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Peri-partum scFOS supplementation modulates development and activity of the immune system of suckling piglets

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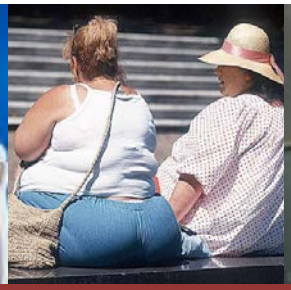
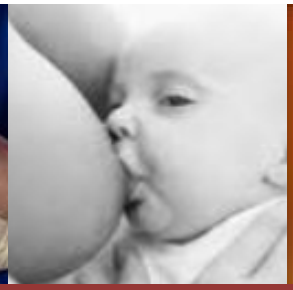
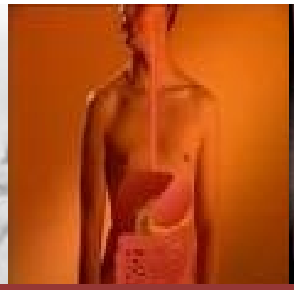
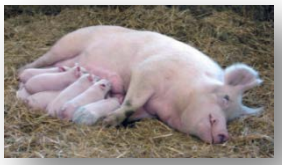
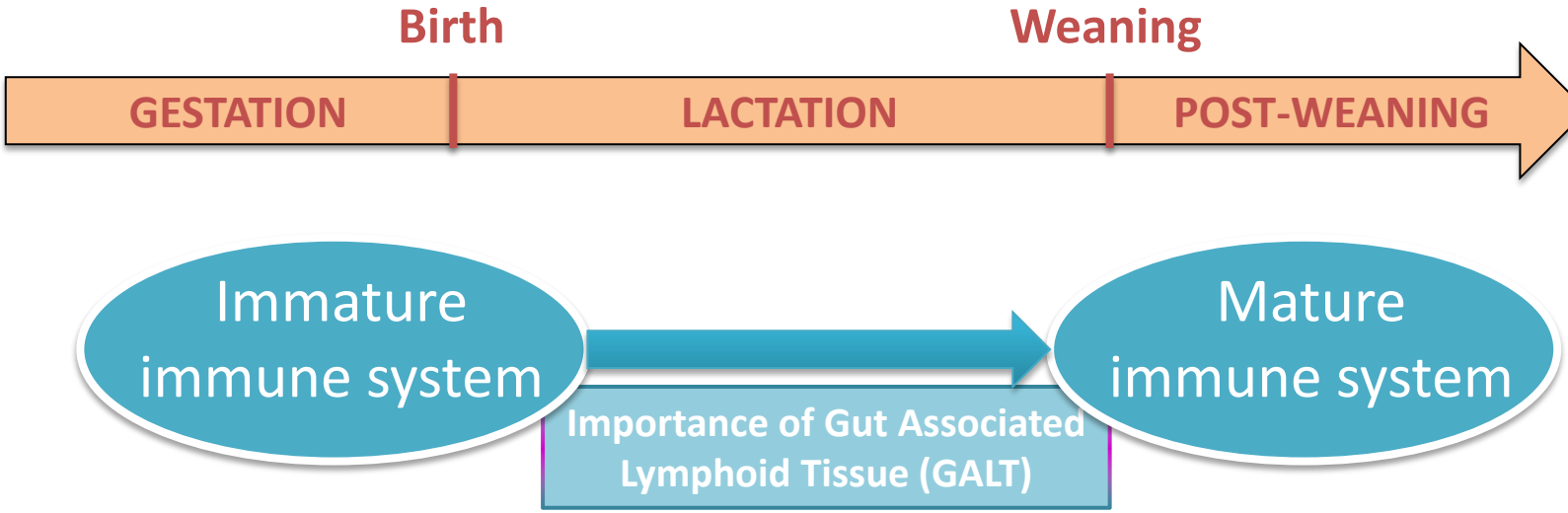




Background

Immune system in early life

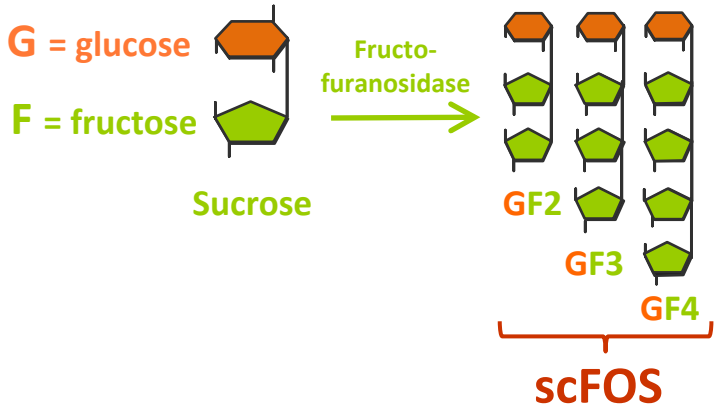


Background

Prebiotics

Definition :

"A selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well being and health"
(Gibson *et al*. 2004)



Dietary components
scFOS
Short-chain fructo-oligosaccharides

Intestinal microbiota
↑Bifidobacteria and Lactobacilli
Swanson *et al*., 2002
Howard *et al*., 1995

Bacteria metabolites
↑SCFA
(butyrate, acetate, propionate)
Berg *et al*., 2005
Tsukahara *et al*., 2003

Intestinal effects
Improvement of barrier function
Reduction of intestinal infections
Modulation of intestinal peptide production
Modulation of immune system
Gibson *et al*., 2004; Cani *et al*.,2009

Background

Immunity modulation by scFOS

Effects on adults:

- augmentation of IgA concentration in serum (Swanson et al., 2002)
- increase of IgA secretion in intestinal mucosa (Hosono et al., 2002)
- improvement of cytokine responses by Peyer's patch cells (Hosono et al., 2002)

Effects on mothers and offspring:

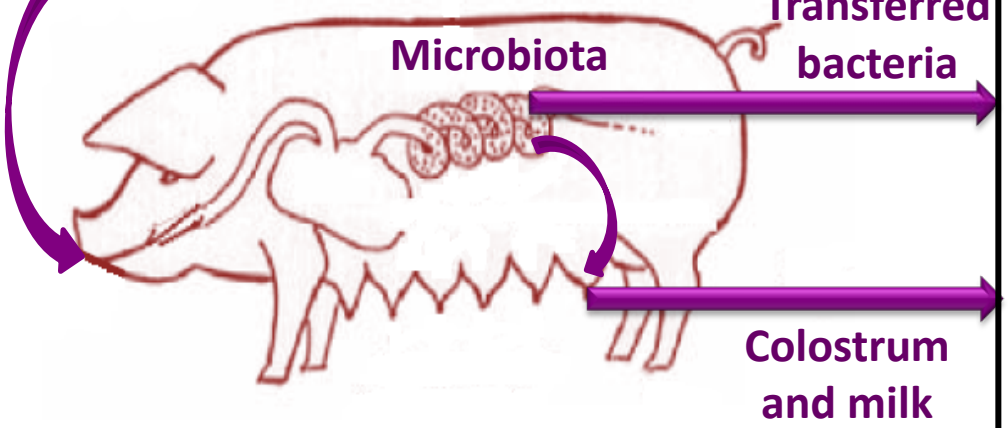
- augmentation of IgM level in colostrum and milk and modulation of Ig concentration in serum of puppies (Adogony et al., 2007)

Global trend for stimulating immunity following scFOS supplementation, but less is known about maternal immune transfer and effects on GALT in piglets

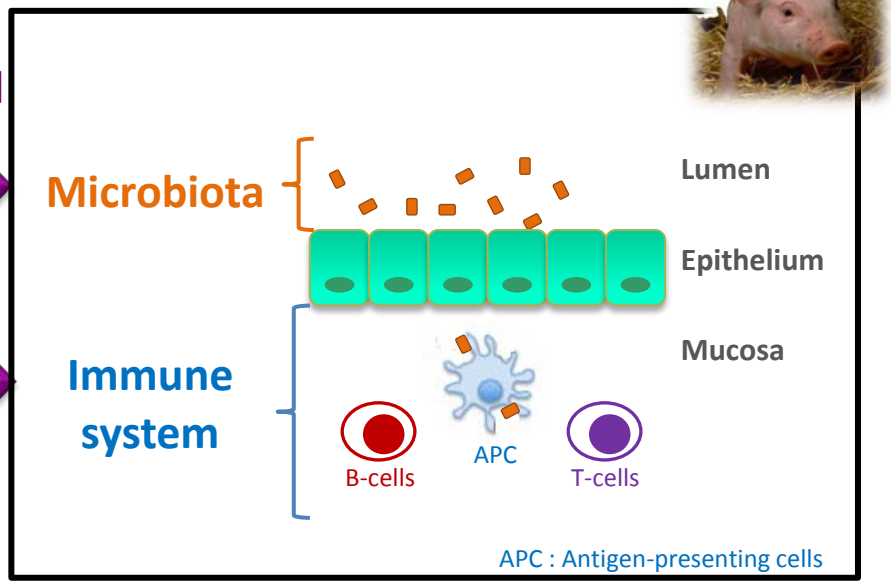
Hypothesis

MOTHER

Peri-partum scFOS supplementation



OFFSPRING GUT



Objectives

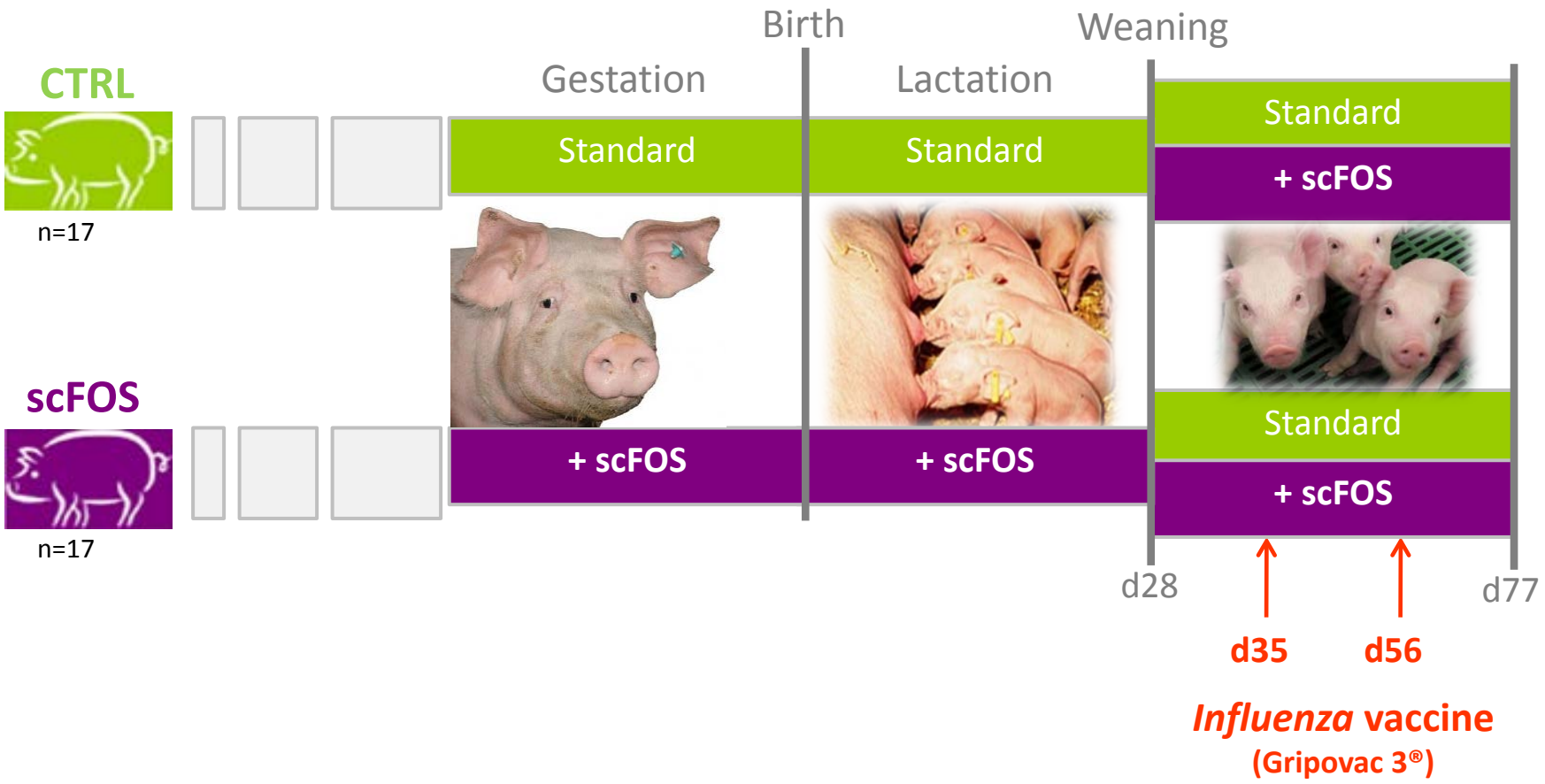
Determine the impact of maternal dietary scFOS supplementation during gestation and lactation on:

- Acquisition of passive immunity in the suckling piglets

- Development of intestinal immune system in the suckling piglets

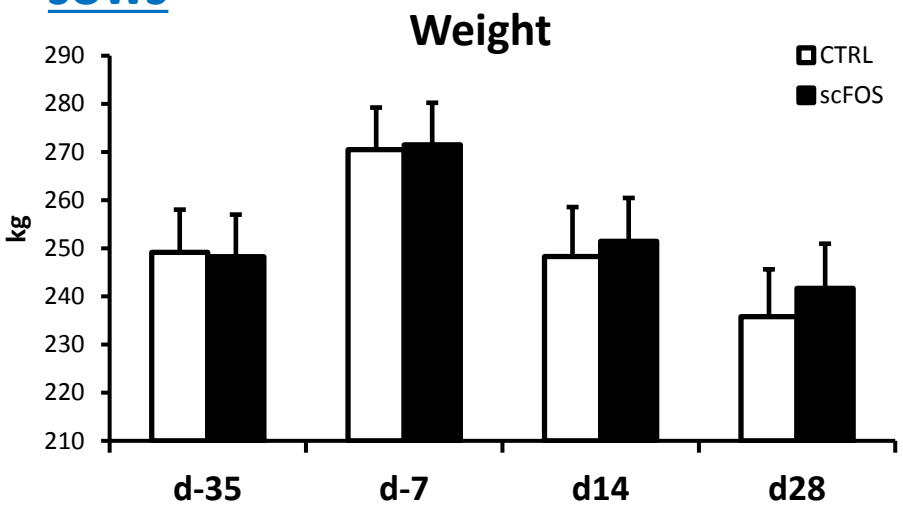
- Response to vaccination in the weaned pigs

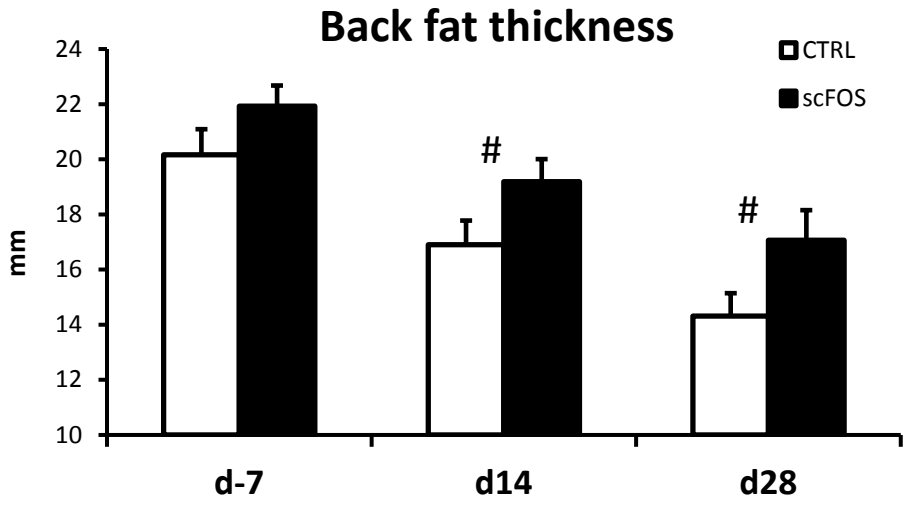
Protocol


Birth
Weaning
CTRL
Gestation
Lactation
Standard
Standard
Standard
+ scFOS
n=17
scFOS
+ scFOS
+ scFOS
Standard
+ scFOS
n=17
d28
d77
d35
d56
Influenza vaccine
(Gripovac 3®)

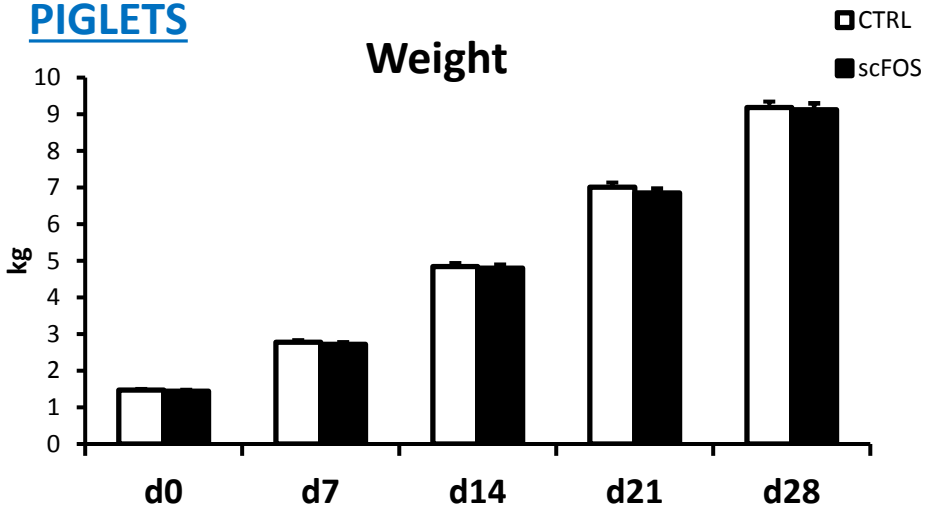
Performances of sows and piglets

SOWS





PIGLETS



#: p <0.10

scFOS supplementation tended to increase back fat thickness in sows during the lactation

Objectives

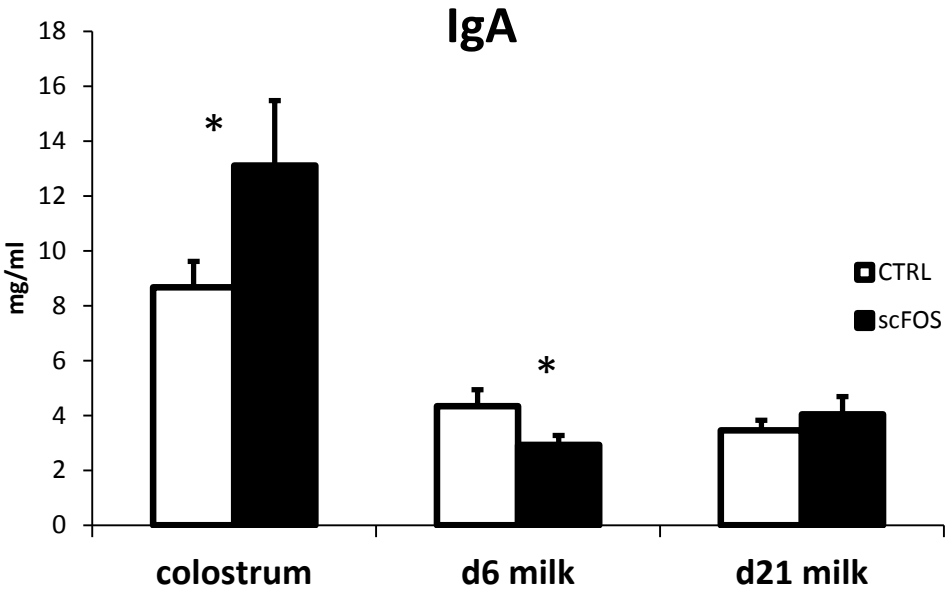
Determine the impact of maternal dietary scFOS supplementation during gestation and lactation on:

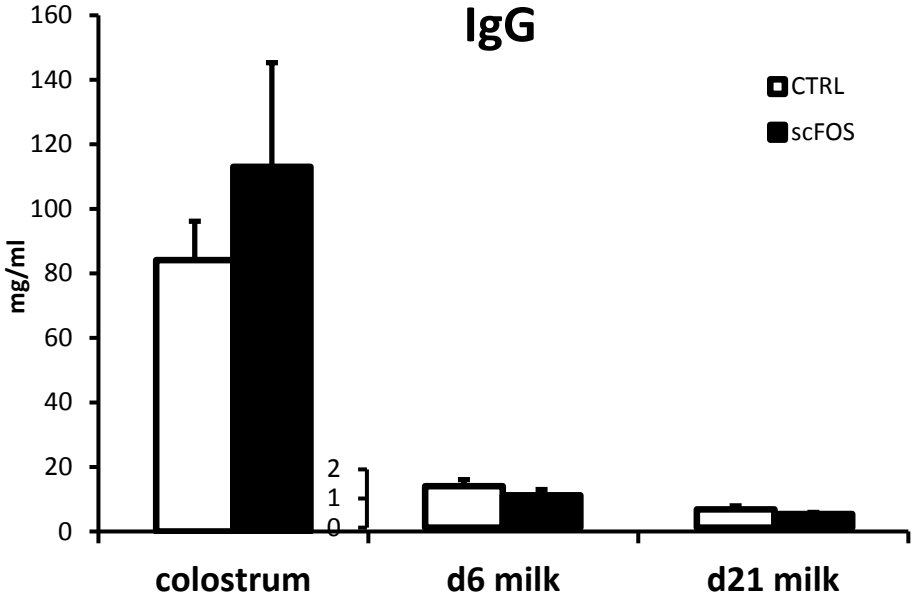
Acquisition of passive immunity in the suckling piglets

Development of intestinal immune system in the suckling piglets

Response to vaccination in the weaned pigs

Colostrum and milk immune quality





scFOS supplementation improved IgA levels in colostrum
= improvement of passive immunity

*: p <0.05

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Intestinal immune system of suckling piglets

(ileal PP d21)

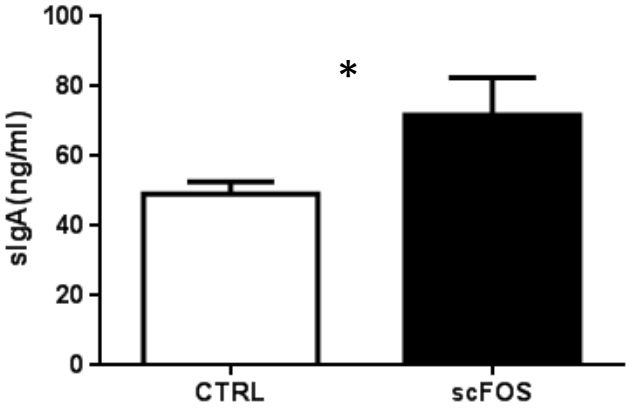
NEONATES

Maturation of the GALT depends on:

*p<0.05
** p<0.01

Humoral-mediated immunity

sIgA secretion



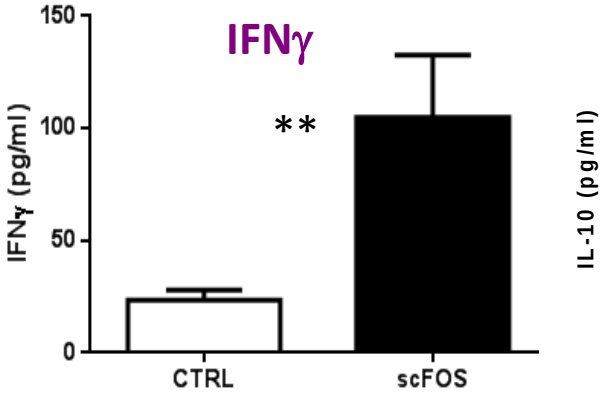
ilPP cells cultured in basal condition for 7d

Cell-mediated immunity

Balance Th1/Th2

IFNγ

IL-10



ilPP cells stimulated with ConA (5µg/ml) for 72h

Maternal scFOS diet improved maturation of GALT after birth that confers a better response against pathogens

Objectives

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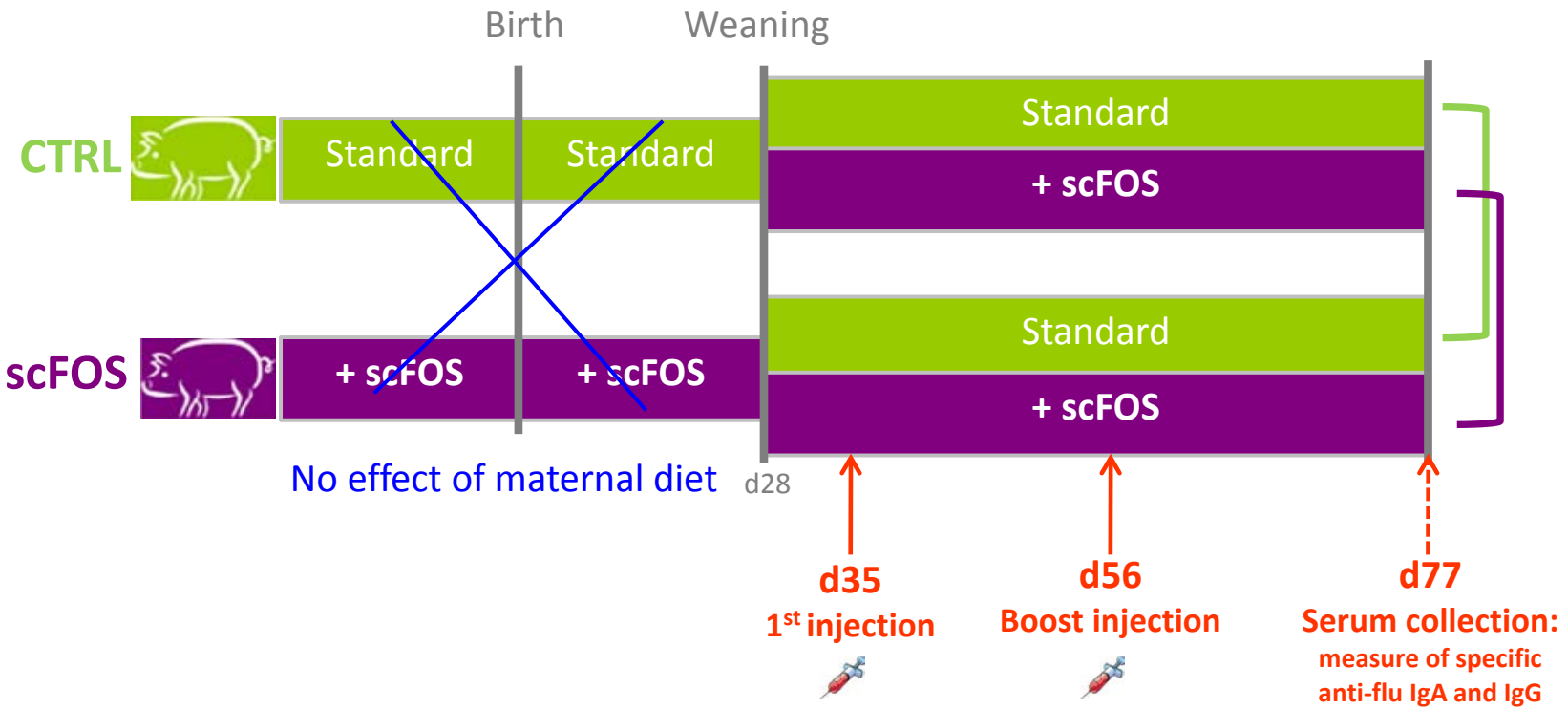
Development of intestinal immune system in the suckling piglets

Response to vaccination in the weaned pigs

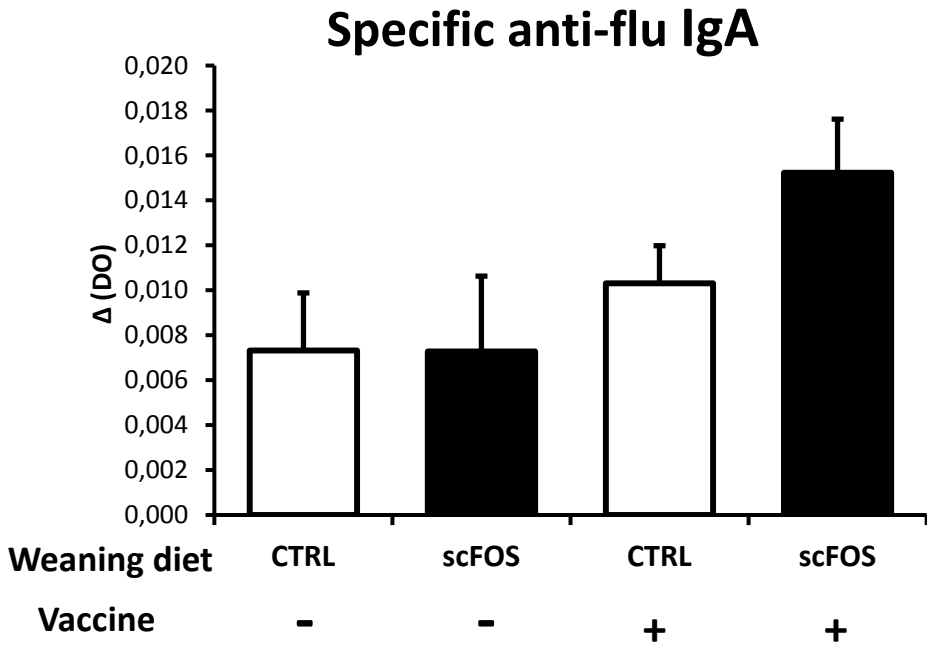
Vaccine challenge in weaned pigs

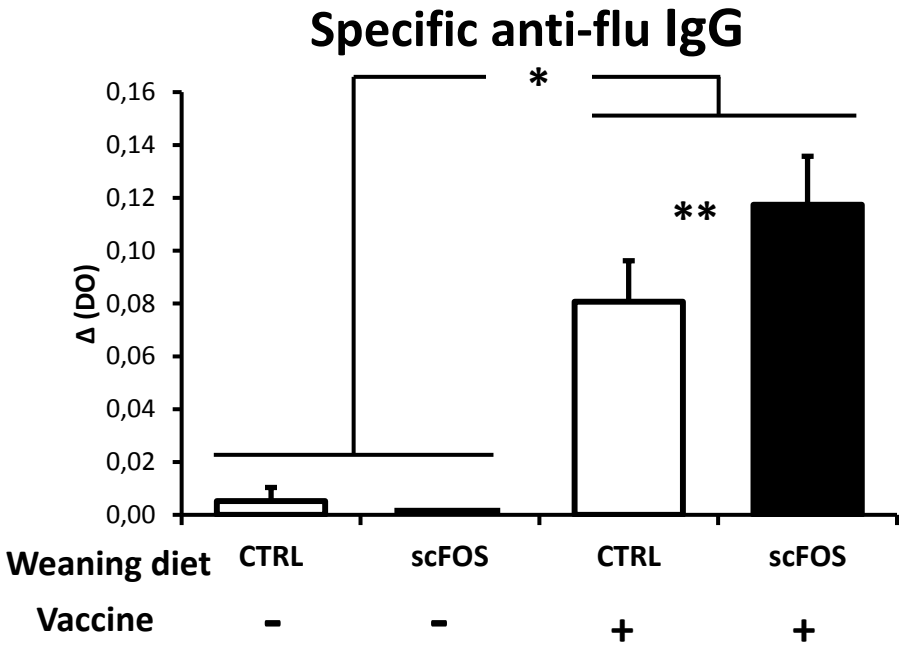
Influenza vaccine (Gripovac 3®)



Vaccine challenge in weaned pigs

Influenza vaccine (Gripovac 3®)





* p<0.05
** p<0.01

Direct scFOS supplementation improved the specific anti-flu IgG concentration in serum of weaned pigs

Summary

Maternal scFOS supplementation during perinatal period:

- Tended to increase body reserves of sows: improvement of reproductive performances
- Higher [IgA] in colostrum : enhancement of passive immunity
- Increased sIgA and IFNγ secretion by ileal PP cells: better development and maturation of the mucosal immune system

Direct scFOS supplementation after weaning:

- Increased specific anti-flu [IgG] in serum: improvement of vaccine response

Thank you for your attention

We thank :

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