Effects of early-life changes on health, welfare and performances of pigs in a commercial farm

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Weaning: the most stressful event in piglet's life

Weaning

CHALLENGES

Separation from the mother

Diet change

Mixing with unfamiliar congeners

Environment change

Vaccination

CONSEQUENCES

Increased agressive behaviours (body injuries, tail-biting)

Reduced feed intake and growth slow-down

Impaired development of intestinal barrier function

Delayed immune system maturation

Increased risk of gastrointestinal disorders and associated mortality

de Groot *et al.,* 2001 ; Melin *et al.,* 2004 ; Moeser *et al.,* 2007a,b ; Smith *et al.,* 2010 ; Campbell *et al.,* 2013

Alternative early life management strategies to reduce animal stress

Alternatives	Positive points
Free-farrowing pen	Reduces mother and piglets' stress Improves piglets' performances
Early-socialization	Accelerates hierarchy's establishment Reduces aggressive behaviours at weaning
Environment's enrichment	Limits tail-biting behaviours
End of mutilations (castration and tail-docking)	

D'Eath *et al.,* 2005 ; Camerling *et al.*, 2018 ; Buijs and Muns., 2019 ; Morgan *et al*., 2021

Aim of the study

To compare the consequences
of an alternative early life management (ELM) strategy
to a conventional one, on pigs' health, performances and welfare,
in a commercial farm.

Experimental protocol

Conventional-ELM
n=75

Tail docking

Farrowing crate

28-day-long sow restraint

Birth — **Slaughter**

Alternative-ELM
n=80

No tail docking

Free-farrowing pen

2-day-long sow restraint

Experimental protocol

Conventional-ELM
n=75

Tail docking
Farrowing crate

No tail docking
Free-farrowing pen

Alternative-ELM
n=80

Tunnel allowing the mixing of the two litters' piglets

Experimental protocol

Conventional-ELM
n=75

Tail docking
Farrowing crate

PCV2 & *M hyo* vaccination
Piglets' transfer to PW room
Mixing of the two litters

Maternity

Weaning

Birth

d9

d28

Slaughter

early-socialization

No tail docking
Free-farrowing pen

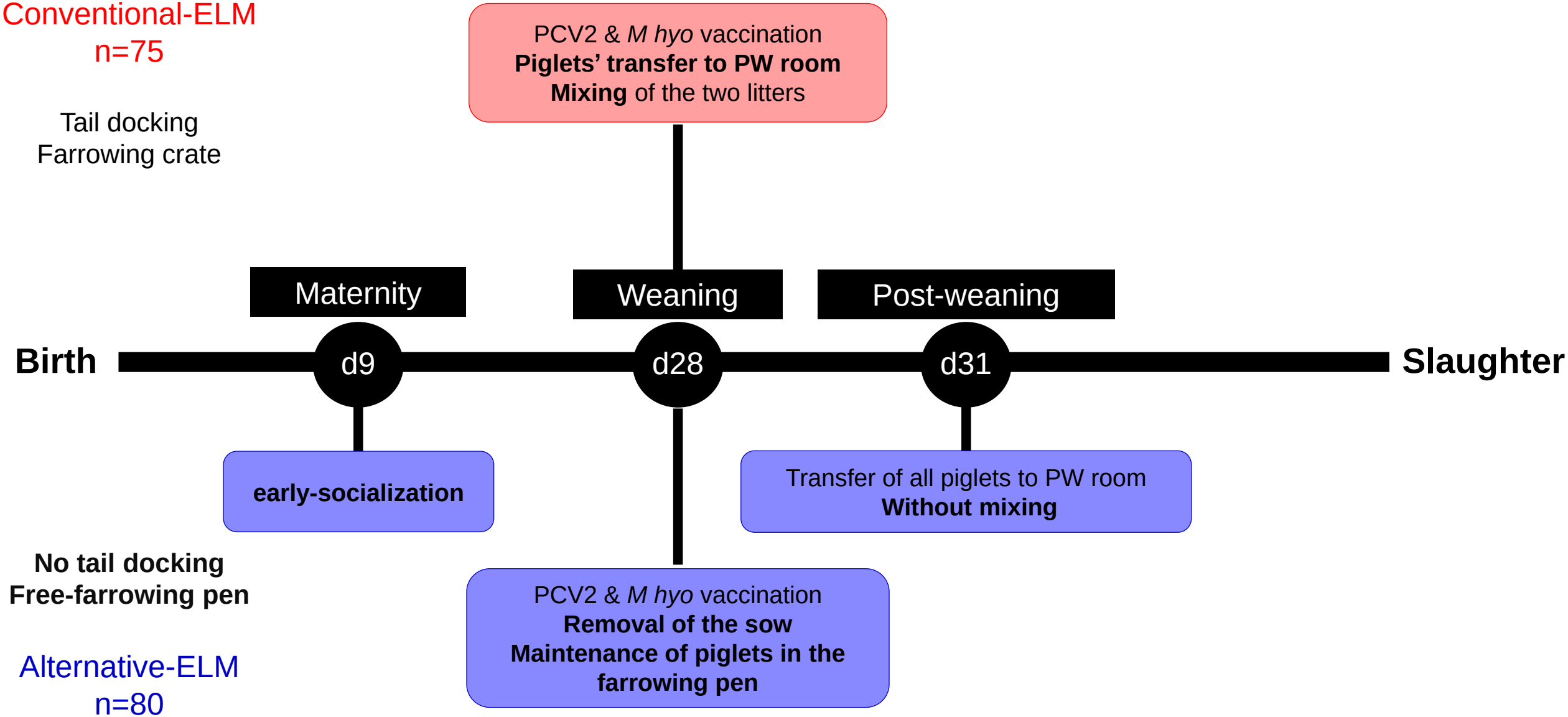
PCV2 & *M hyo* vaccination
Removal of the sow
Maintenance of piglets in the farrowing pen

Alternative-ELM
n=80

Experimental protocol

Conventional-ELM
n=75

Tail docking
Farrowing crate



No tail docking
Free-farrowing pen

Alternative-ELM
n=80

Experimental protocol

Conventional-ELM
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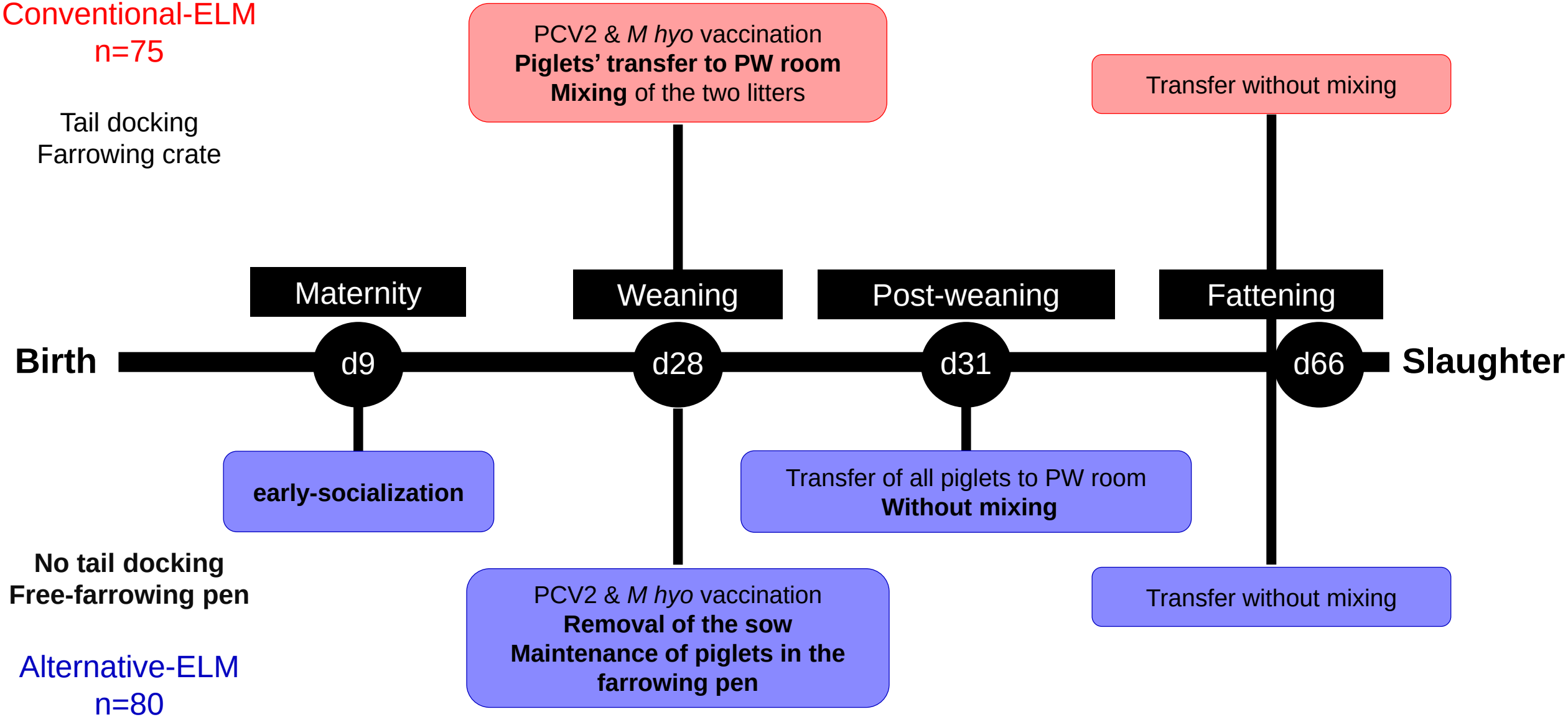
Tail docking
Farrowing crate



No tail docking
Free-farrowing pen

Alternative-ELM
n=80

Summary of measurements and samples taken from the animals

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Samples taken only from ♂
n = 79

Performances

Immune competence

Health

Aggressiveness

Stress mediators

Summary of measurements and samples taken from the animals

Samples taken only from ♂
n = 79

Performances

- Weight (d10, d28, d29, d31, d36, d66)
- Hot carcass weight
- Lean meat percentage

Health

Immune competence

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Samples taken only from ♂
n = 79

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- Weight (d10, d28, d29, d31, d36, d66)
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Immune competence

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- Body injury score (d10, d28, d29, d36, d66)
- Tail injury score (d36, d66)

Stress mediators

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Samples taken only from ♂
n = 79

Performances

- Weight (d10, d28, d29, d31, d36, d66)
- Hot carcass weight
- Lean meat percentage

Immune competence

- **Cell blood count** (d29, d36, d66)
- **Serum IgG** (d66)
- **Anti-PCV2 vaccine response** (d66)
- **Whole Blood Assay** (d36, d66)
- **Phagocytosis** (d36, d66)
- **Circulating IL-6 assay** (d29)
- **Lymphocyte phenotyping** (d36, d66)

Health

Aggressiveness

- Body injury score (d10, d28, d29, d36, d66)
- Tail injury score (d36, d66)

Stress mediators

Summary of measurements and samples taken from the animals

Samples taken only from ♂
n = 79

Performances

- Weight (d10, d28, d29, d31, d36, d66)
- Hot carcass weight
- Lean meat percentage

Health

- Inflammation : **CRP** (d29, d36), **haptoglobin** (d66)
- Clinical signs
- Intestinal permeability : **endotoxin** (d29, d36)
- **Insulin**, **IGF1, glucose** (d28)

Immune competence

- **Cell blood count** (d29, d36, d66)
- **Serum IgG** (d66)
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- Tail injury score (d36, d66)

Stress mediators

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Aggressiveness

- Body injury score (d10, d28, d29, d36, d66)
- Tail injury score (d36, d66)

Stress mediators

- **Plasma catecholamines** (d28, d29)
- **Serum cortisol** (d28, d29)
- **Hair cortisol** (d66, d155)

Statistical analysis

⇒ Linear mixed effect model :

Fixed effects: early life management and age

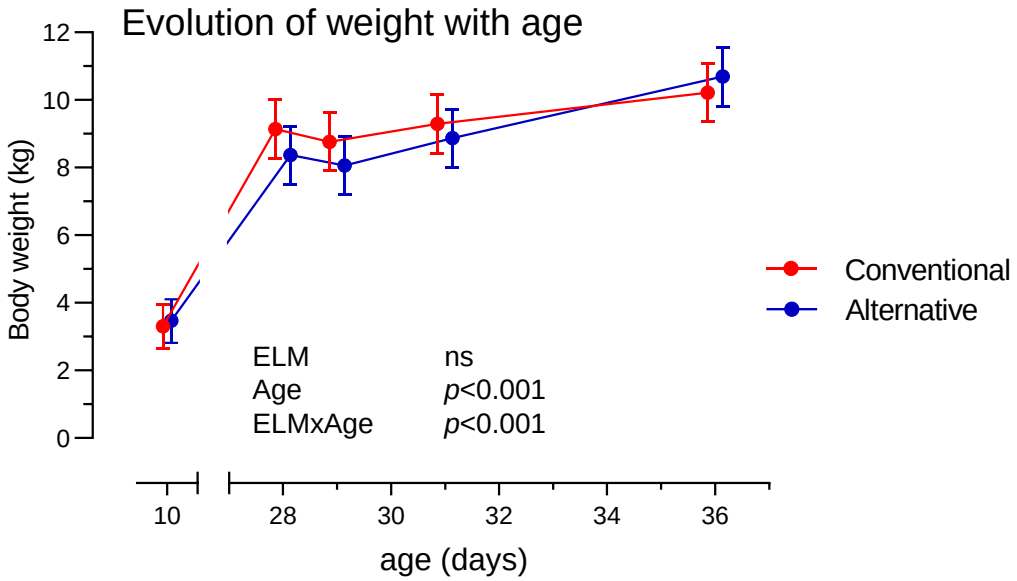
Random effects: individual, current and birth mother, batch

⇒ Mixed logistic regression model :

Body and tail lesions, IL-6 and Insulin assay

Effects of ELM strategy on pigs' performances

At farm :



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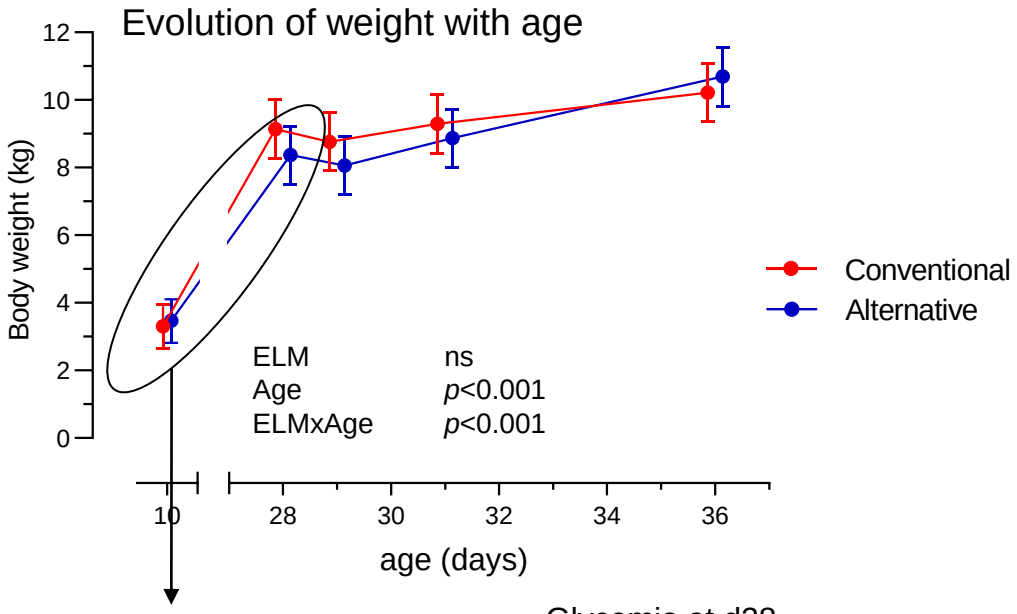
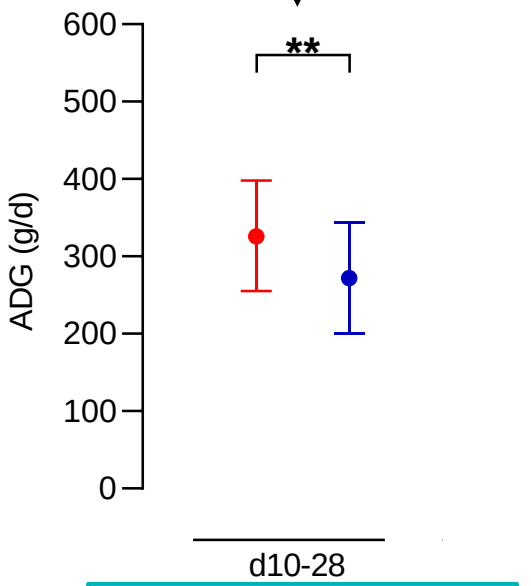
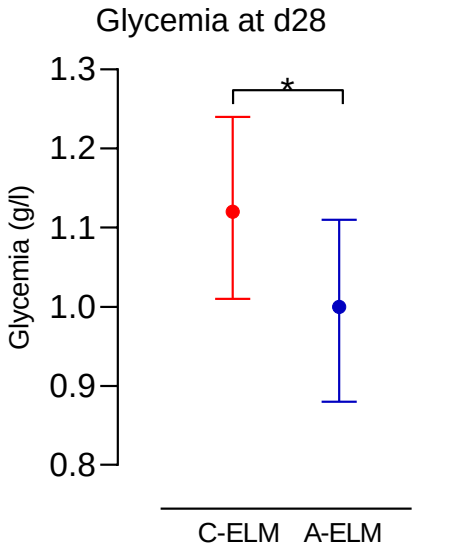




More competition for udders and more activity in A-ELM piglets



In connection with the increase of the activity, the glycemia level is lower in A-ELM piglets

Effects of ELM strategy on pigs' performances

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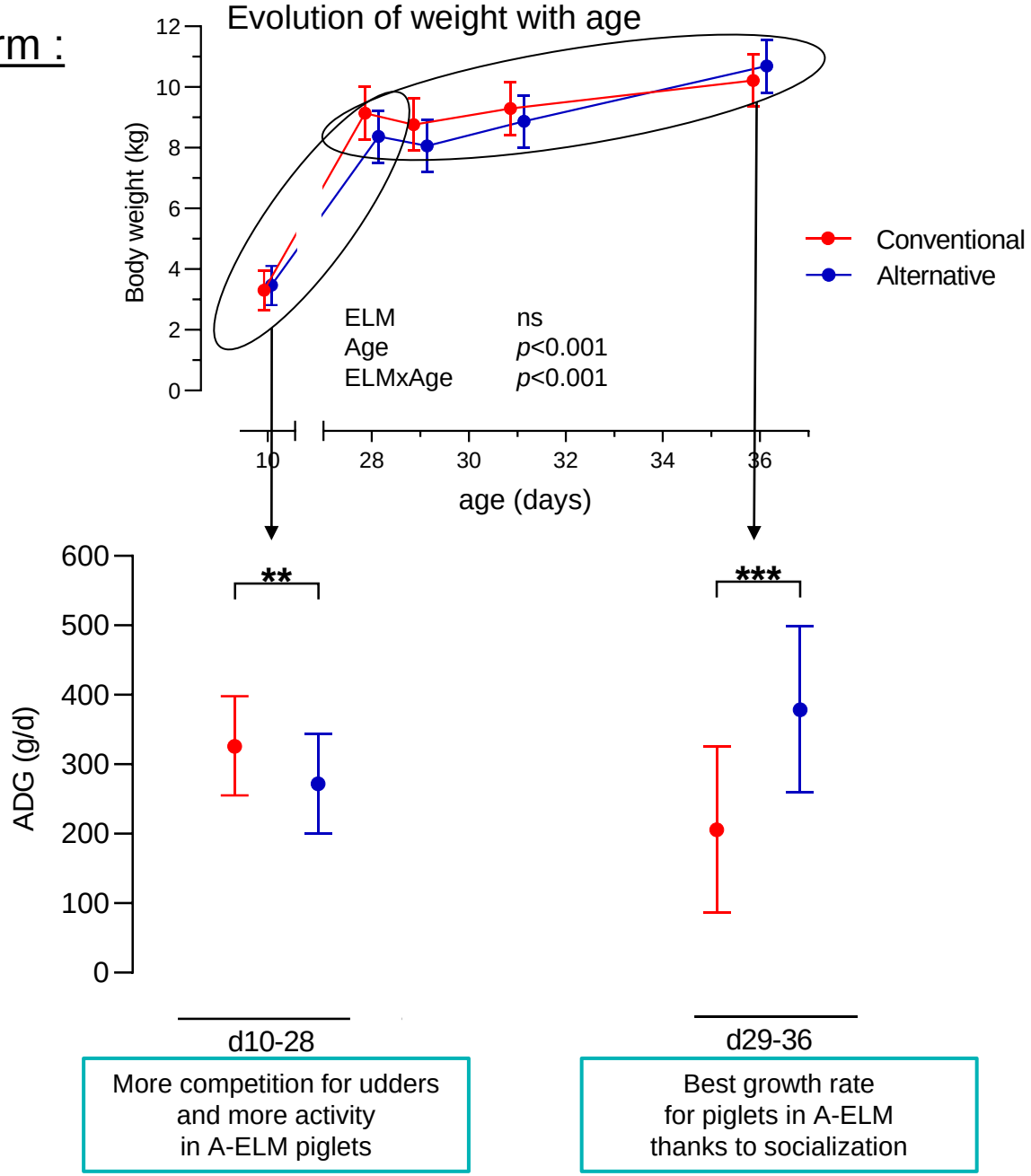

More competition for udders and more activity in A-ELM piglets

Best growth rate for piglets in A-ELM thanks to socialization

Effects of ELM strategy on pigs' performances

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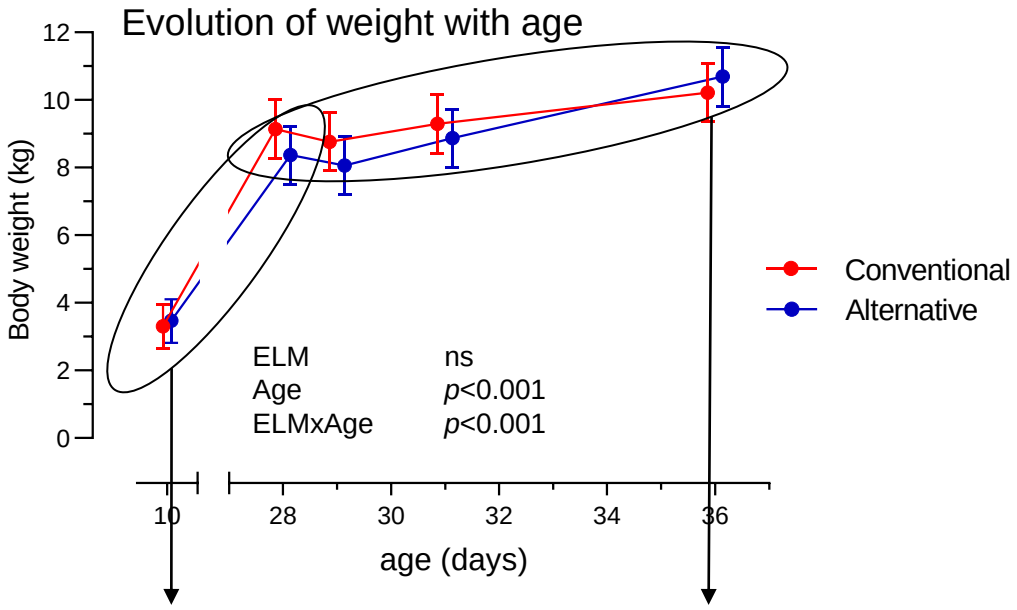

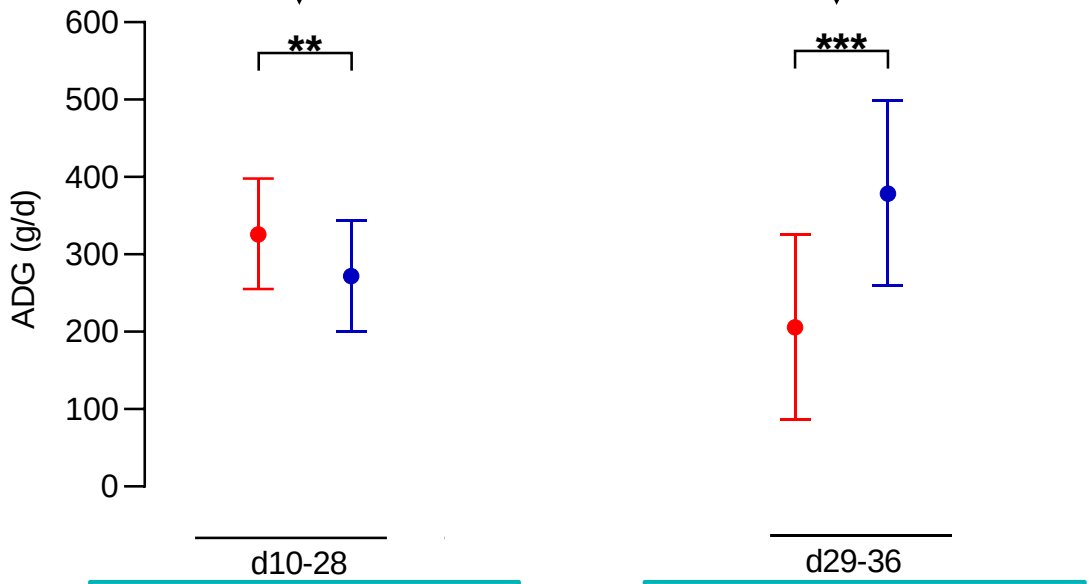

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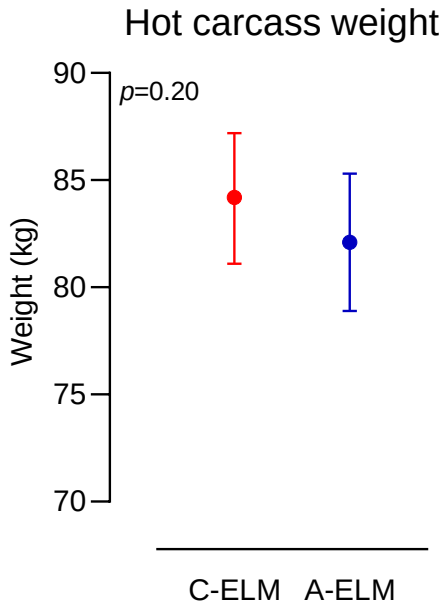
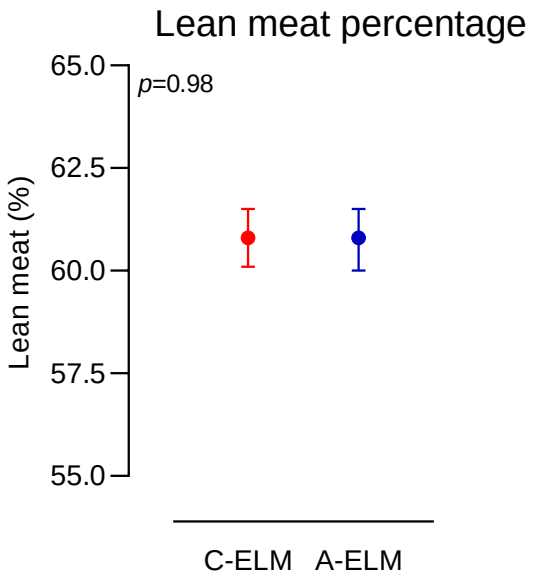
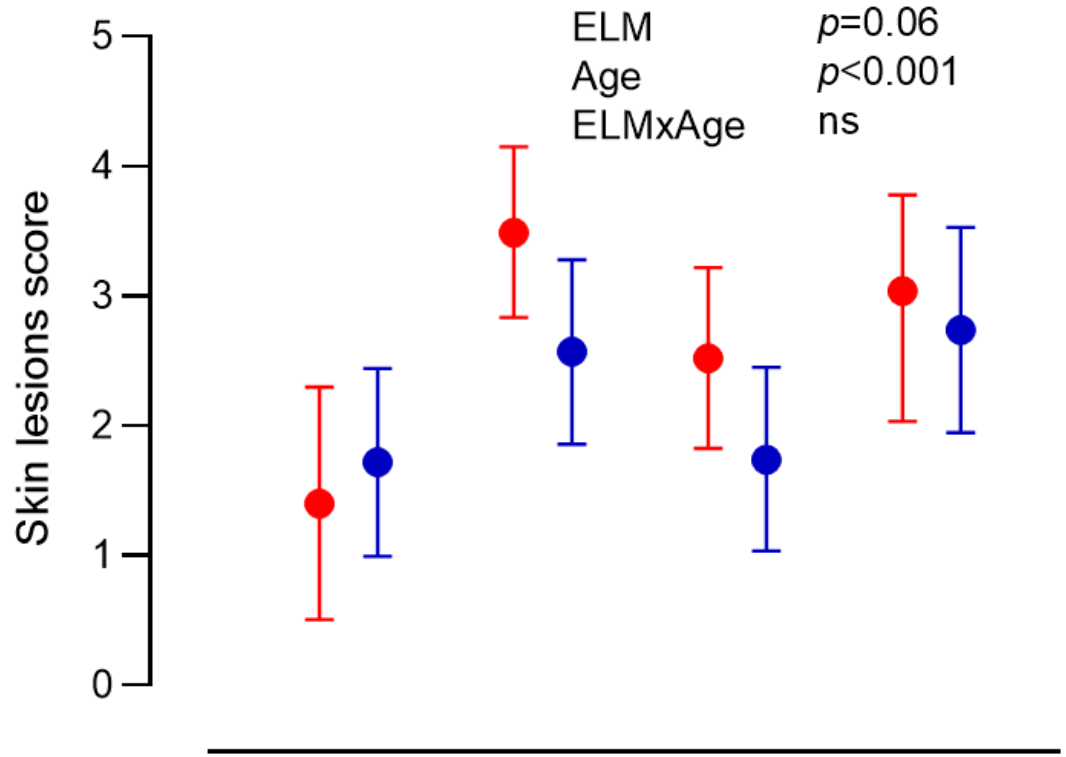
At slaughter :





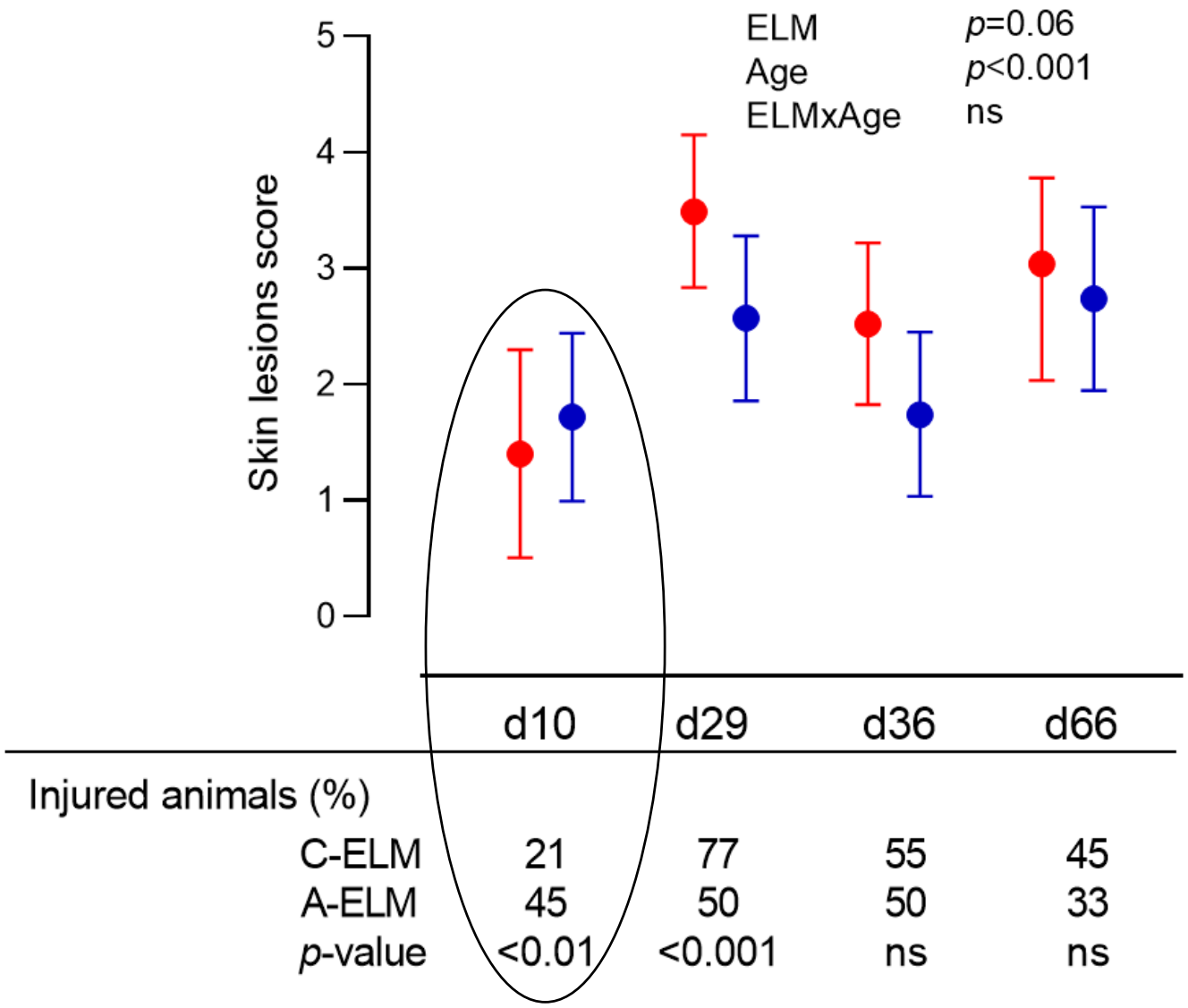
Similar performances in both groups

Effect of ELM strategy on animal aggressiveness



Injured animals (%)	d10	d29	d36	d66
C-ELM	21	77	55	45
A-ELM	45	50	50	33
p-value	<0.01	<0.001	ns	ns

Effect of ELM strategy on animal aggressiveness



Injured animals (%)	d10	d29	d36	d66
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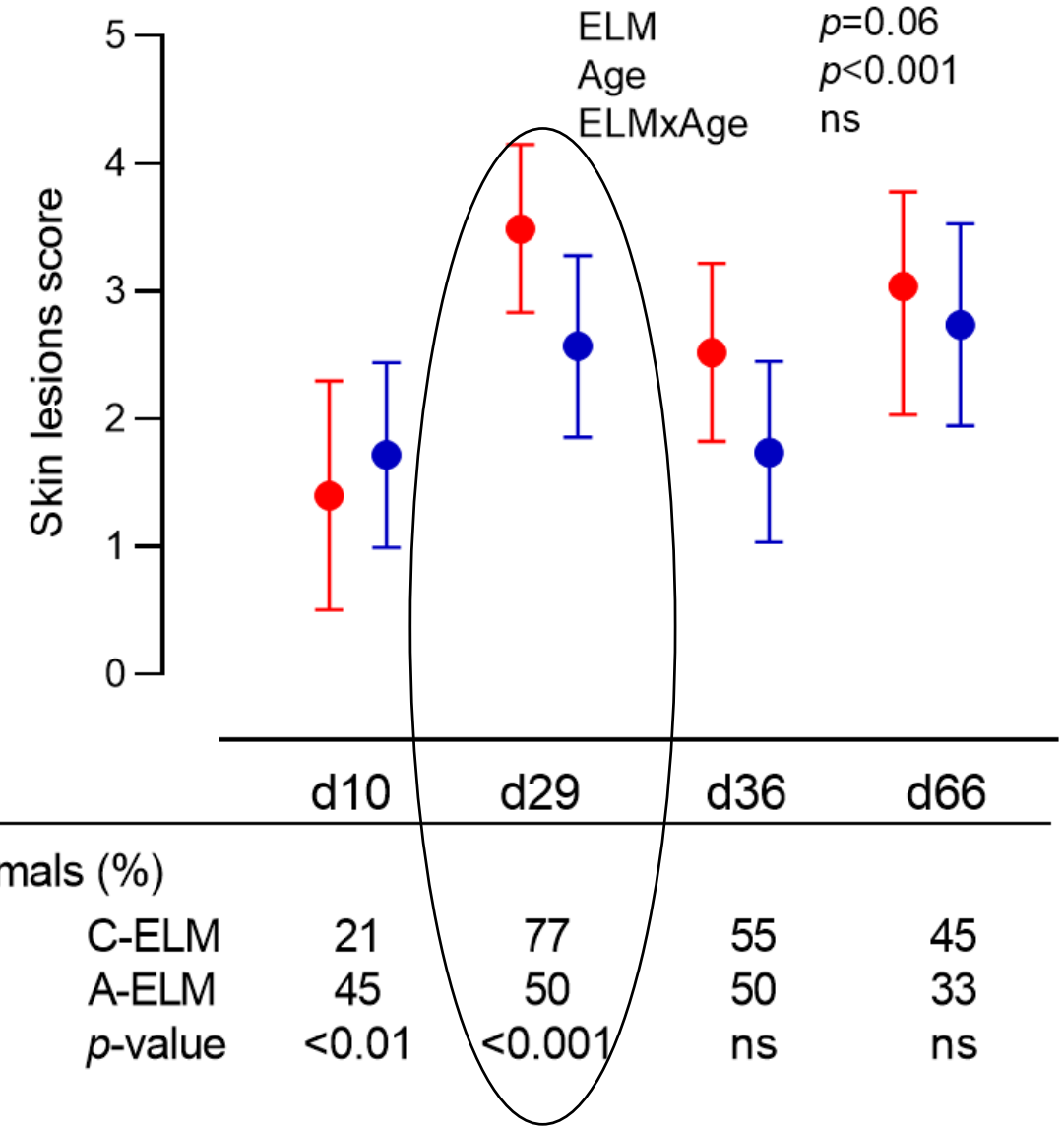
After 24 hours of socialization, piglets reared under A-ELM showed more aggressiveness but overall the severity of injuries was low.

Effect of ELM strategy on animal aggressiveness



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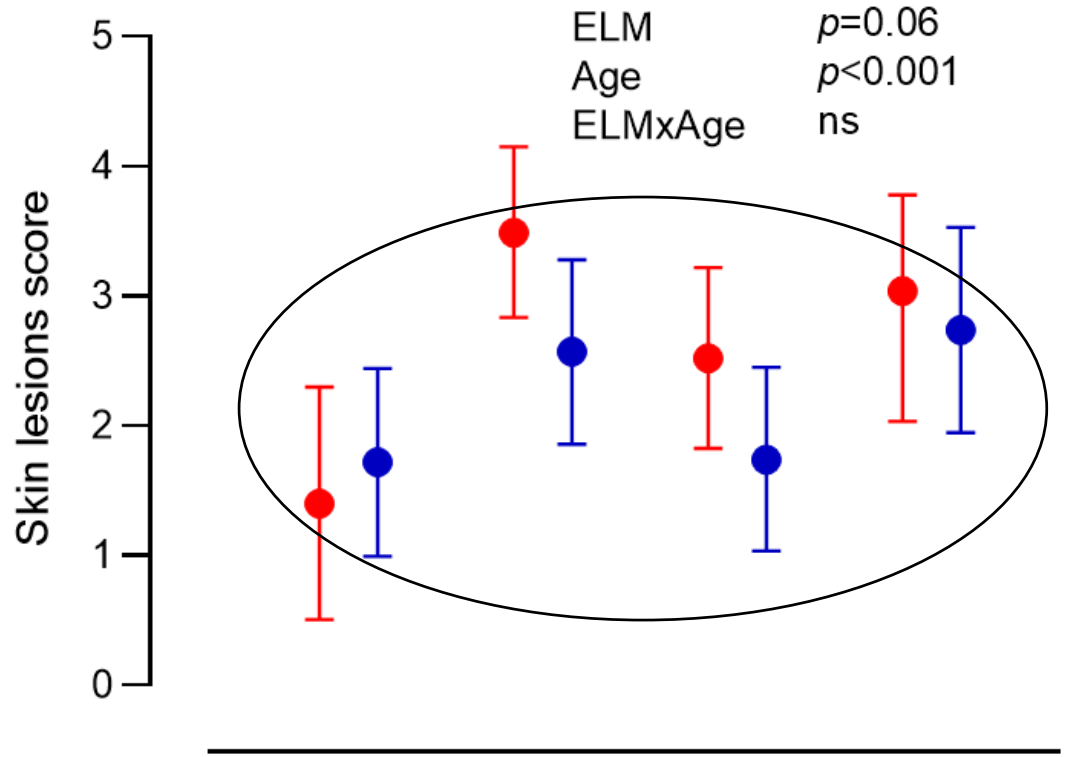
24 hours after weaning, piglets reared under A-ELM showed less aggressiveness.

⇒Early-socialization better prepared piglets for weaning.

Effect of ELM strategy on animal aggressiveness



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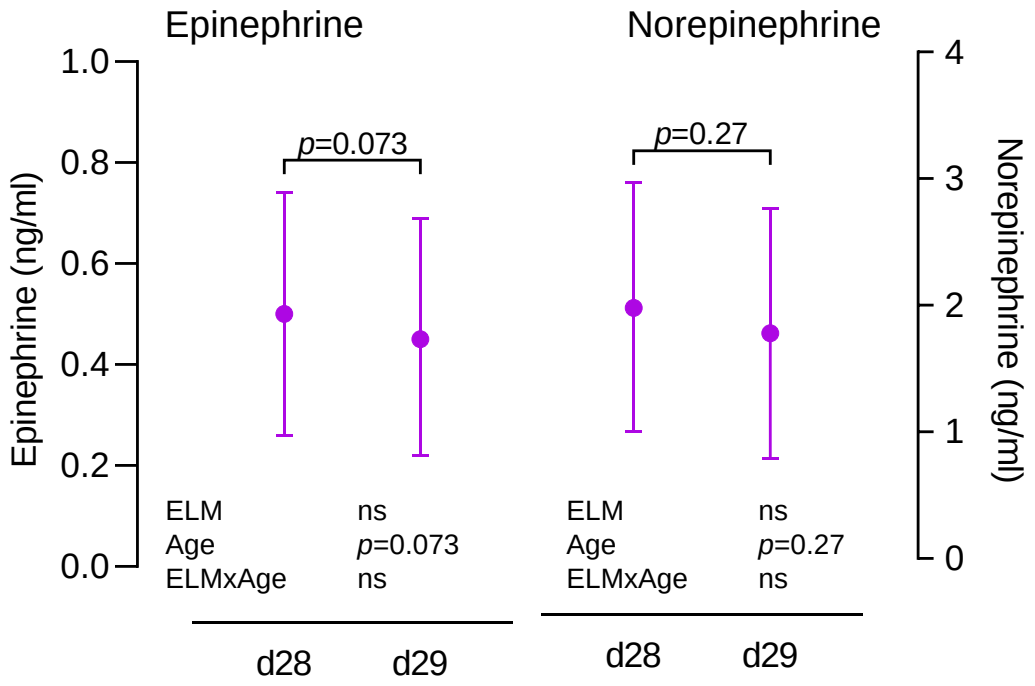
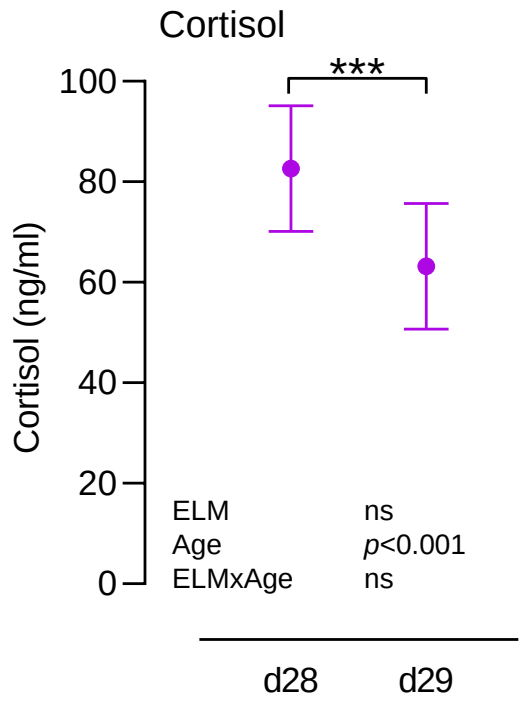
24 hours after weaning, piglets reared under A-ELM showed less aggressiveness.

⇒Early-socialization better prepared piglets for weaning.

Overall, piglets in the A-ELM tended to have less severe lesions to compared to C-ELM piglets.

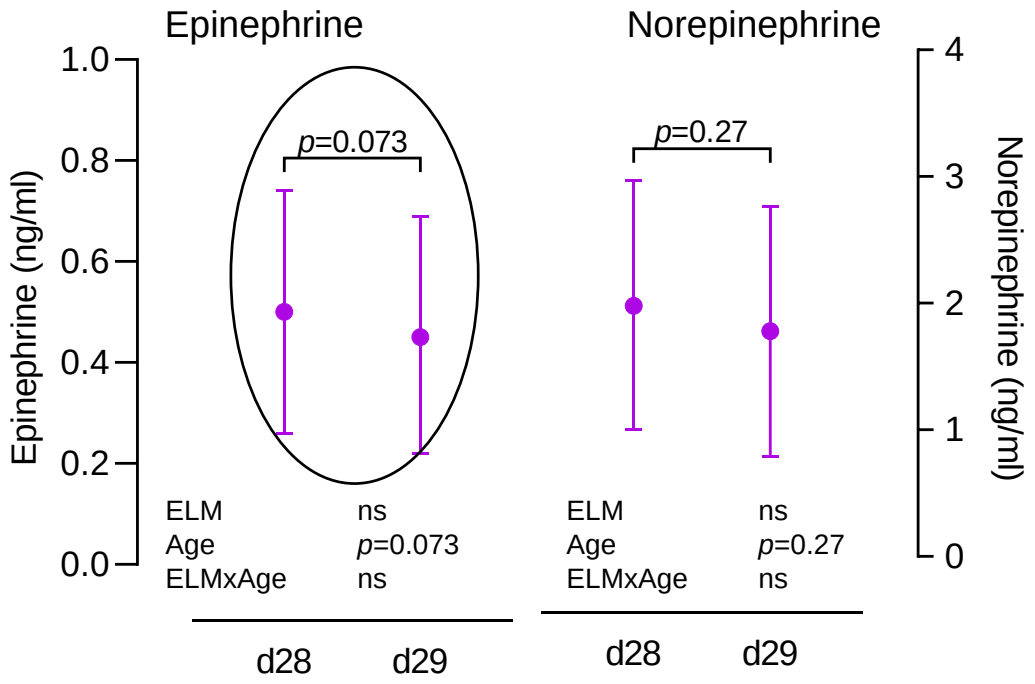
Effects of ELM strategy on stress mediators levels around weaning

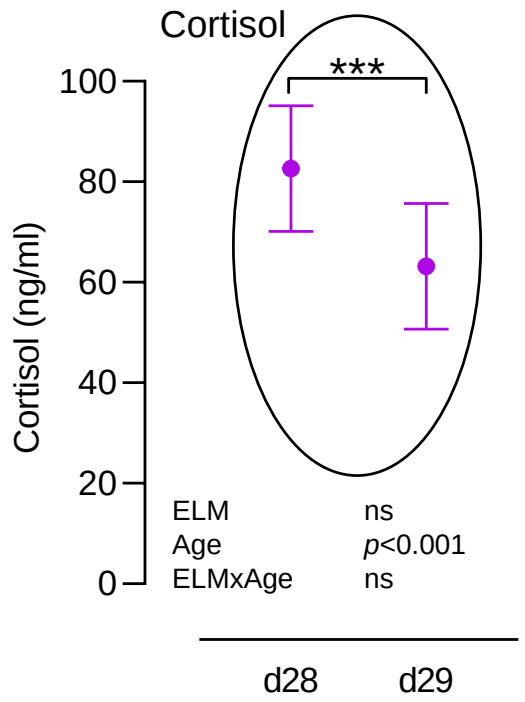




Circulating epinephrine, norepinephrine and cortisol levels were not affected by ELM.

Effects of ELM strategy on stress mediators levels around weaning

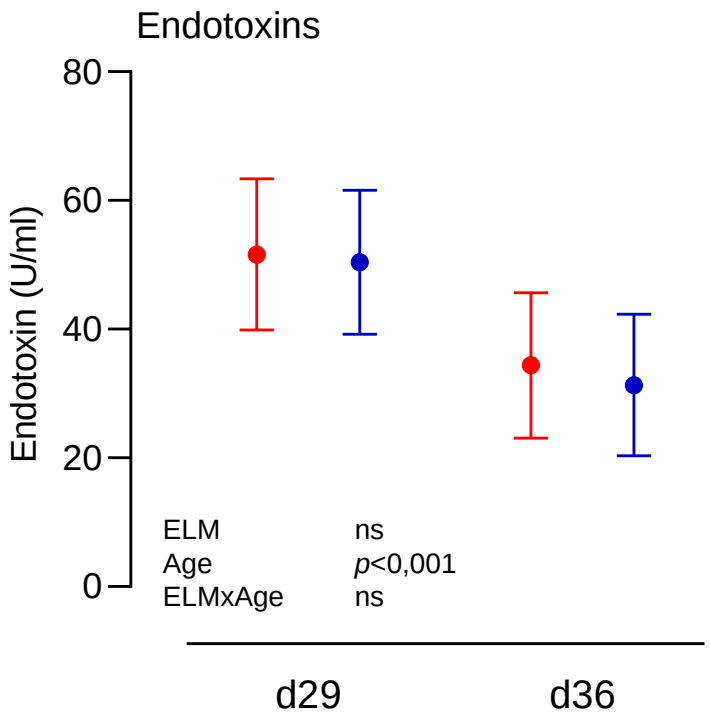


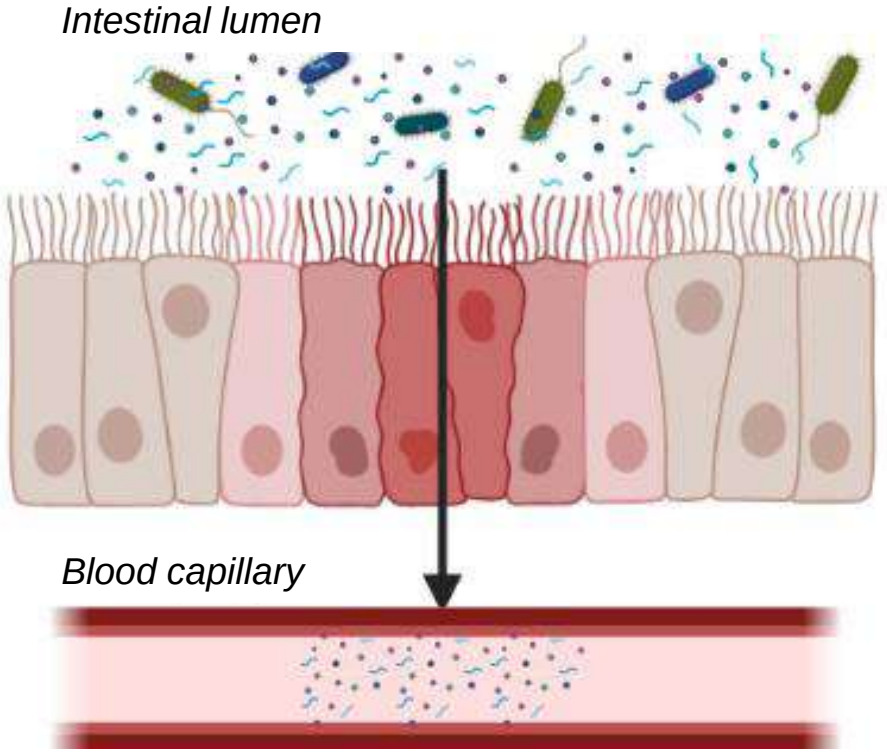


Circulating epinephrine, norepinephrine and cortisol levels were not affected by ELM.

Circulating cortisol levels were higher at weaning (d28) as compared to the day after (d29).
Circulating epinephrine levels tended to be elevated at d28 as compared to d29.

Effects of ELM strategy on intestinal barrier function





Impaired intestinal permeability

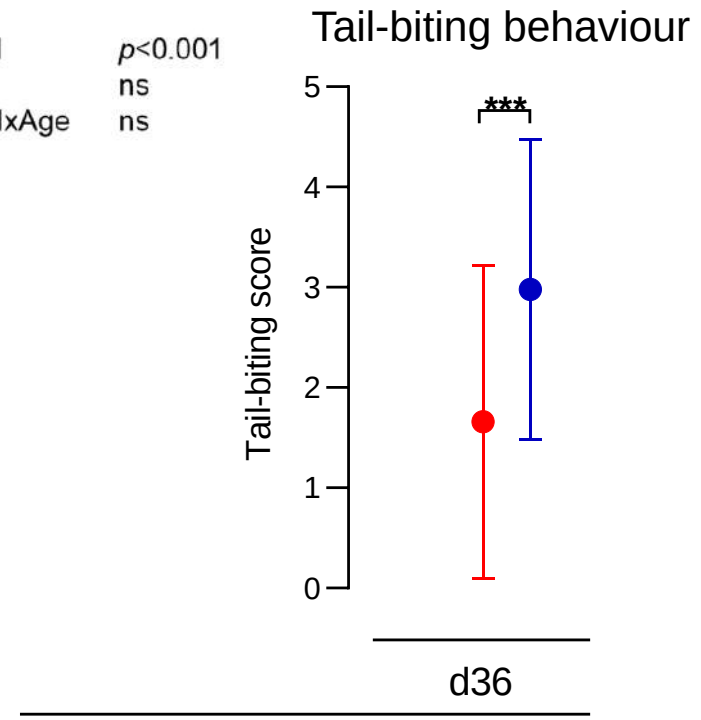
Endotoxins passe in the bloodstream

Circulating endotoxins levels were not affected by ELM.

Circulating endotoxins levels were higher one day after weaning than a week later.

Effect of ELM strategy on cannibalism and its consequences

ELM $p<0.001$
Age ns
ELMxAge ns

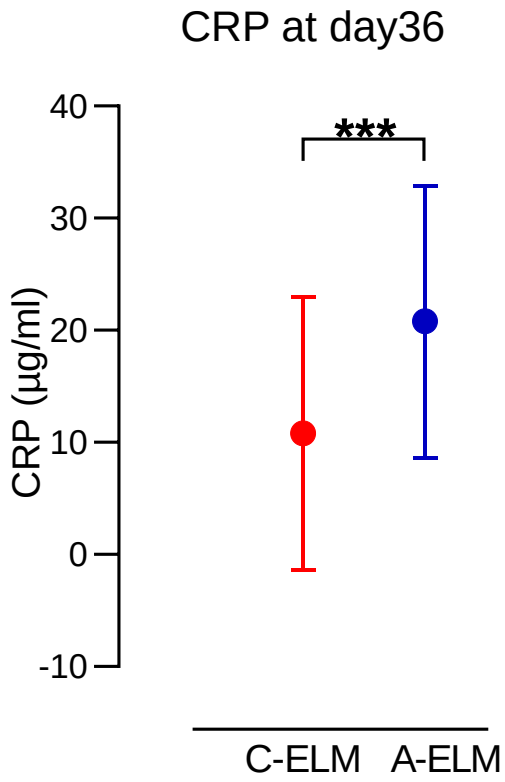


Injured animals (%)

C-ELM	10
A-ELM	30
p-value	<0.001

Tail-biting episodes started at d36 in both groups.

Undocked-tail piglets were more injured and these injuries are more severe.



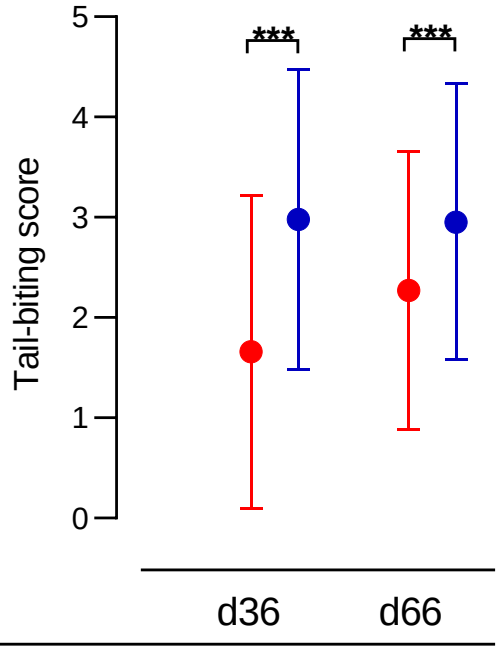
Piglets in the A-ELM had significantly higher CRP levels at d36:

⇒Greater inflammation due to tail lesions

Effect of ELM strategy on cannibalism and its consequences

ELM	$p<0.001$
Age	ns
ELMxAge	ns

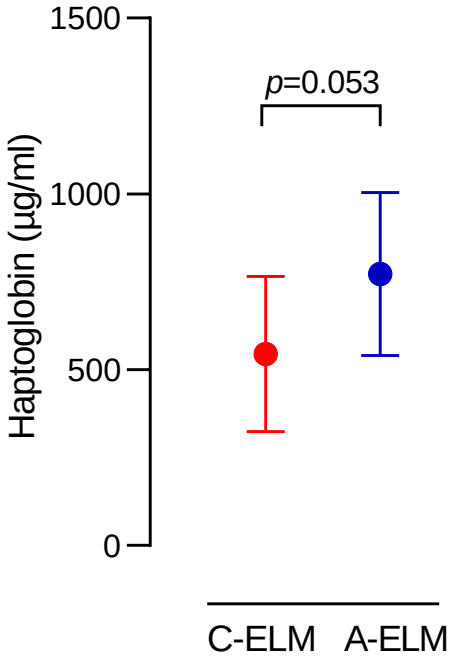
Tail-biting behaviour



Injured animals (%)		
C-ELM	10	16
A-ELM	30	28
p-value	<0.001	<0.001

At day 66, tail injuries remained more severe in the A-ELM during fattening

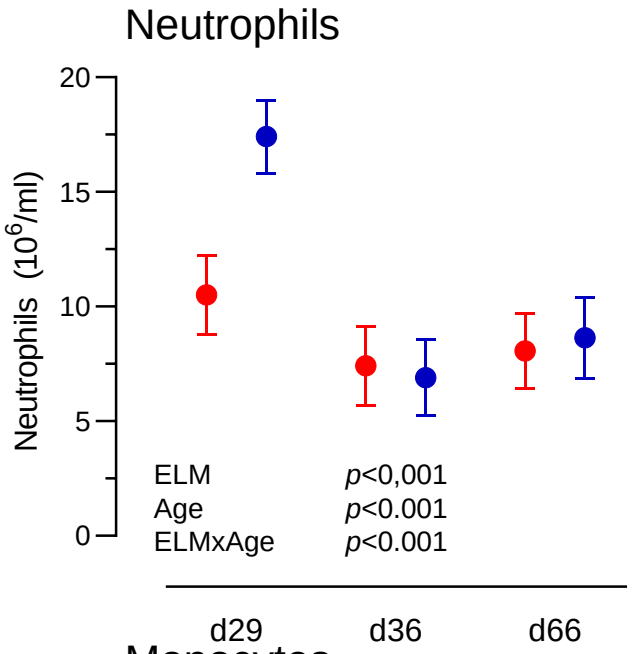
Haptoglobin at day66

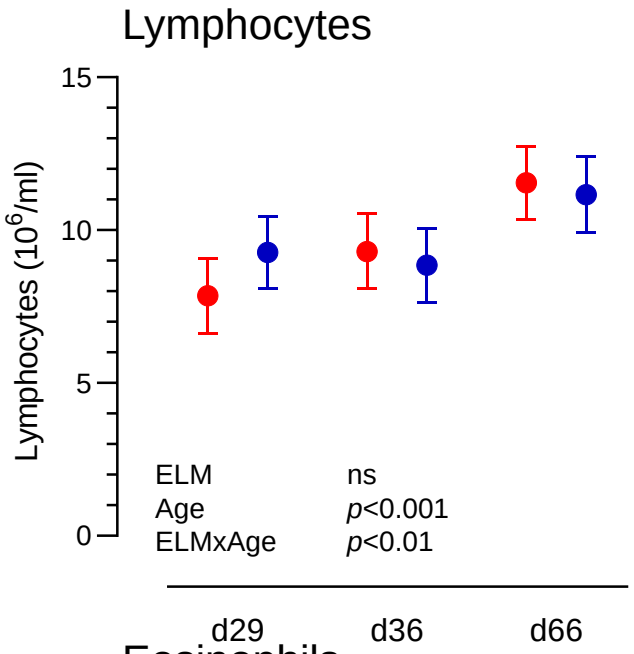


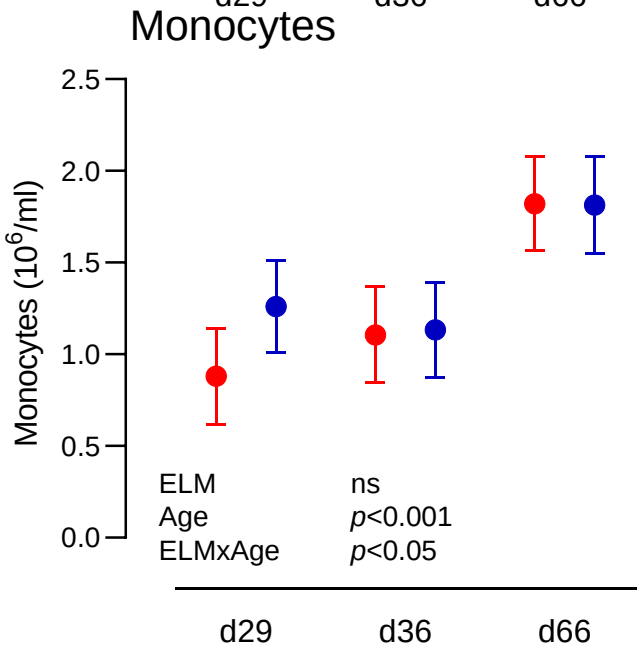
In agreement, haptoglobin concentration tended to be higher in piglets reared under A-ELM:

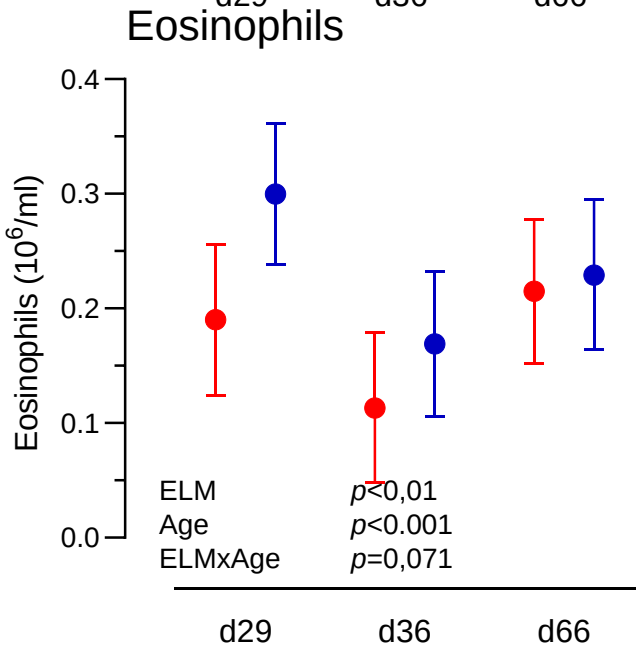
⇒ Tail-biting inflammation

Effect of ELM strategy on immune cell counts

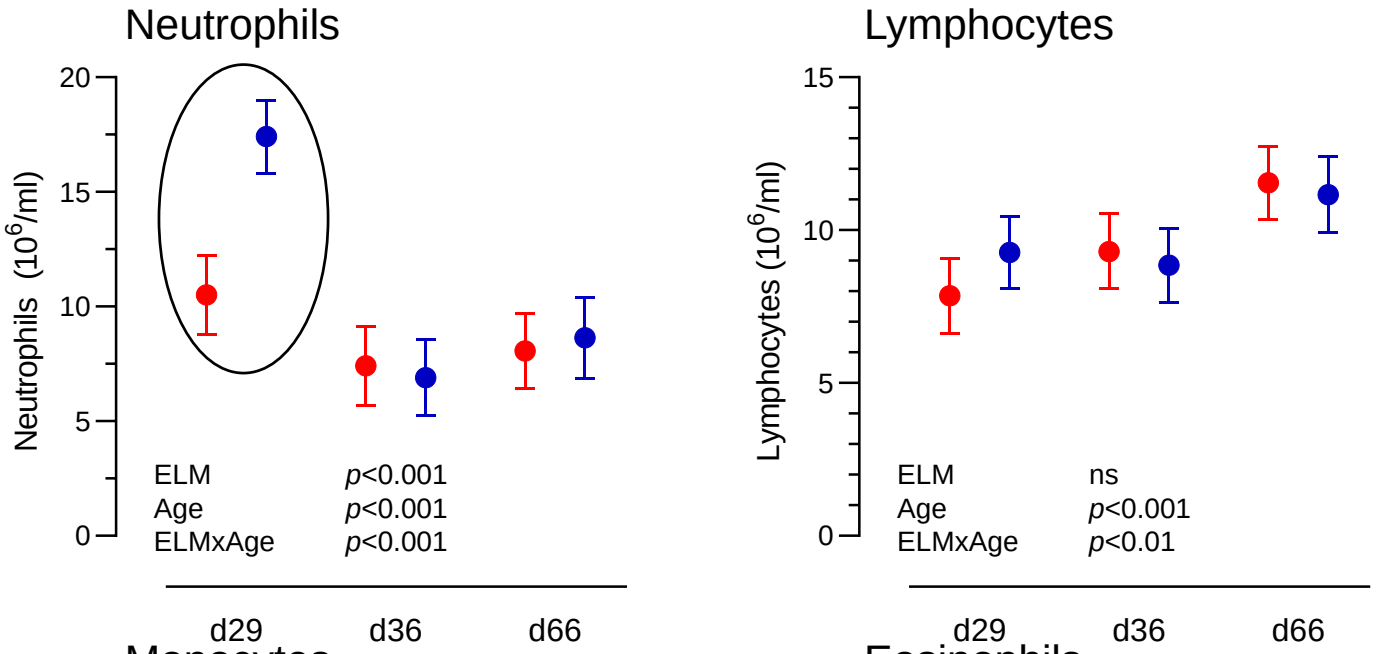


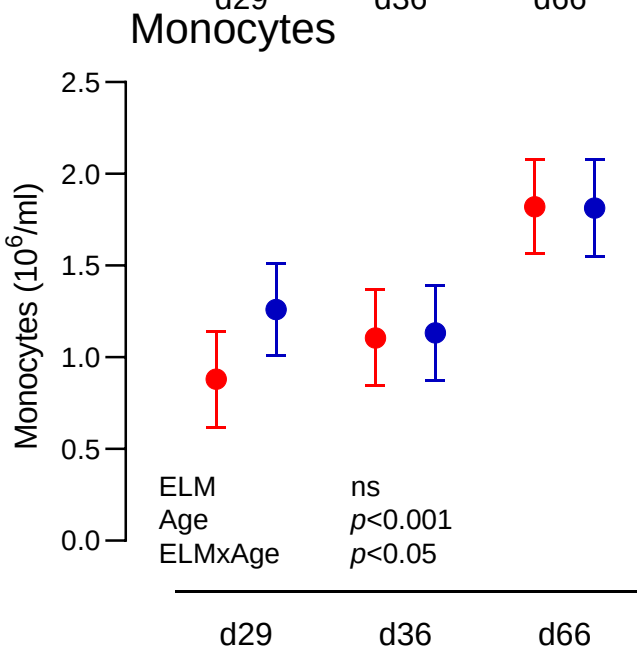


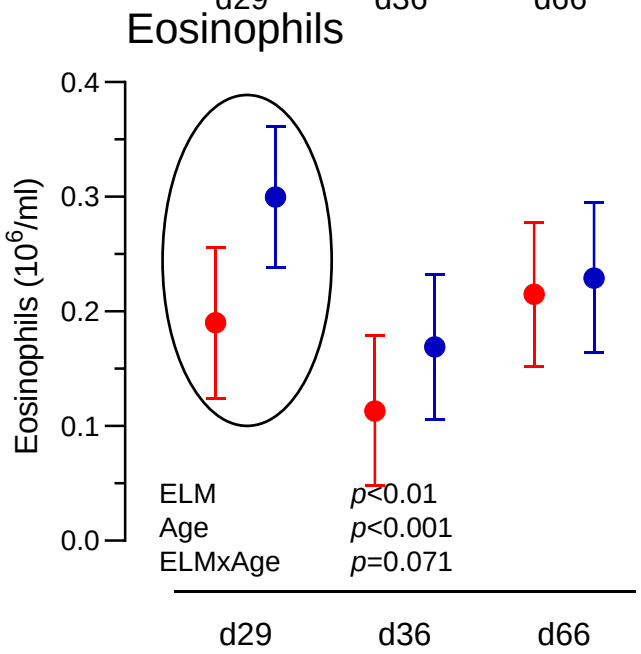




Effect of ELM strategy on immune cell counts



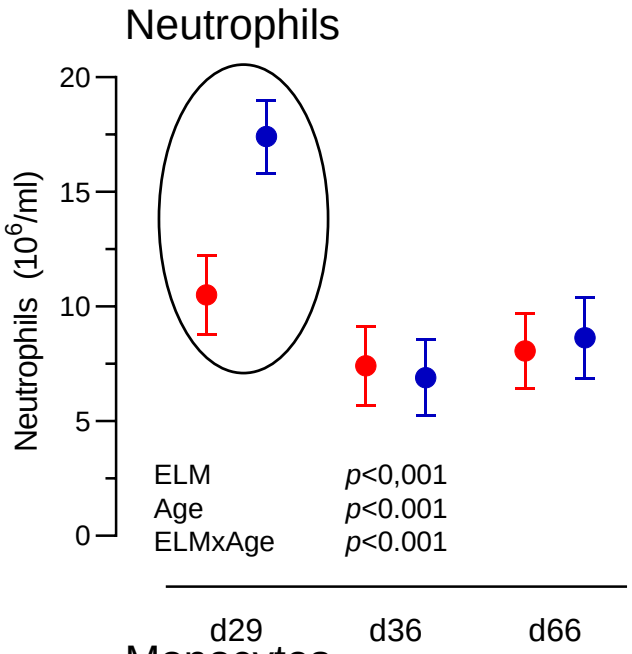


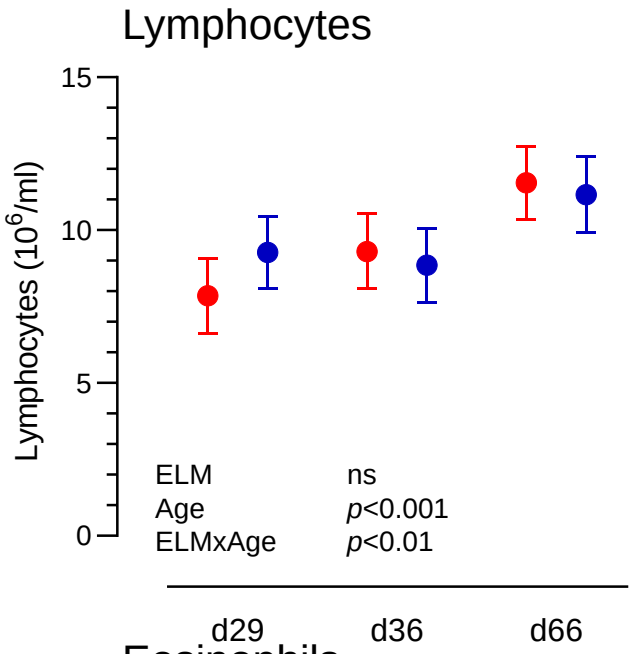


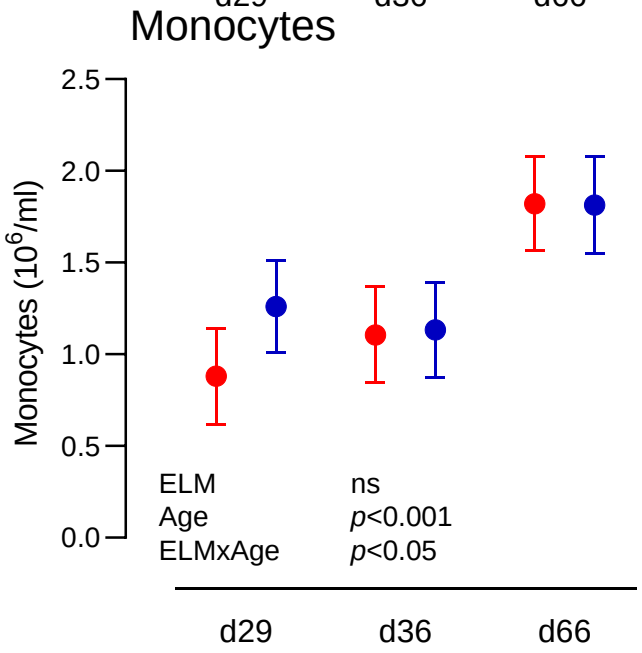
Numbers of neutrophils and eosinophils were greater at d29 than at d36 in both groups:

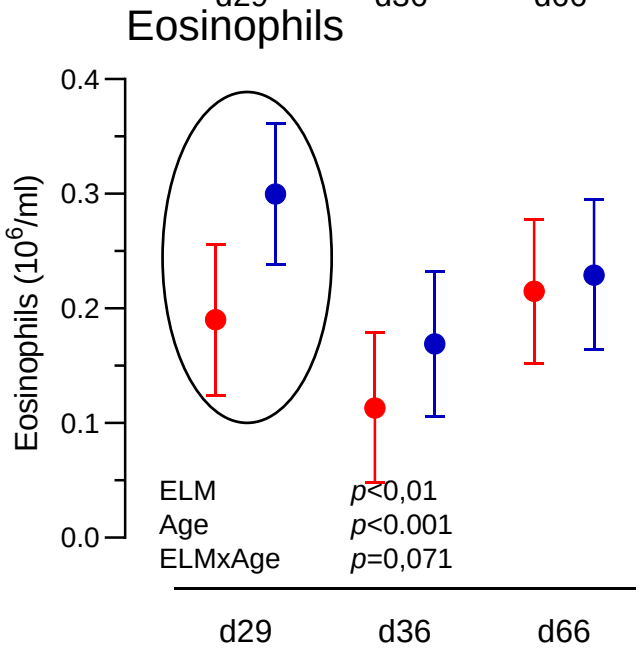
⇒Vaccination effect.

Effect of ELM strategy on immune cell counts









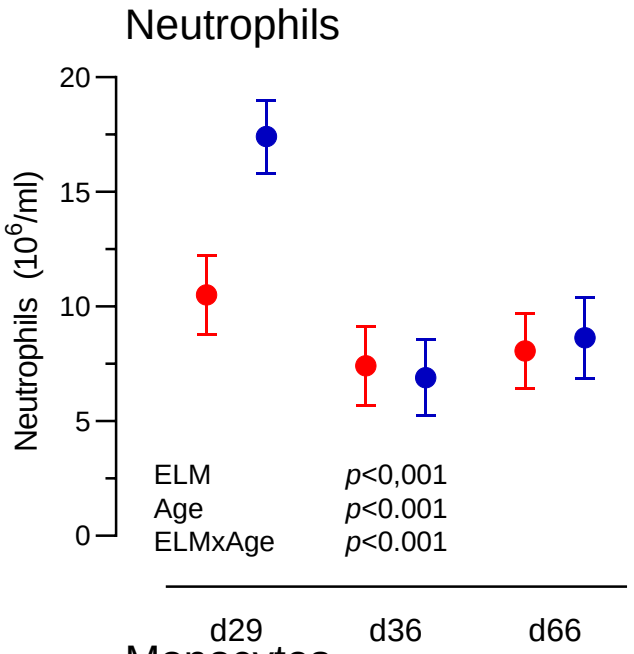
Numbers of neutrophils and eosinophils were greater at d29 than at d36 in both groups:

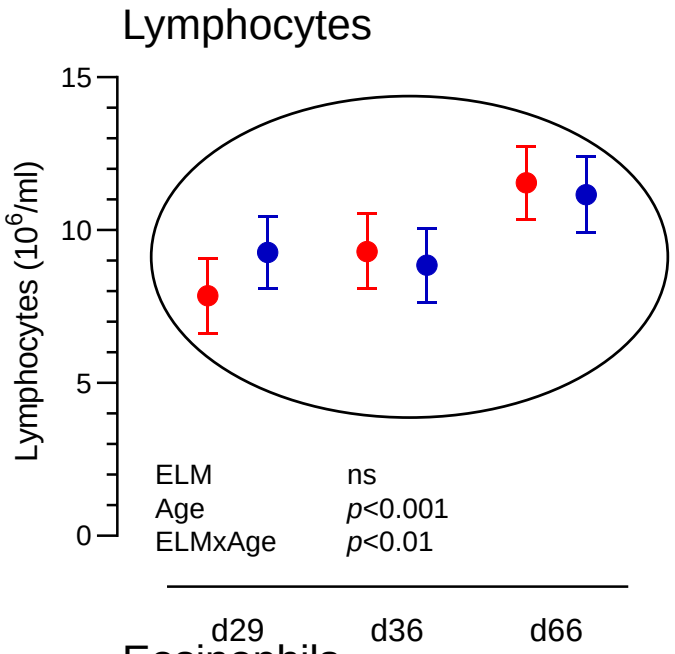
⇒Vaccination effect.

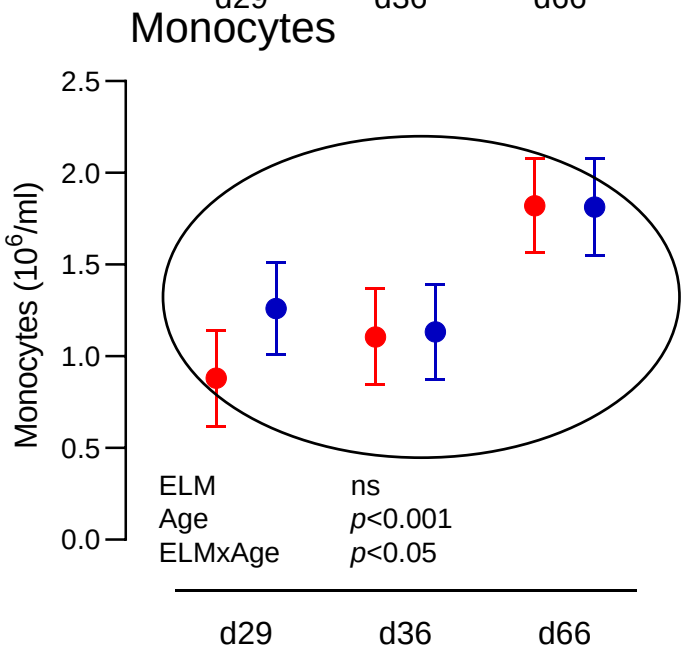
Numbers of neutrophils and eosinophils were significantly higher in A-ELM piglets at d29:

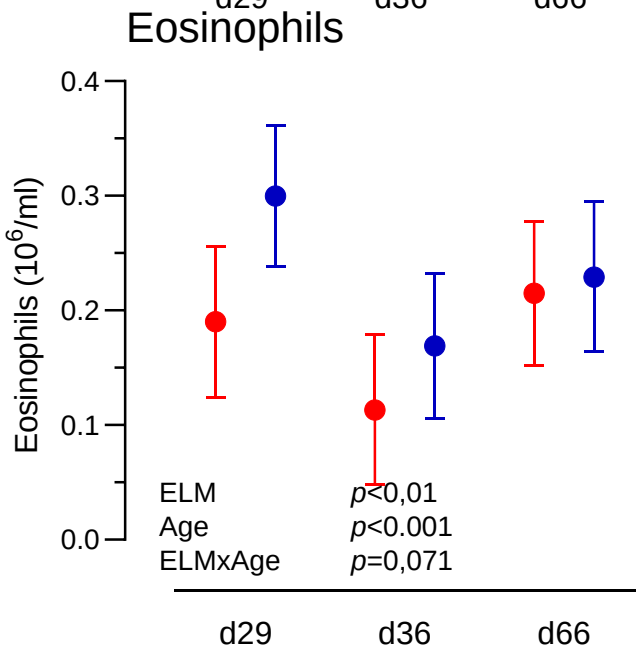
⇒Early-socialization challenged piglets.

Effect of ELM strategy on immune cell counts









Numbers of neutrophils and eosinophils were greater at d29 than at d36 in both groups:

⇒Vaccination effect.

Numbers of neutrophils and eosinophils were significantly higher in A-ELM piglets at d29:

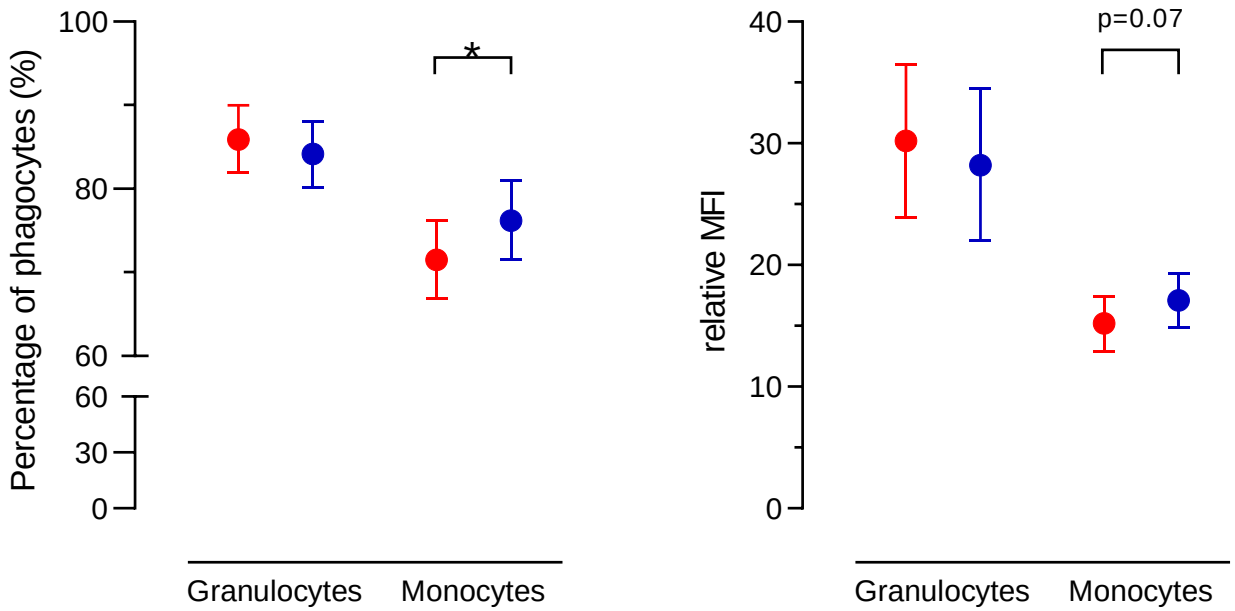
⇒Early-socialization challenged piglets.

Numbers of lymphocytes and monocytes increased with age in piglets from both groups:

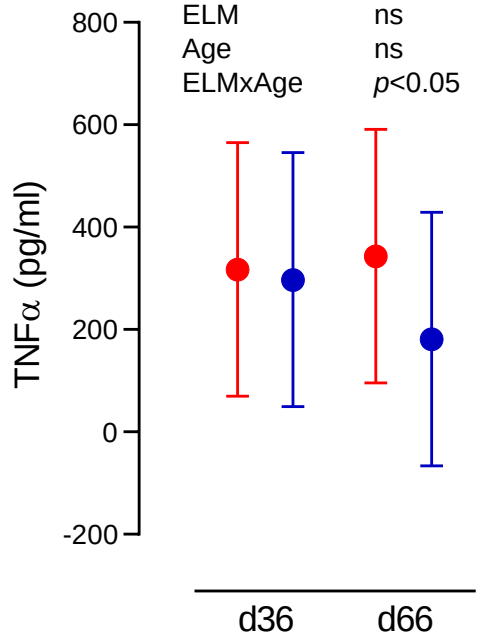
⇒Early-socialization did not affected WBC counts in the long-term.

Effect of ELM strategy on immune competence

Phagocytosis capacity of granulocytes and monocytes at day 36



Whole Blood Assay, TNFα

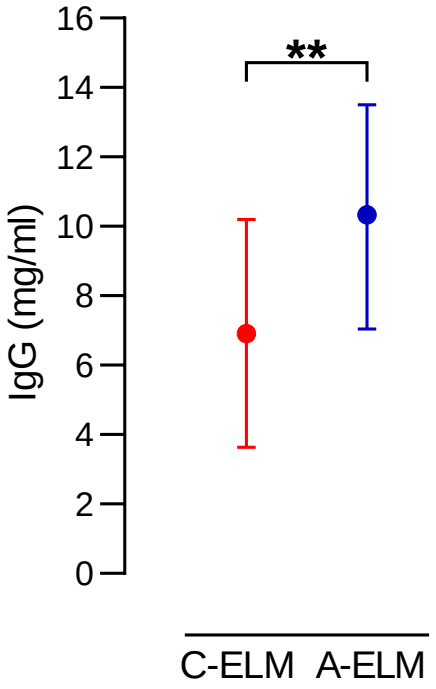


At day 36, the percentage of phagocyte monocytes is higher in A-ELM piglets and the phagocytic activity of monocytes tended to increase.

ELM influences the ability of blood cells to secrete TNFα at day 66, with A-ELM piglets showing lower TNFα levels in response to LPS stimulation.

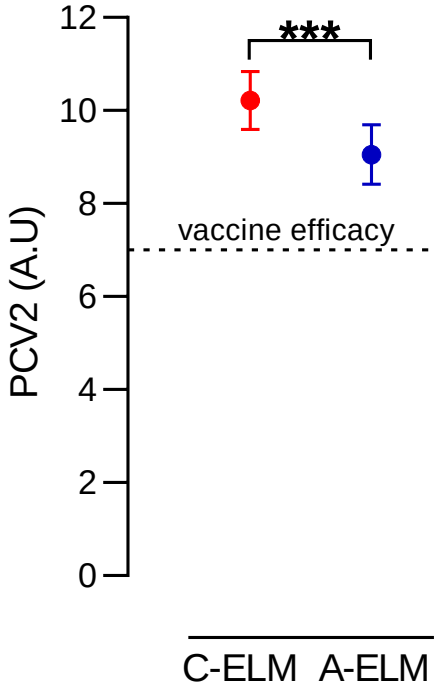
Effect of ELM strategy on immune competence

Total IgG level at d66



The total IgG level at d66 was significantly higher in A-ELM piglets.

Anti-PCV2 vaccine response at d66



The level of anti-PCV2 antibodies was significantly lower in A-ELM piglets but all piglets were efficiently protected.

Conclusions

Alternative early life management strategy

⇒ End of tail docking
⇒ Free-farrowing pen
⇒ Socialization

Slower growth during the lactation period

Better growth rate during the post-weaning period

⇒ **similar performances**

No difference evidenced in the stress response of animals around weaning

Fewer injuries the day after weaning
But episodes of tail biting

⇒ **cannibalism in undocked-tail piglets**

Similar immune competence
Good vaccine protection

⇒ **similar health status**

Conclusions

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Similar immune competence
Good vaccine protection

⇒ **similar health status**

⇒ Field studies are important to assess the transposability of alternative rearing practices and their true relevance to pigs' health and welfare

Thank you for your attention

INRAE

METAPROGRAMME

SANté et Bien-être des Animaux en élevage (MP-SANBA)

Région PAYS DE LA LOIRE

Oniris
ÉCOLE NATIONALE VÉTÉRINAIRE, AGROALIMENTAIRE ET DE L'ALIMENTATION
SANTÉ ET ALIMENTATION AU CŒUR DE LA VIE

IECM

BIOEPAR UMR 1300
INRAE, Oniris

Cooperl

GAEC du Pront

L.I.T LABORATOIRE D'INNOVATION TERRITORIAL
OUEST TERRITOIRES D'ÉLEVAGE

MSD

R&D service lab