620* |
| | Sig. (2-tailed) | | ,007 | ,000 | ,019 | ,014 |
| AvDBS17 | Pearson Correlation | ,666** | 1 | ,685** | ,446 | ,383 |
| | Sig. (2-tailed) | ,007 | | ,005 | ,095 | ,159 |
| AvDBS20 | Pearson Correlation | ,800** | ,685** | 1 | ,524* | ,431 |
| | Sig. (2-tailed) | ,000 | ,005 | | ,045 | ,108 |
| AvDBS24 | Pearson Correlation | ,598* | ,446 | ,524* | 1 | ,347 |
| | Sig. (2-tailed) | ,019 | ,095 | ,045 | | ,205 |
| AvDBS28 | Pearson Correlation | ,620* | ,383 | ,431 | ,347 | 1 |
| | Sig. (2-tailed) | ,014 | ,159 | ,108 | ,205 | |

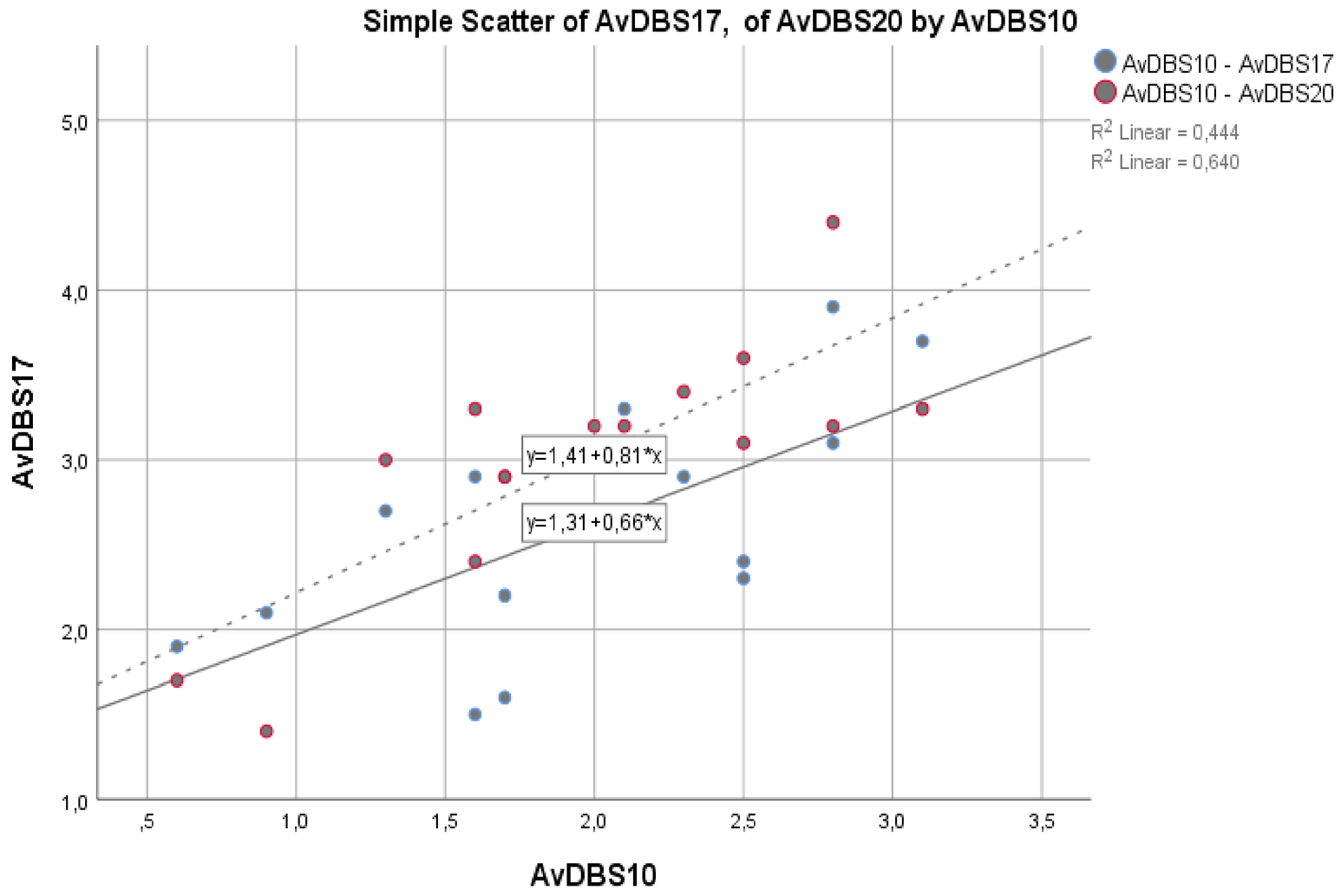
UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

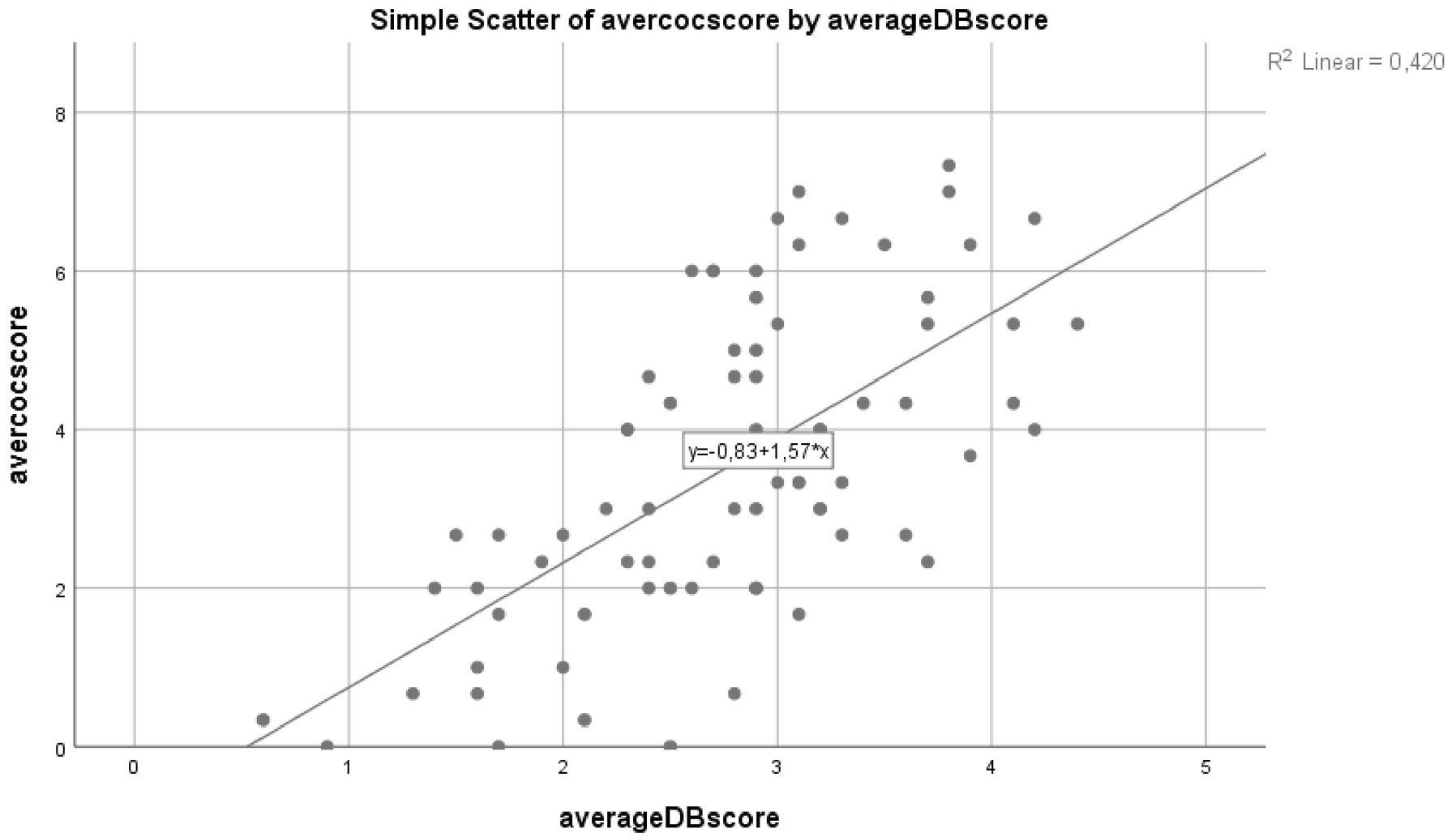
# DYSBACTERIOSIS D10/D17/D20





# COCCIDIOSIS - DYSBACTERIOSIS





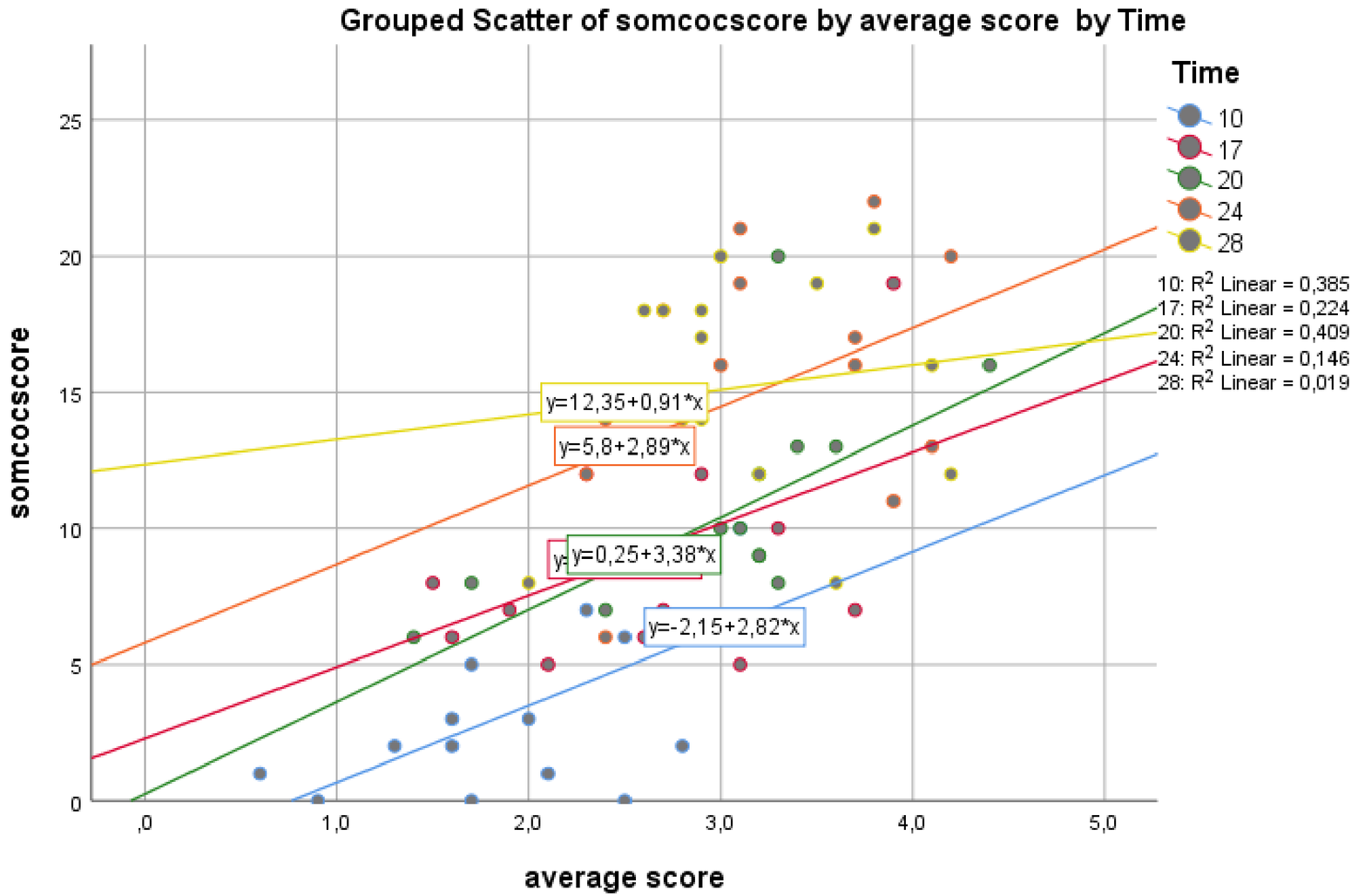

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

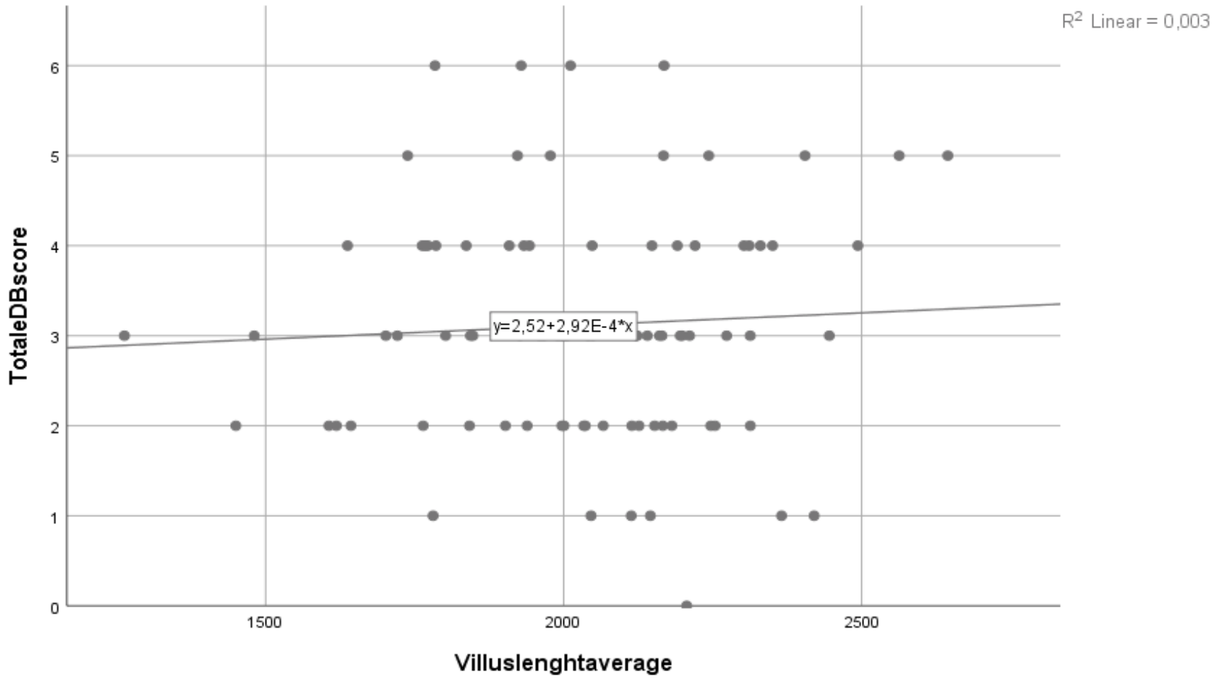
# COCCIDIOSIS - DYSBACTERIOSIS

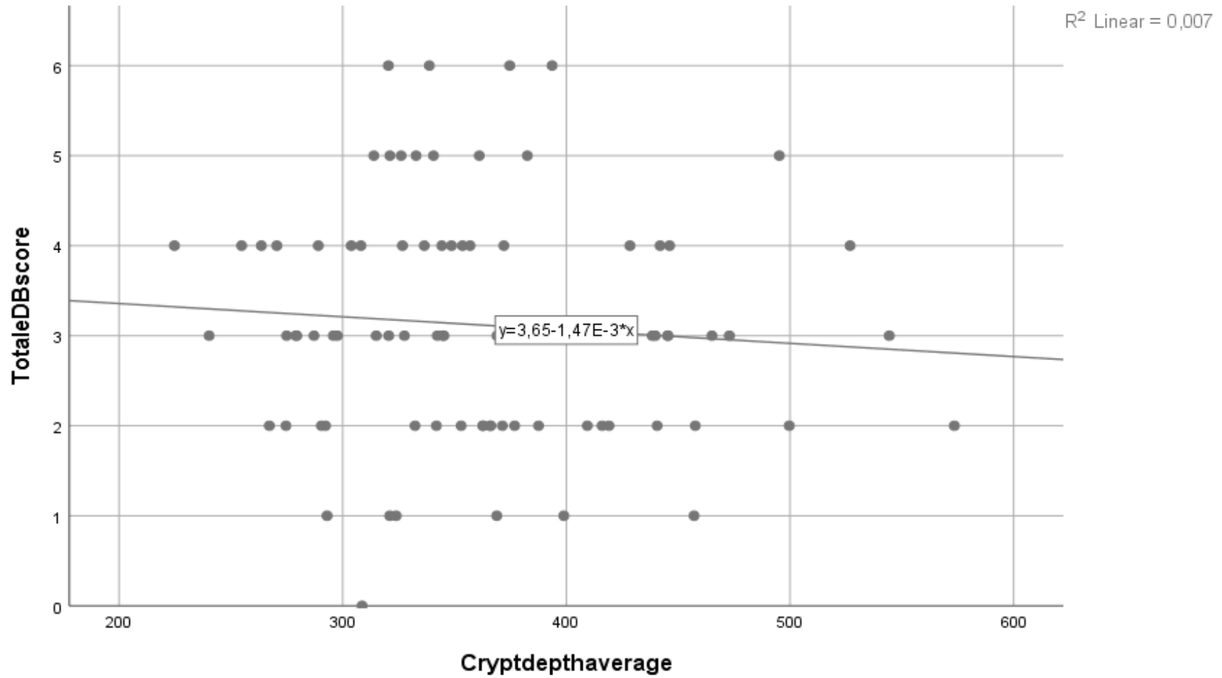




# HISTOLOGY – DB SCORE

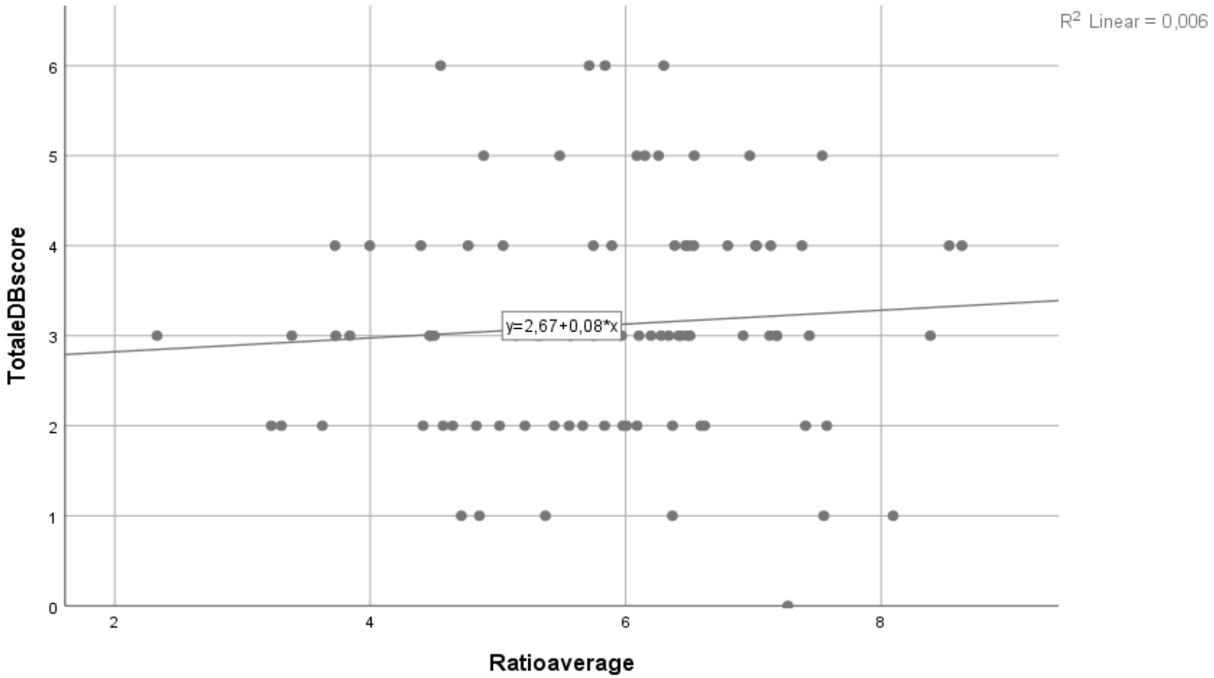


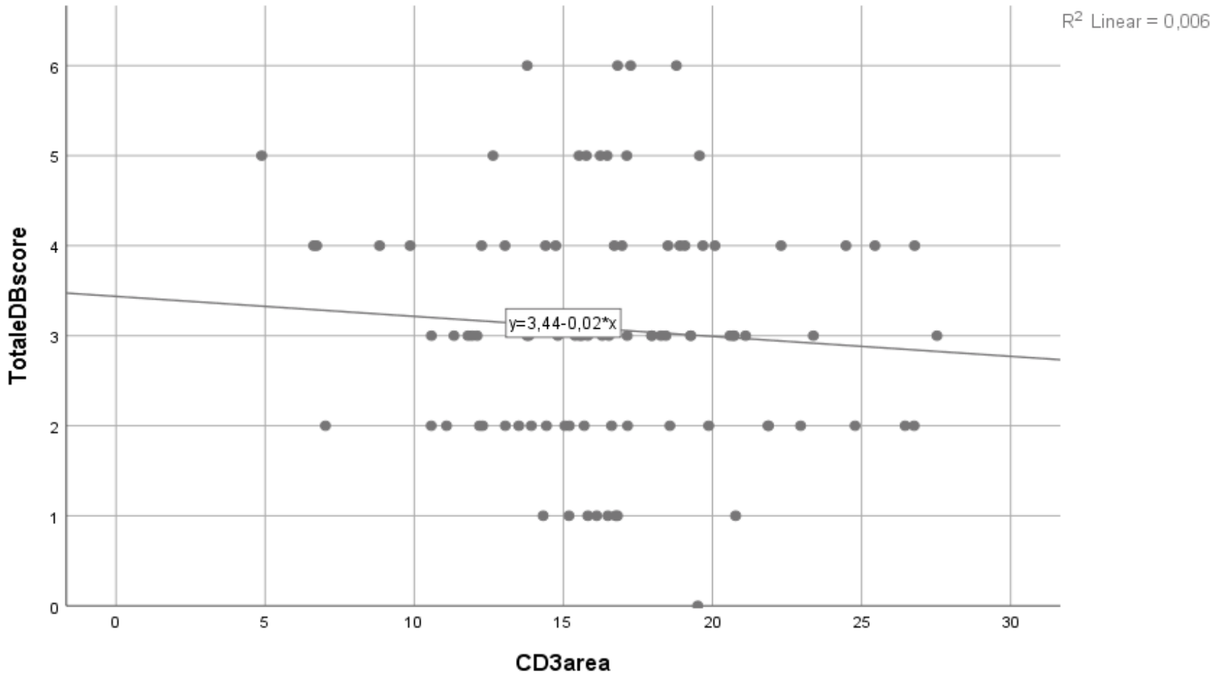


# HISTOLOGY – DB SCORE






UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

# CONCLUSION

UNIVERSITEIT
GENT

# CONCLUSION LONGITUDINAL STUDY

- AMU has no significant effect on the average DB score
- Strong and significant correlation between the DB score on D10 and the score on D20
- DB and coccidiosis show a significant correlation in the animal until about 3 weeks of age

FACULTEIT DIERGENEESKUNDE
accredited by EAEVE


## Nele Caekebeke
MVetMed, PhD-student

DEPARTMENT OF REPRODUCTION, OBSTETRICS AND HERD HEALTH

E nele.caekebeke@ugent.be
T +32 9 264 75 48

## Moniek Ringenier
MVetMed, PhD-student

DEPARTMENT OF REPRODUCTION, OBSTETRICS AND HERD HEALTH

E moniek.ringenier@ugent.be
T +32 9 264 75 48


Ghent University
@ugent
Ghent University

UNIVERSITEIT GENT

AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen