



Session 59. Milk properties for the valorization of dairy (by-products) manufacturing.



Investigating the effect of total and differential somatic cell count on bovine milk mineral content

D. Valoppi*, G. Stocco, A. Summer, G. Niero, M. Penasa, M. Ablondi, C. Cipolat-Gotet



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



*davide.valoppi@unipr.it

Introduction - Background

Introduction

Aim

Materials and
Methods

Results

Conclusions

Studies on :



SCS or DSCC impacts on mineral content



SCS × DSCC impact on mineral content



**Minerals content and daily quantity
across different levels of SCS × DSCC**



DSCC = Differential Somatic Cell Count ; SCS = Somatic Cell Score

Aim



**Assess the effects of the interaction of
different levels of SCS and DSCC
on the mineral profile of bovine milk**

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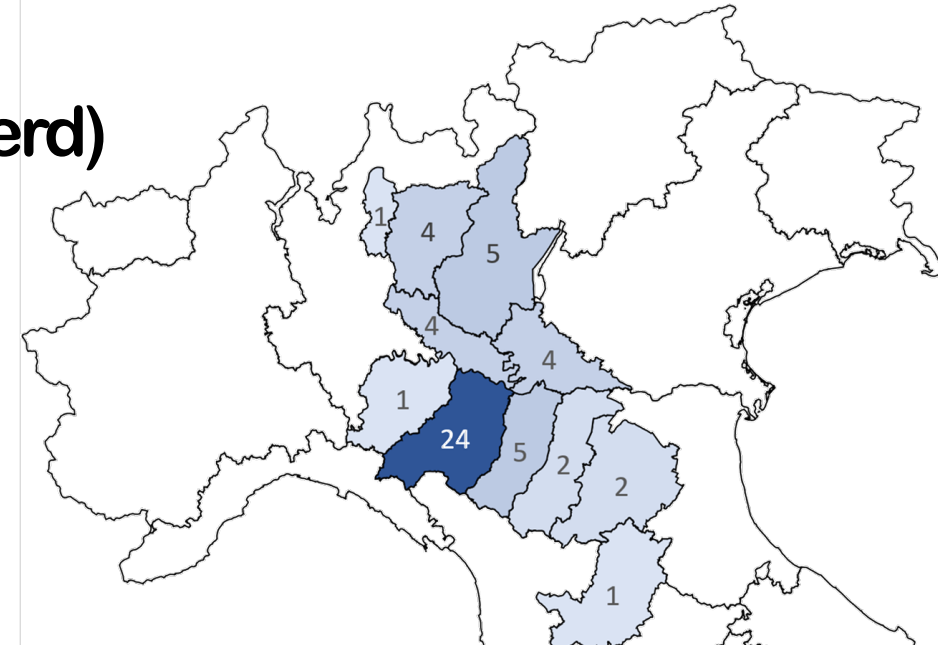
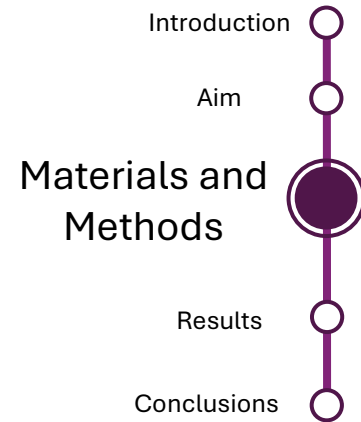
Materials and Methods

GeneToCheese Project

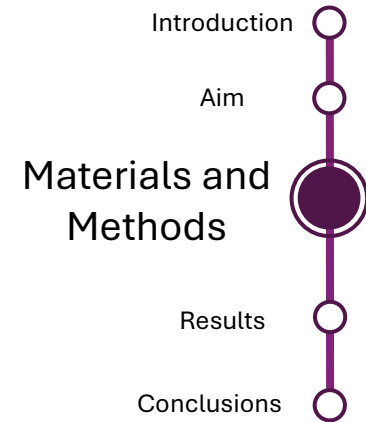
53 herds in north-central Italy

02 / 2021 - 02 / 2022 → 12 months

1,060 Brown-Swiss cows (20 cows per herd)



Materials and Methods



Milk Analyses



Milk composition (fat, protein, casein, lactose and total solids)

Infrared spectroscopy (Milkoscan FT3, Foss Electric)



Mineral profile (Ca, Mg, K, S, P, Cl and Na)

Wavelength dispersive X-ray fluorescence (S6 jaguar, Bruker Corporation)

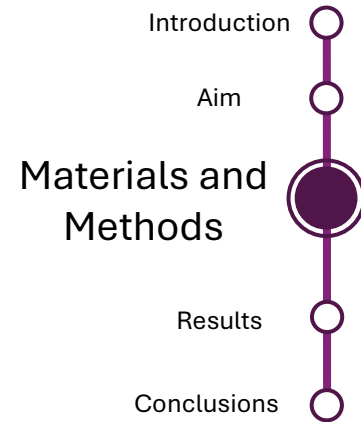


Indirect udder health traits (SCC and DSCC)

Flow cytometry (Fossomatic 7DC, Foss Electric)

SCC = Somatic Cell Count ; DSCC = Differential SCC ; SCS = Somatic Cell Score

Materials and Methods



Milk Analyses



Milk composition (fat, protein, casein, lactose and total solids)

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Indirect udder health traits (SCC and DSCC)

Flow cytofluorimetry (Fossomatic 7DC, Foss Electric)

Minerals in mg/kg

Daily Milk Yield → **Minerals in g/day**

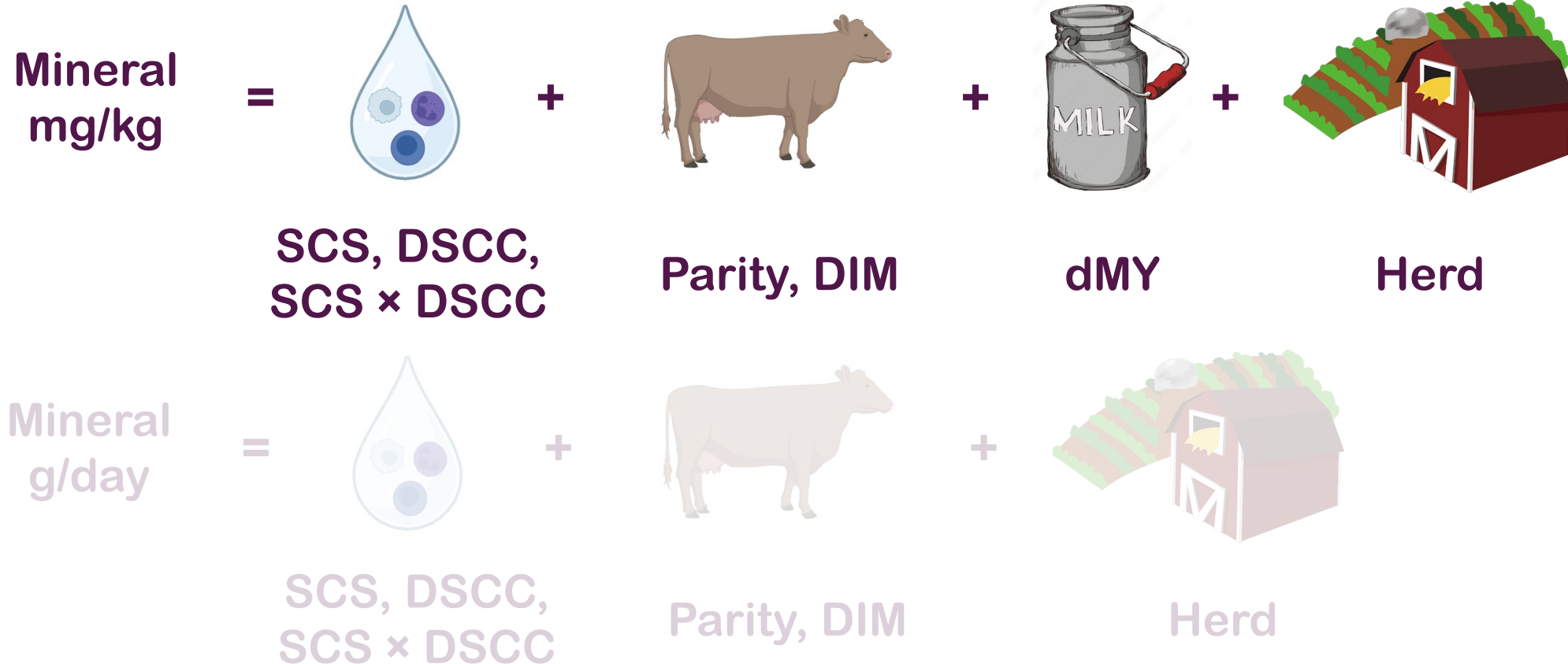
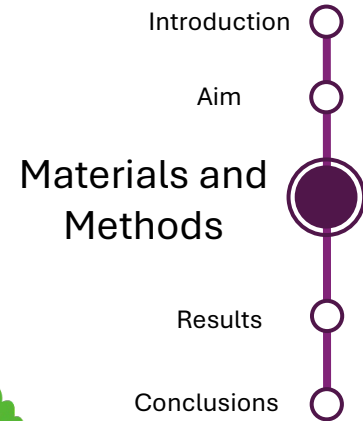
SCC in cells/mL

→ **SCS as $\log_2 (\text{SCC} \times 10^{-5}) + 3$**

SCC = Somatic Cell Count ; DSCC = Differential SCC ; SCS = Somatic Cell Score

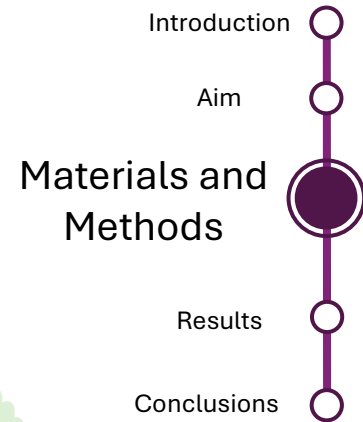
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Statistical Models

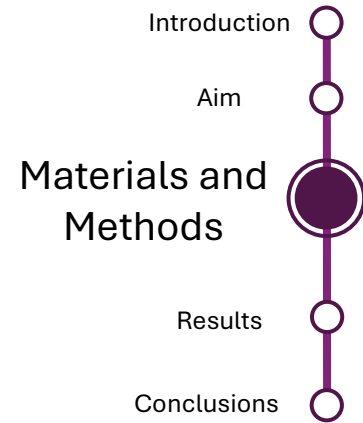


Materials and Methods

Statistical Models



Materials and Methods



Statistical Models: Fixed Factors

SCS 5 classes: quintiles

DSCC 5 classes: quintiles

dMY 5 classes: quintiles

Parity 5 classes: 1, 2, 3, 4, ≥ 5

DIM 6 classes: 0-60, 60-120, ... , ≥ 300



RESULTS

Ca

K

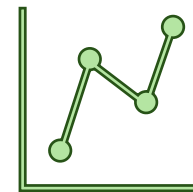
Cl

Mg

Na

Zn

S



Descriptive Statistics

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Composition	Mean	SD
Fat (%)	4.11	0.78
Protein (%)	3.68	0.37
Casein (%)	2.92	0.32
Lactose (%)	4.76	0.21
dMY (kg/day)	25.6	7.62
SCS	2.39	1.82
DSCC (%)	62.6	16.2

Mineral (mg/kg)	Mean	SD
Na	419	95.0
Cl	981	126
Ca	1377	128
P	1255	120
K	1436	95.7
Mg	120	17.1
S	400	39.2

SD = Standard Deviation

Analysis of Variance

Significance of somatic cells fixed factors

Mineral	mg/Kg			g/day		
	SCS	DSCC	SCS × DSCC	SCS	DSCC	SCS × DSCC
Na	***	***	***	*		•
Cl	***	•	•	•		
Ca		*	**	***		
P	**	**	•	***		
K	***	•		***		
Mg				***		
S				***		

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• p < 0.1
 * p < 0.05
 ** p < 0.01
 *** p < 0.001

Analysis of Variance

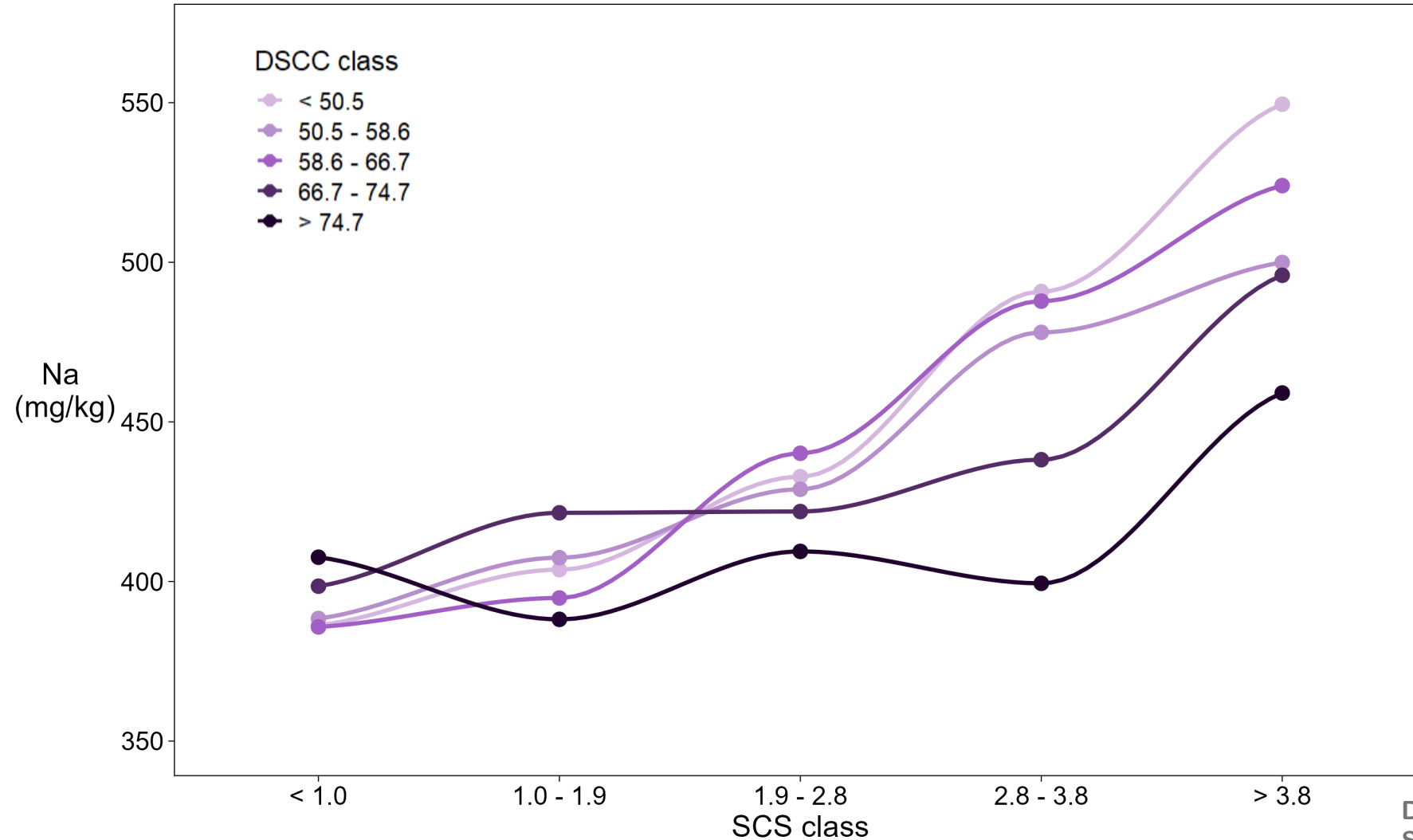
Significance of somatic cells fixed factors

Mineral	mg/Kg			g/day		
	SCS	DSCC	SCS × DSCC	SCS	DSCC	SCS × DSCC
Na	***	***	***	*		•
Cl	***	•	•	•		
Ca		*	**	***		
P	**	**	•	***		
K	***	•		***		
Mg				***		
S				***		

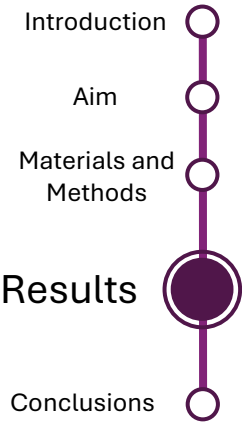
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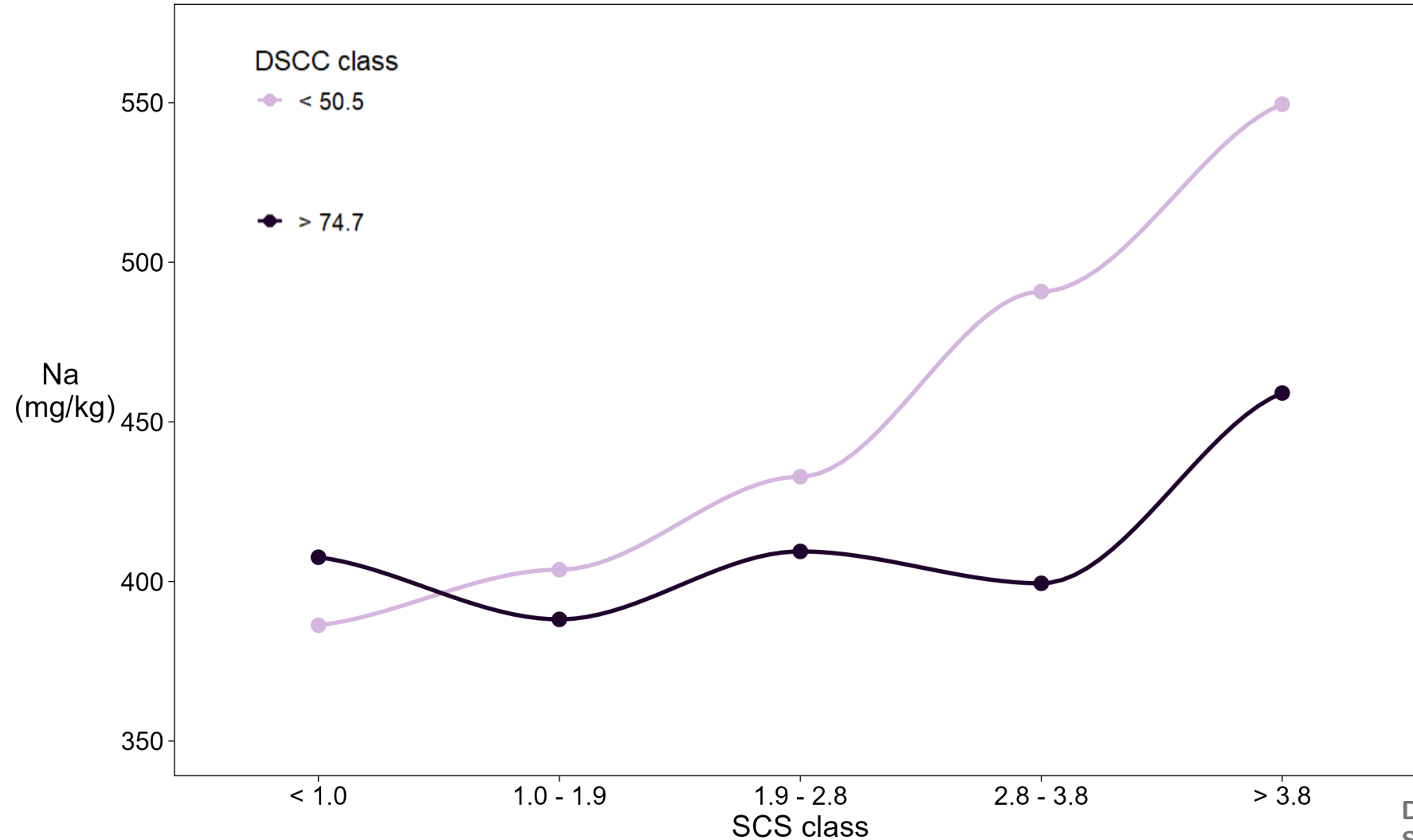
SCS × DSCC on Na mg/kg



DSCC = Differential Somatic Cell Count
SCS = Somatic Cell Score



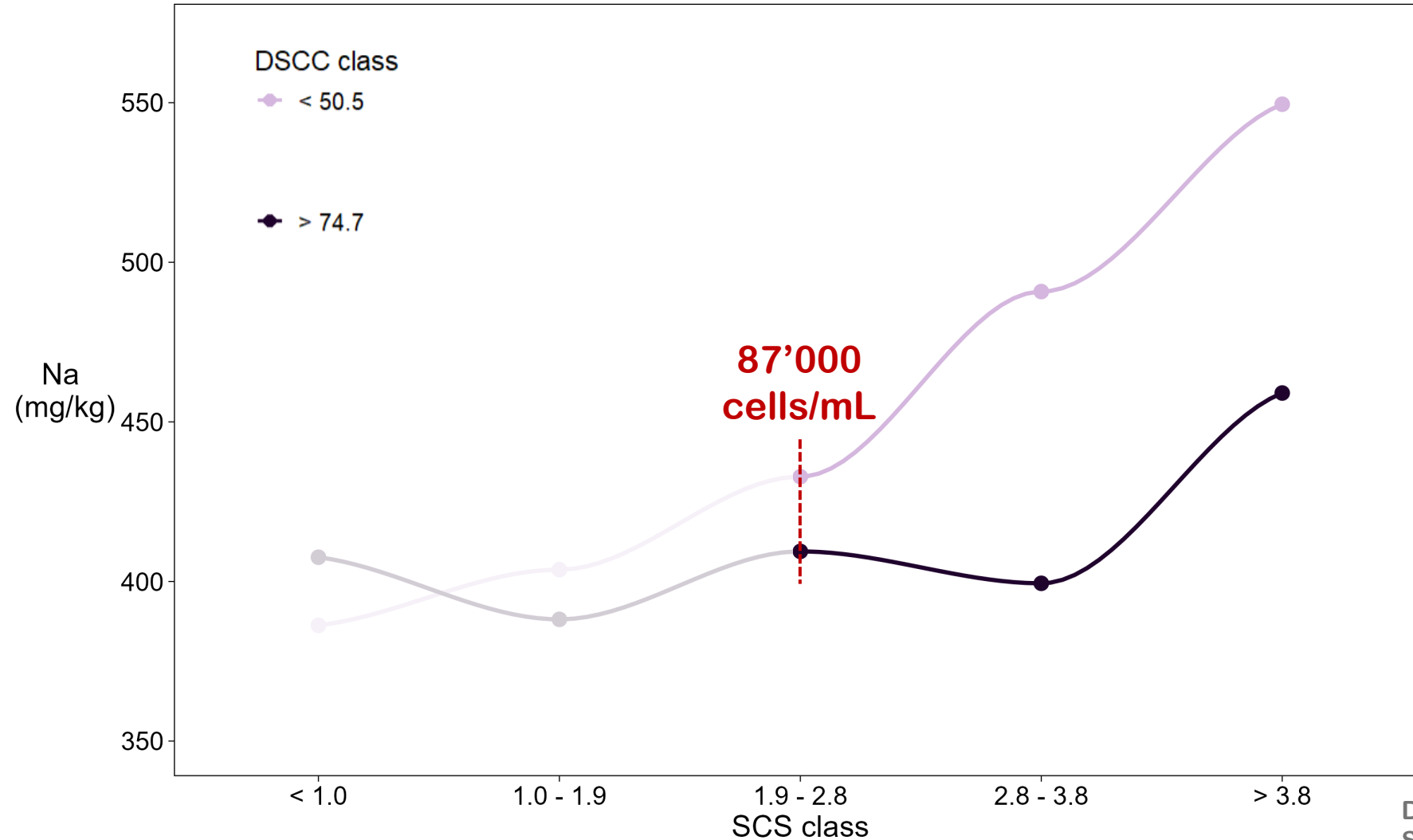
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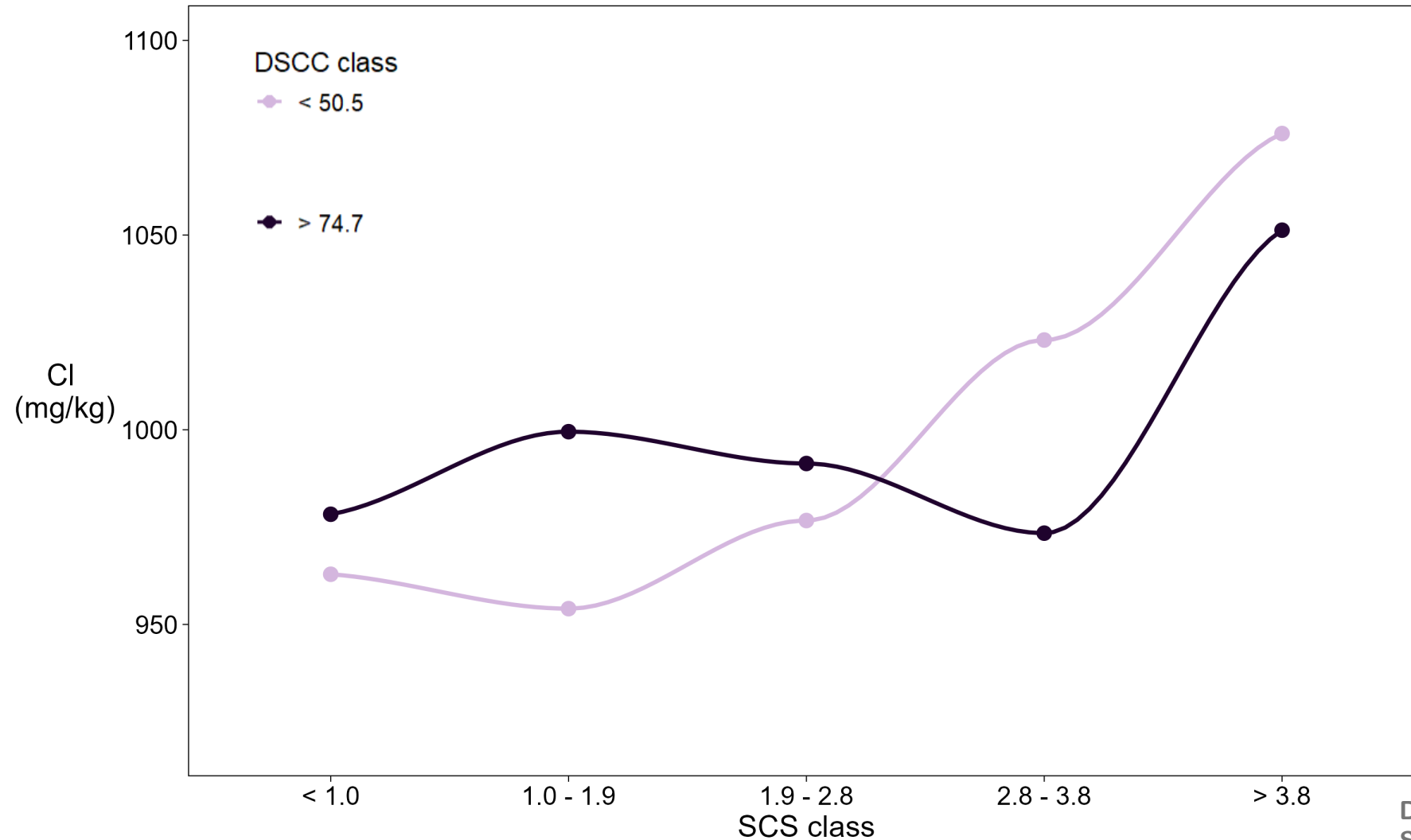
SCS × DSCC on Na mg/kg



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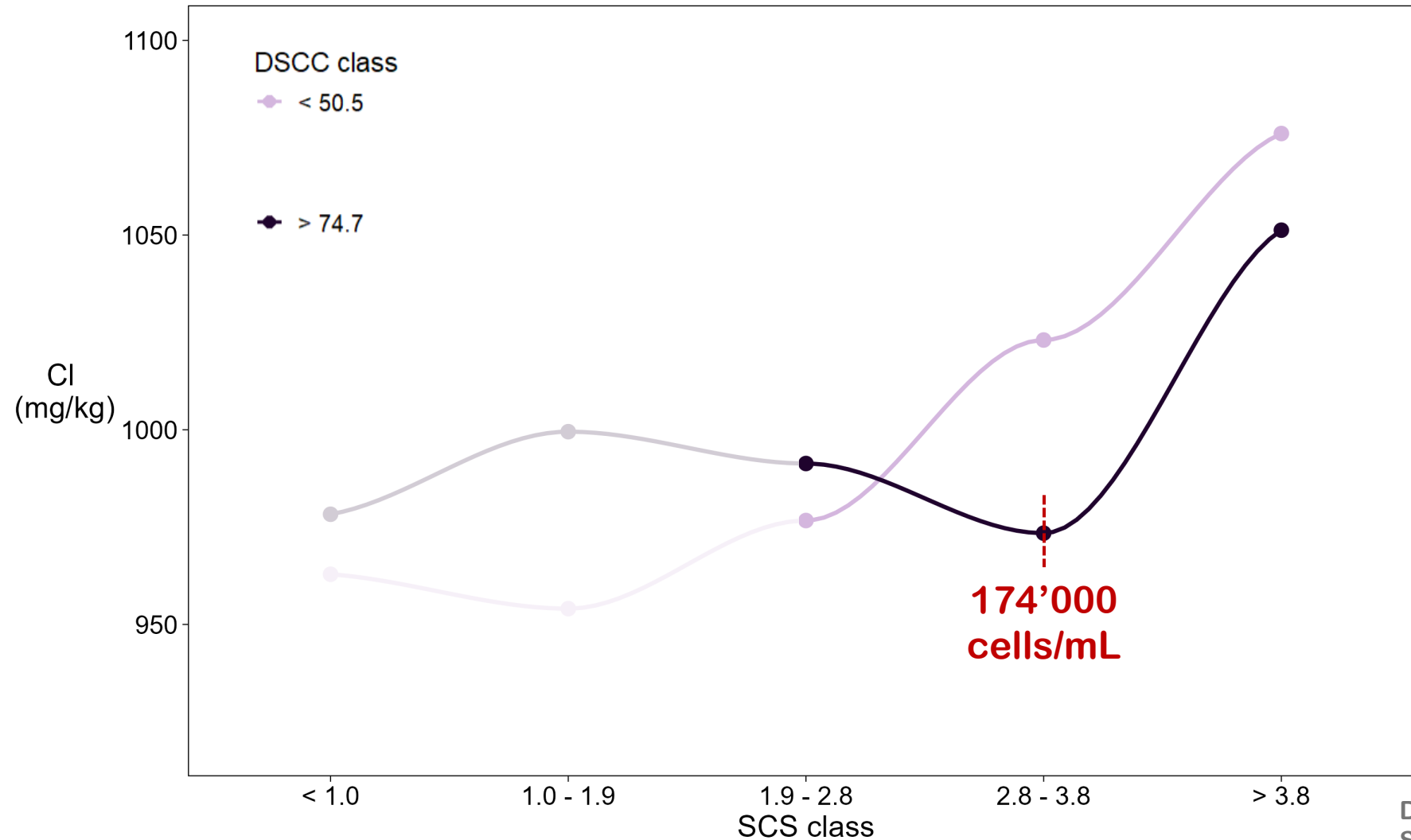
SCS × DSCC on Cl mg/kg



DSCC = Differential Somatic Cell Count
SCS = Somatic Cell Score

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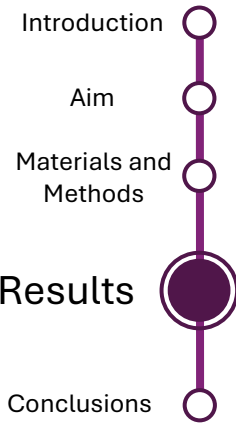
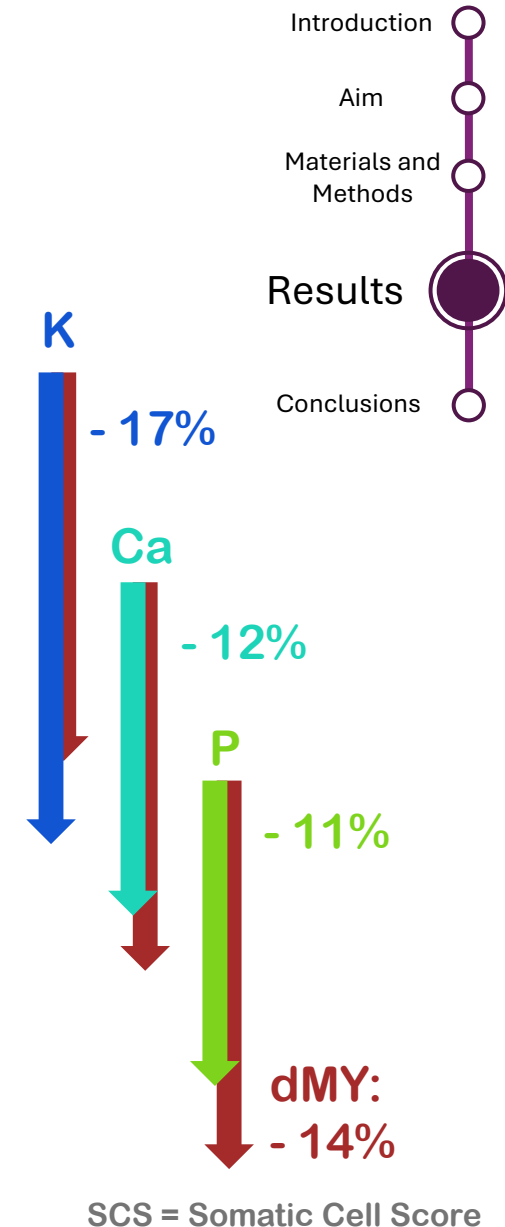
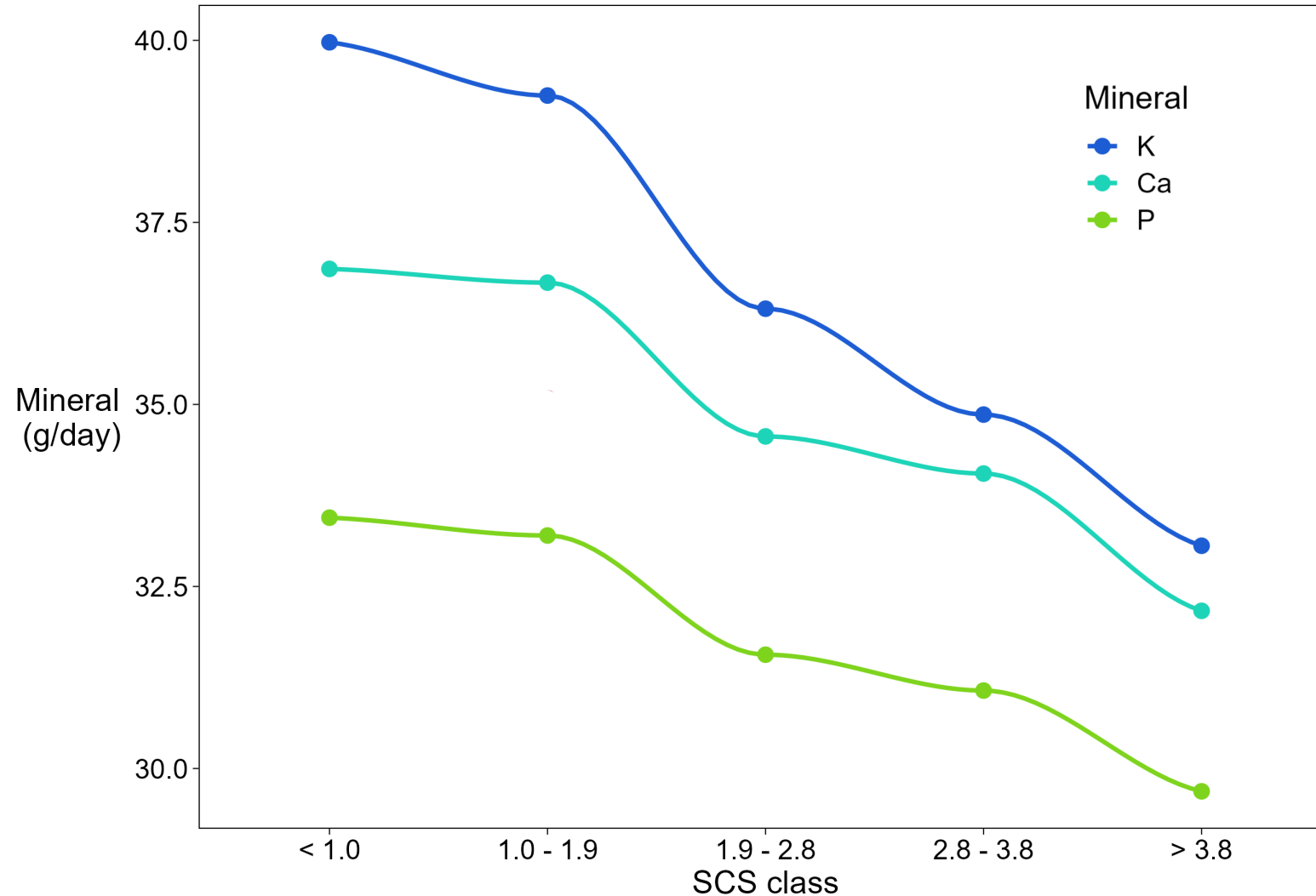
SCS × DSCC on Cl mg/kg



DSCC = Differential Somatic Cell Count
SCS = Somatic Cell Score

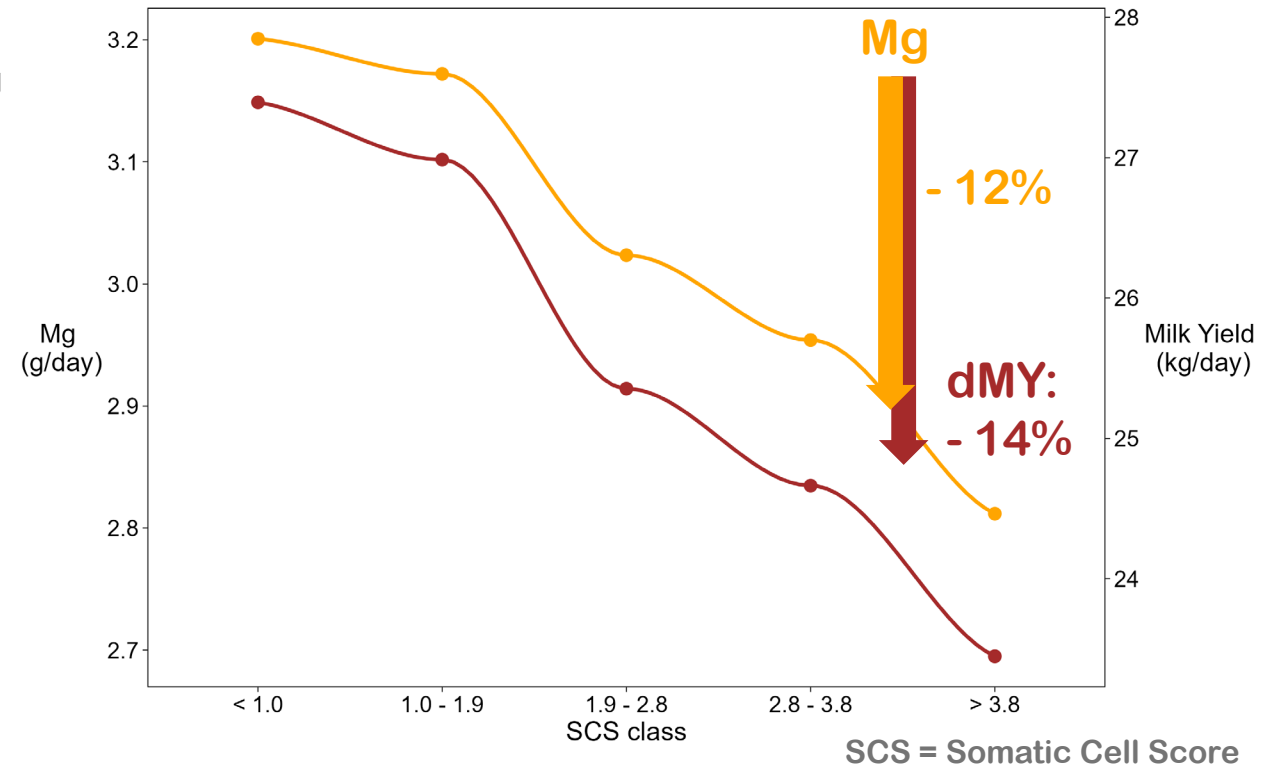
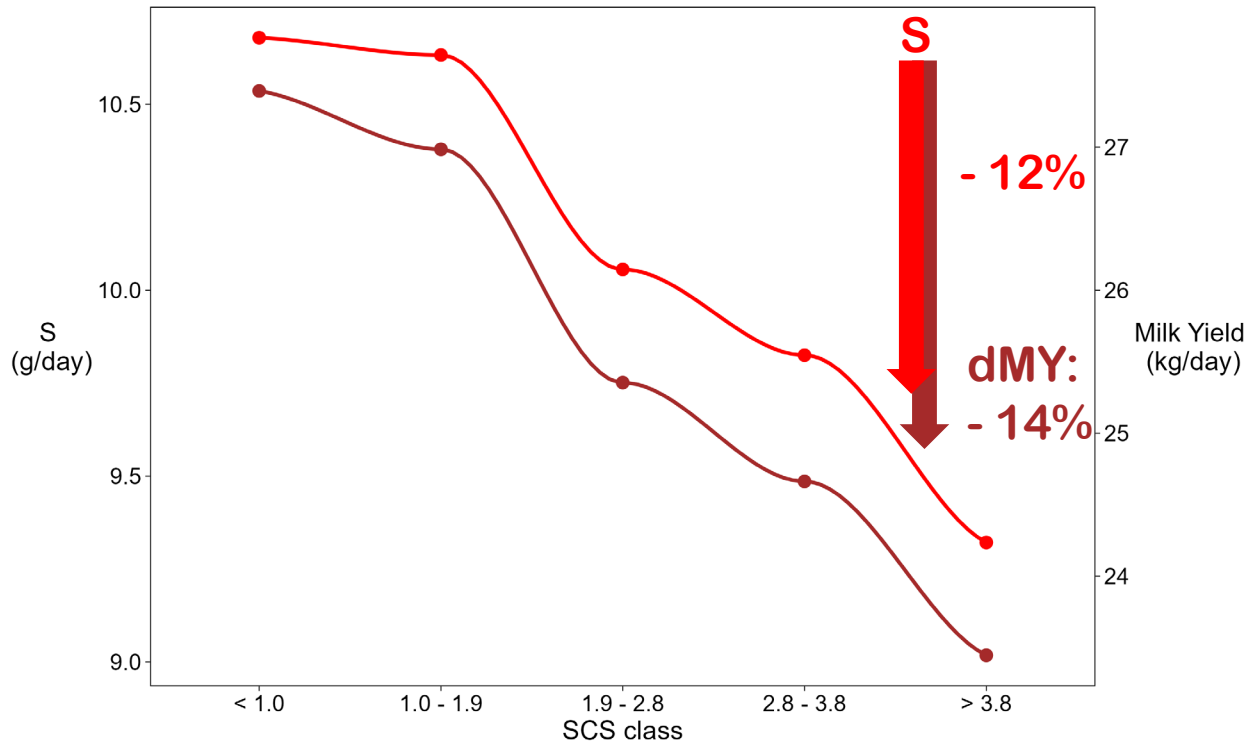
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SCS impact on K, Ca, P g/day



SCS impact on daily Mg, S quantity

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Conclusions

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✓ The highest Na and Cl concentration appeared related to chronic inflammation

✓ Daily mineral quantities are not affected by the $SCS \times DSCC$ and differences are due only to SCS

🔭 Future studies on the association between $SCS \times DSCC$ and other phenotypes (protein fractions, amyloid, ...)

Thanks for the attention !



Analysis of Variance

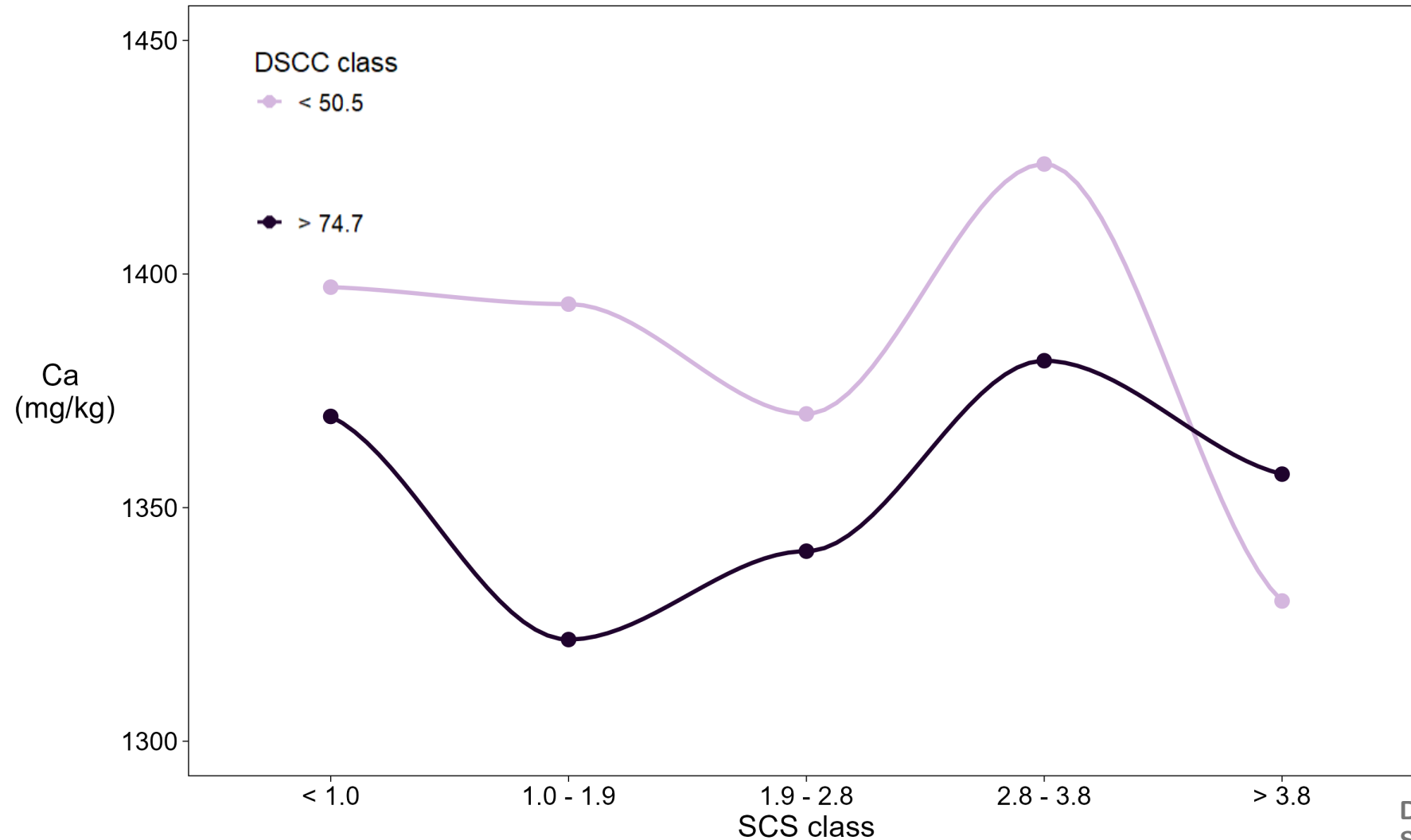
Significance of animal fixed factors

mg/kg	dMY	Parity	DIM
Na	***	***	***
Cl	***	***	***
Ca	***		***
P		***	***
K	***	***	***
Mg	***		***
S	***		***

g/day	Parity	DIM
Na	***	***
Cl	***	***
Ca	***	***
P	***	***
K	***	***
Mg	***	***
S	***	***

* p > 0.1
* p > 0.05
** p > 0.01
*** p > 0.001

SCS × DSCC on Ca mg/kg



DSCC = Differential Somatic Cell Count
SCS = Somatic Cell Score