Dietary algal β-glucan and its role in modulating the immune system in pigs and poultry

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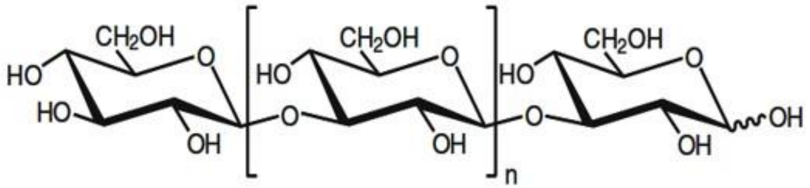
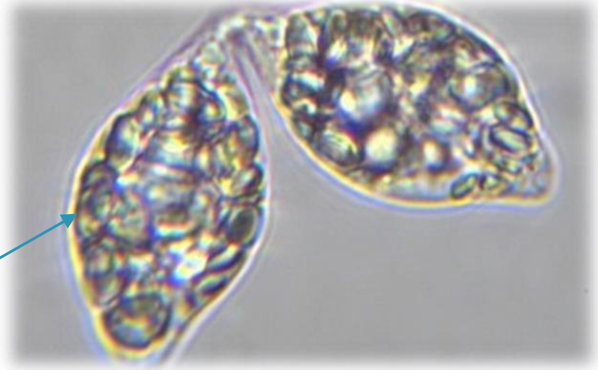
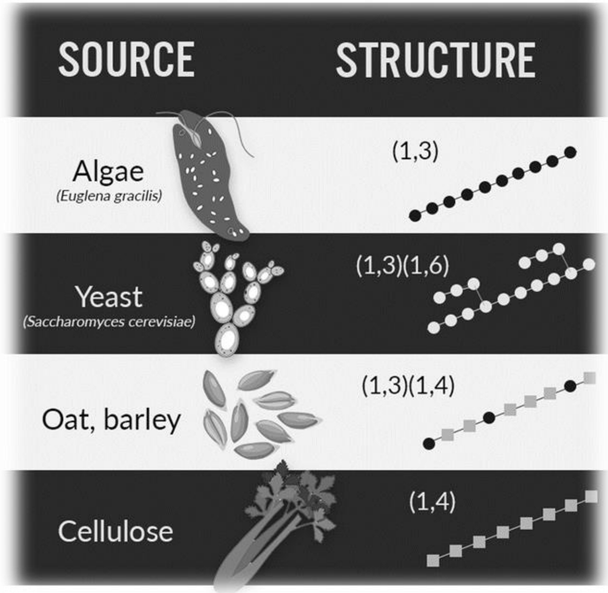
Algae as animal feed supplement

- *Euglena gracilis*
- Unicellular microalga
- > 50% β-(1,3)-glucan in cytoplasm



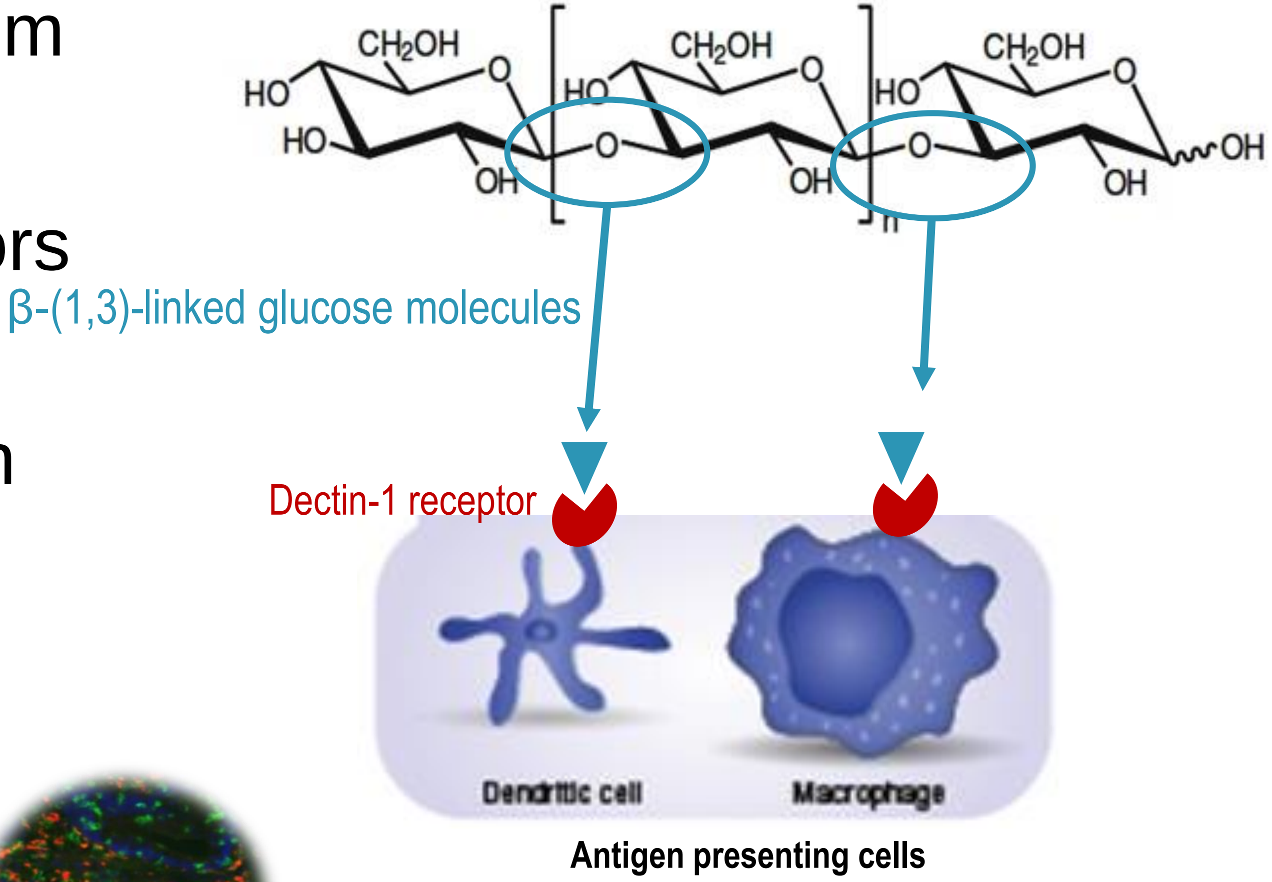
- Immune modulating properties

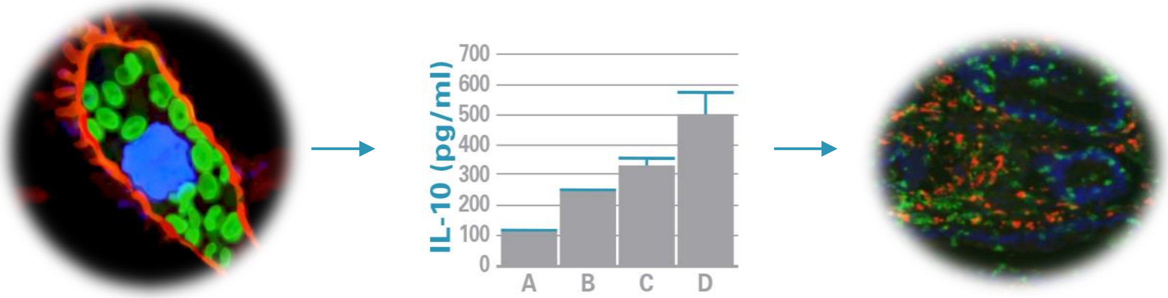




Algal β-(1,3)-glucan

- Interacts with the immune system
- Recognized by dectin-1 receptors
- Increased interleukin production
- Recruitment of immune cells





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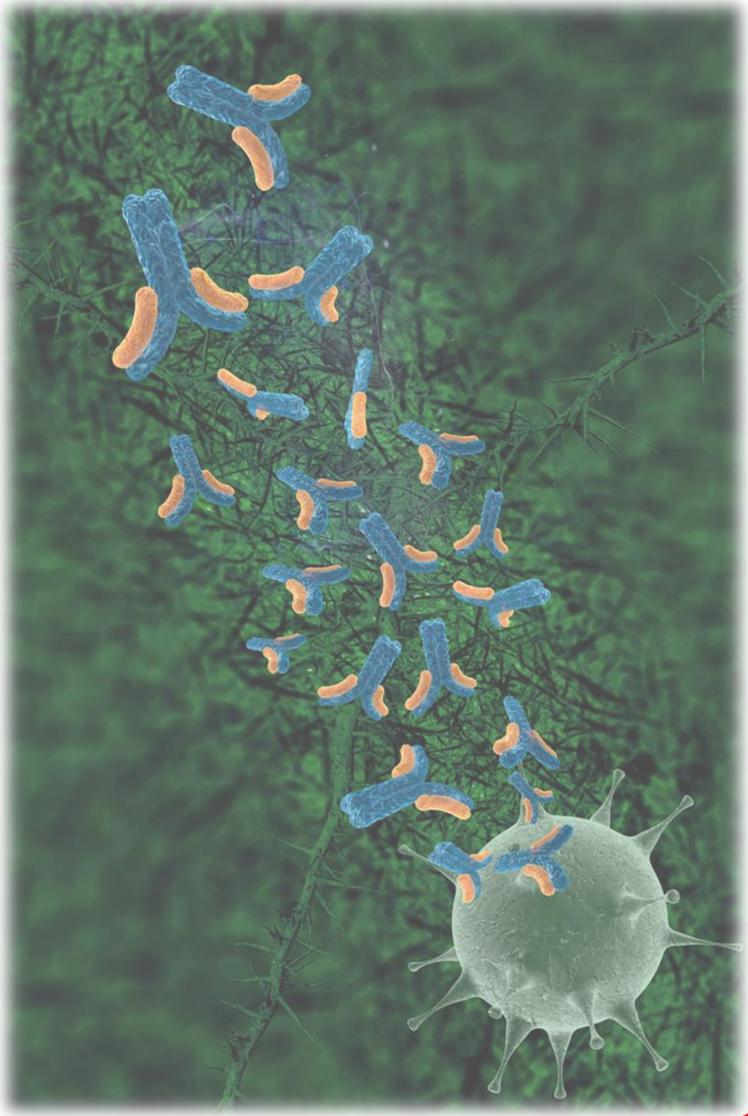
Immune system

- Especially important for
  - Young, Old, Pregnant, Immunocompromised
  - Vaccination
  - Disease prevention
- Antibiotic reduction programs



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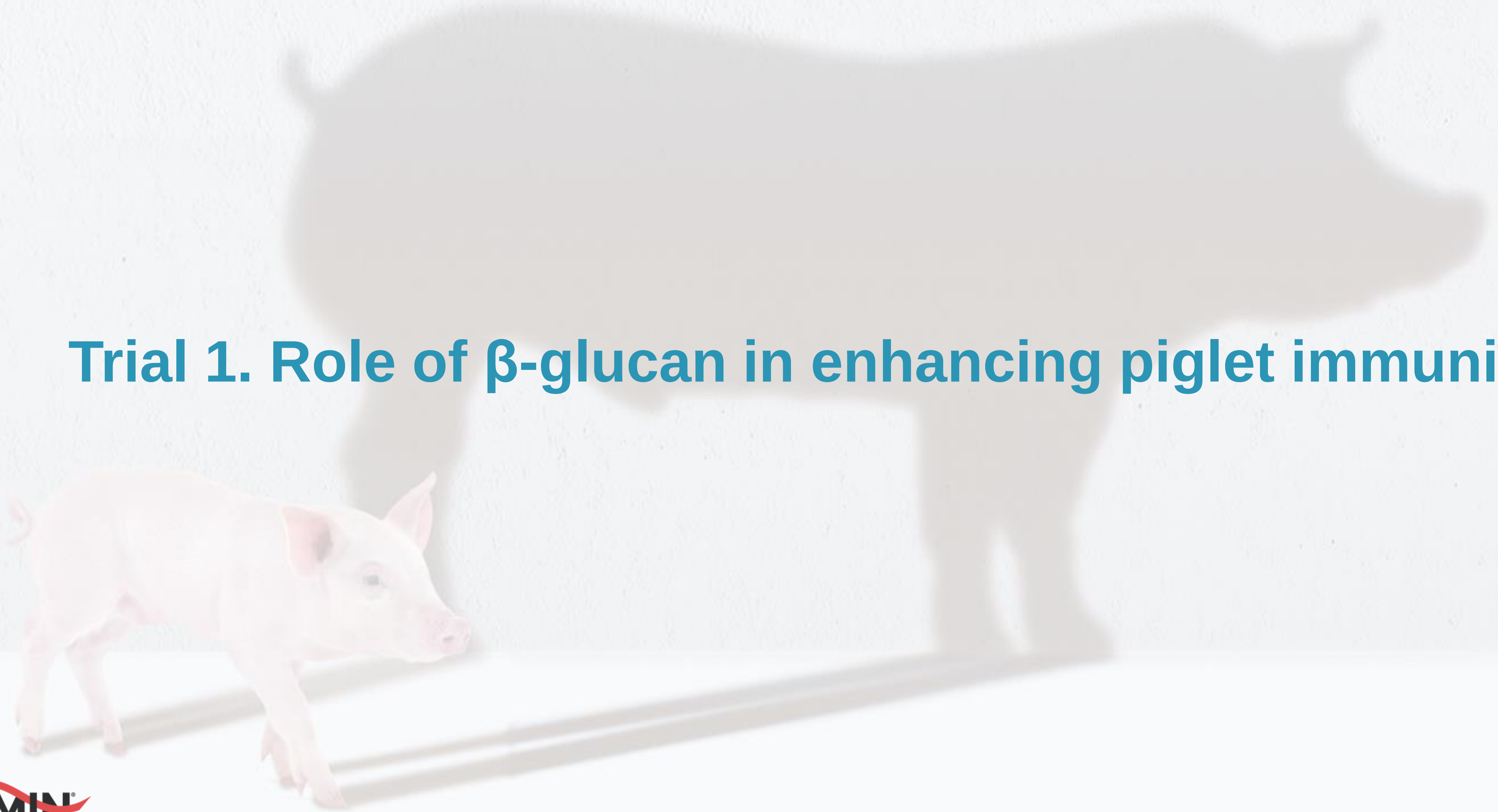


Trial 1. Role of β-glucan in enhancing piglet immunity

Trial 1. Role in enhancing piglet immunity

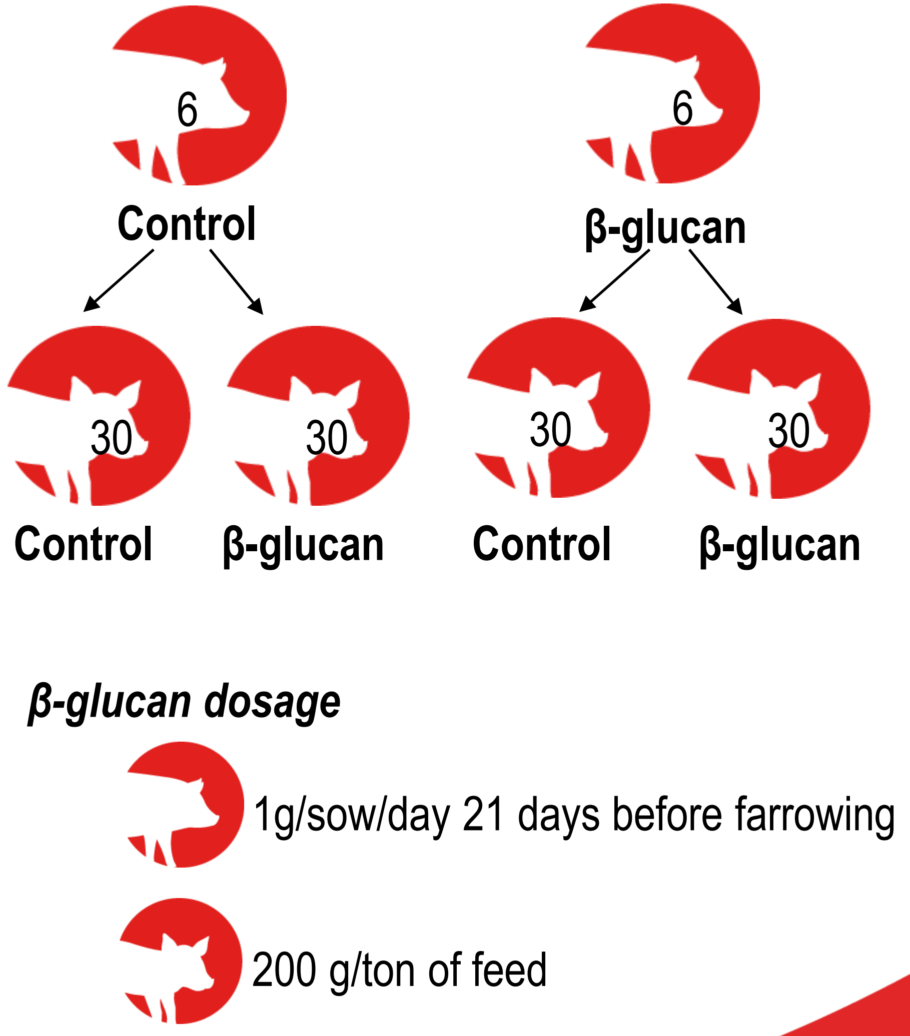
Materials and methods

Animals

- 12 sows (Topigs 20) in 2 groups
- 120 piglets (Topigs x Piétrain) in 4 groups

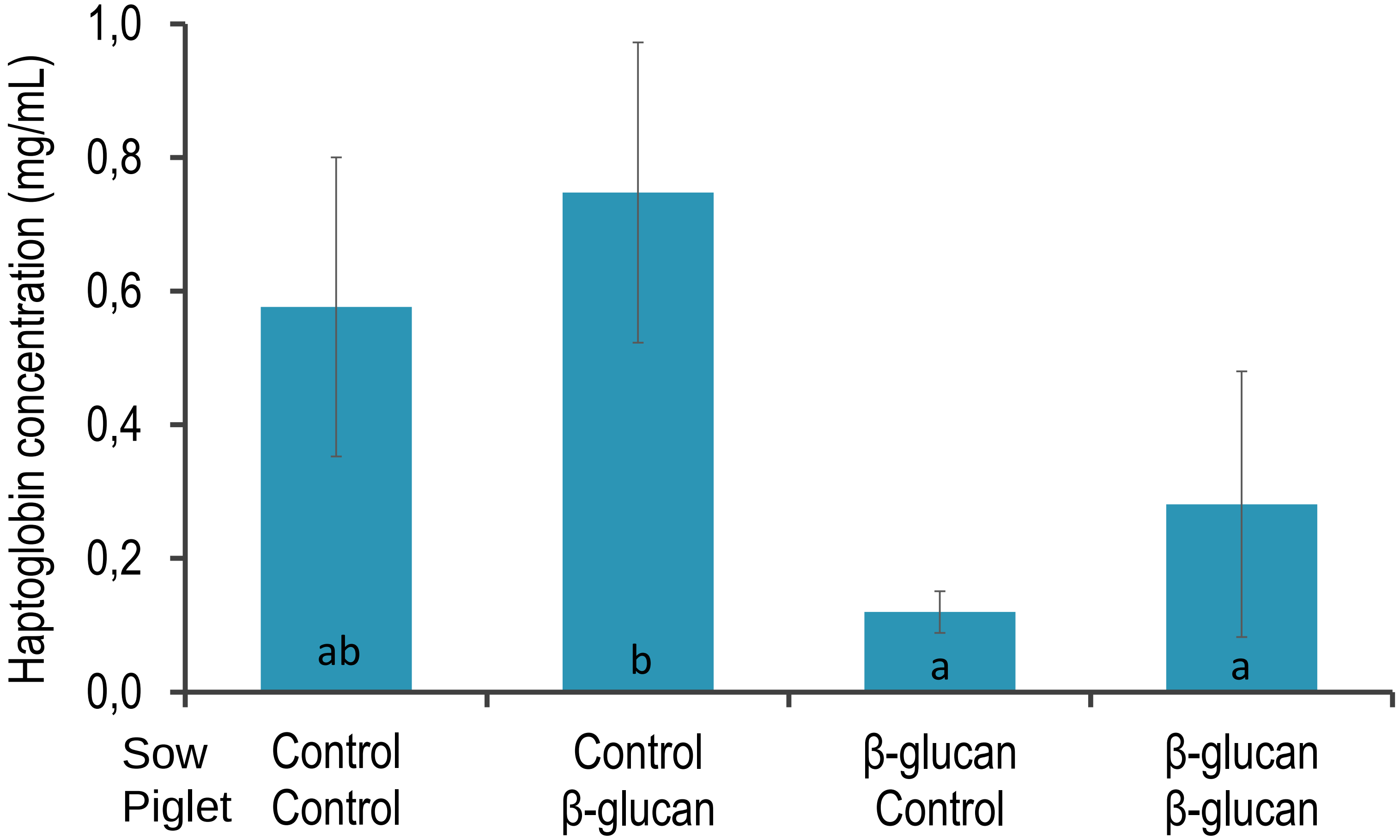
Measurements

- *Innate immunity*: blood haptoglobin concentration using an enzymatic kit, 42 d after weaning (26 d)
- *Acquired immunity*: T-lymphocyte subsets using flow cytometry, 14 d after weaning



Trial 1. Role in enhancing piglet immunity

Results – innate immunity



β-(1,3)-glucan supplementation decreased haptoglobin concentration indicating lower susceptibility to infection (less inflammation due to infection).

Trial 1. Role in enhancing piglet immunity

Results – acquired immunity

Treatment Sow - piglet	T-lymphocytes(area %) Naive $CD4^-CD8^-$	 Memory $CD4^+CD8^{lo}$	 Cytotoxic $CD4^-CD8^+$	 Helper $CD4^+CD8^-$
Control - Control	27.7[bc]	11.8[b]	6.8[b]	53.7
β-glucan - Control	29.8[c]	11.5[b]	5.6[b]	53.1
Control - β-glucan	25.8[ab]	13.0[b]	7.2[ab]	54.0
β-glucan - β-glucan	23.9[a]	16.0[a]	10.8[a]	49.3

β-(1,3)-glucan supplementation increased the conversion of naive/preliminary T-cells to memory or cytotoxic T-cells indicating a more active immune system.

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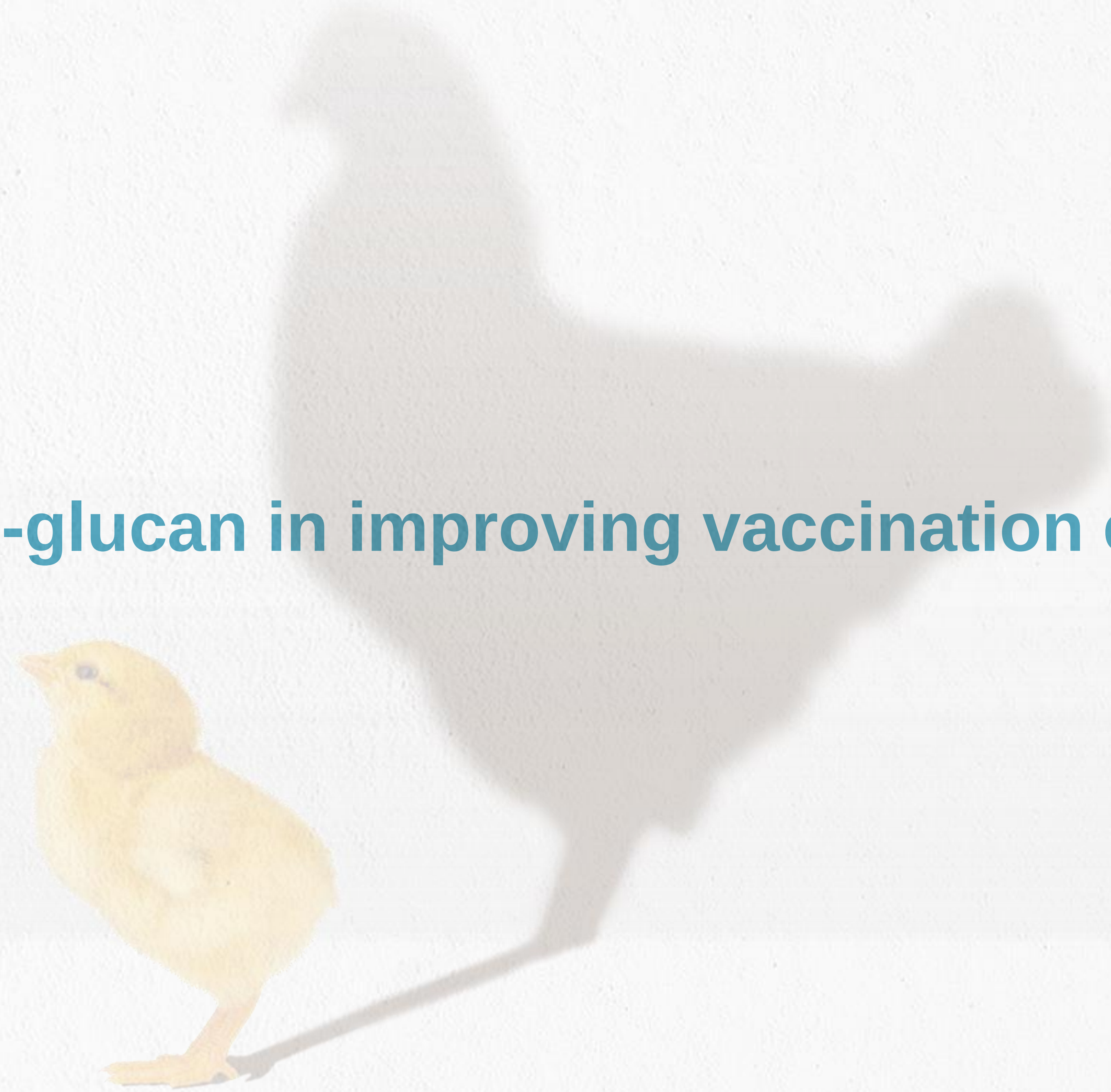


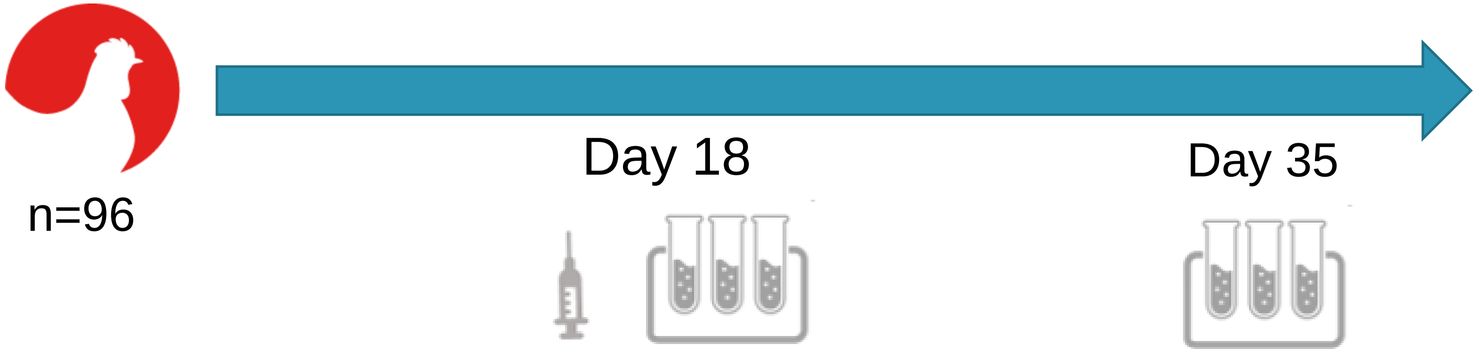
Trial 2. Role of β-glucan in improving vaccination efficiency

Trial 2. Role in improving vaccination efficiency

Materials and methods

- Ross 308 male broilers
- 3 treatment groups x 8 replicates

Group	Treatment
1	Not vaccinated, not supplemented
2	Vaccinated, not supplemented
3	Vaccinated, 50 g/T β-(1,3)-glucan



- Day 18: IBD (infectious bursal disease) vaccination (live freeze-dried vaccine)
- Day 18 and 35: blood antibody titers against IBD (ELISA)

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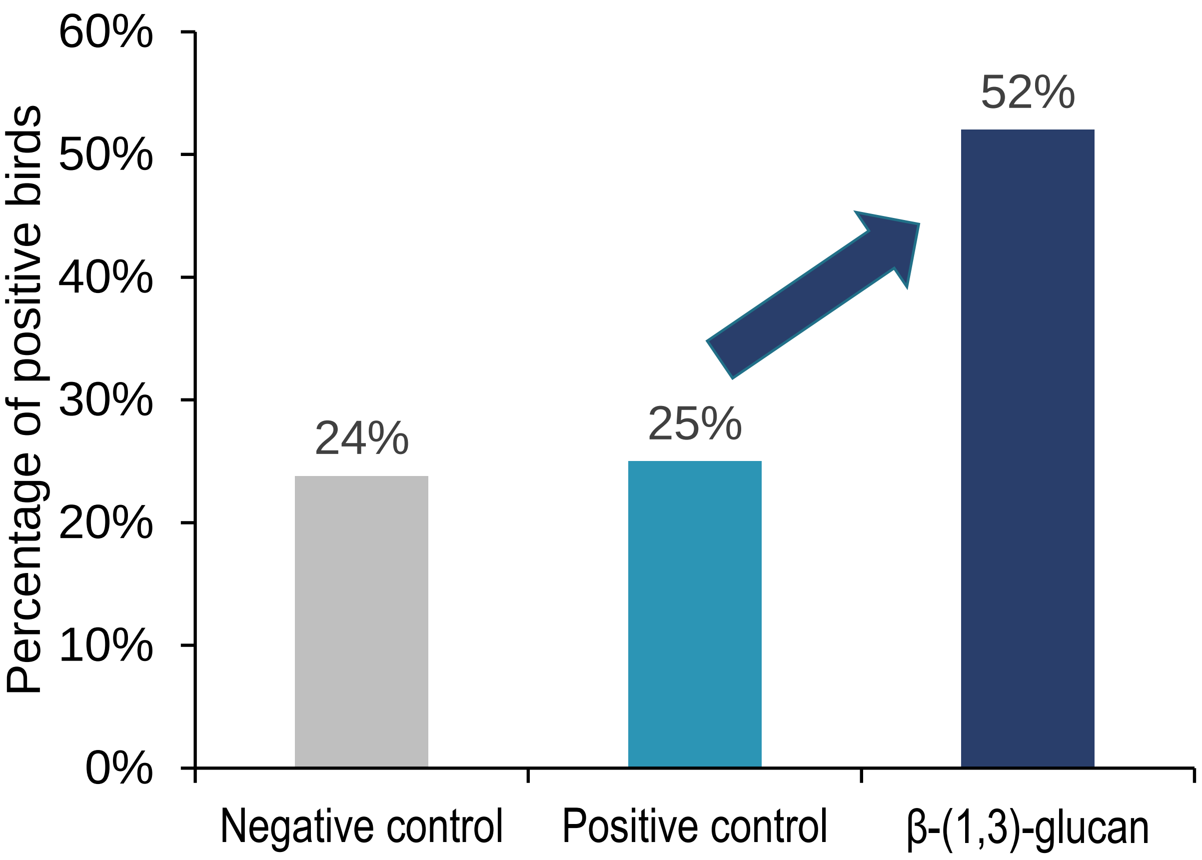
Trial 2. Role in improving vaccination efficiency

Results



Group	Treatment	IBD titer at 35d (ELISA units)
1	Not vaccinated, not supplemented	1349[a] ± 1362
2	Vaccinated, not supplemented	3906[a] ± 1985
3	Vaccinated, 50 g/T β-(1,3)-glucan	4563[b] ± 2166
	P-value	0.004

➔ β-(1,3)-glucan supplementation increased the number of seroconverted birds and the specific antibody titers for IBD indicating an enhanced vaccination efficiency

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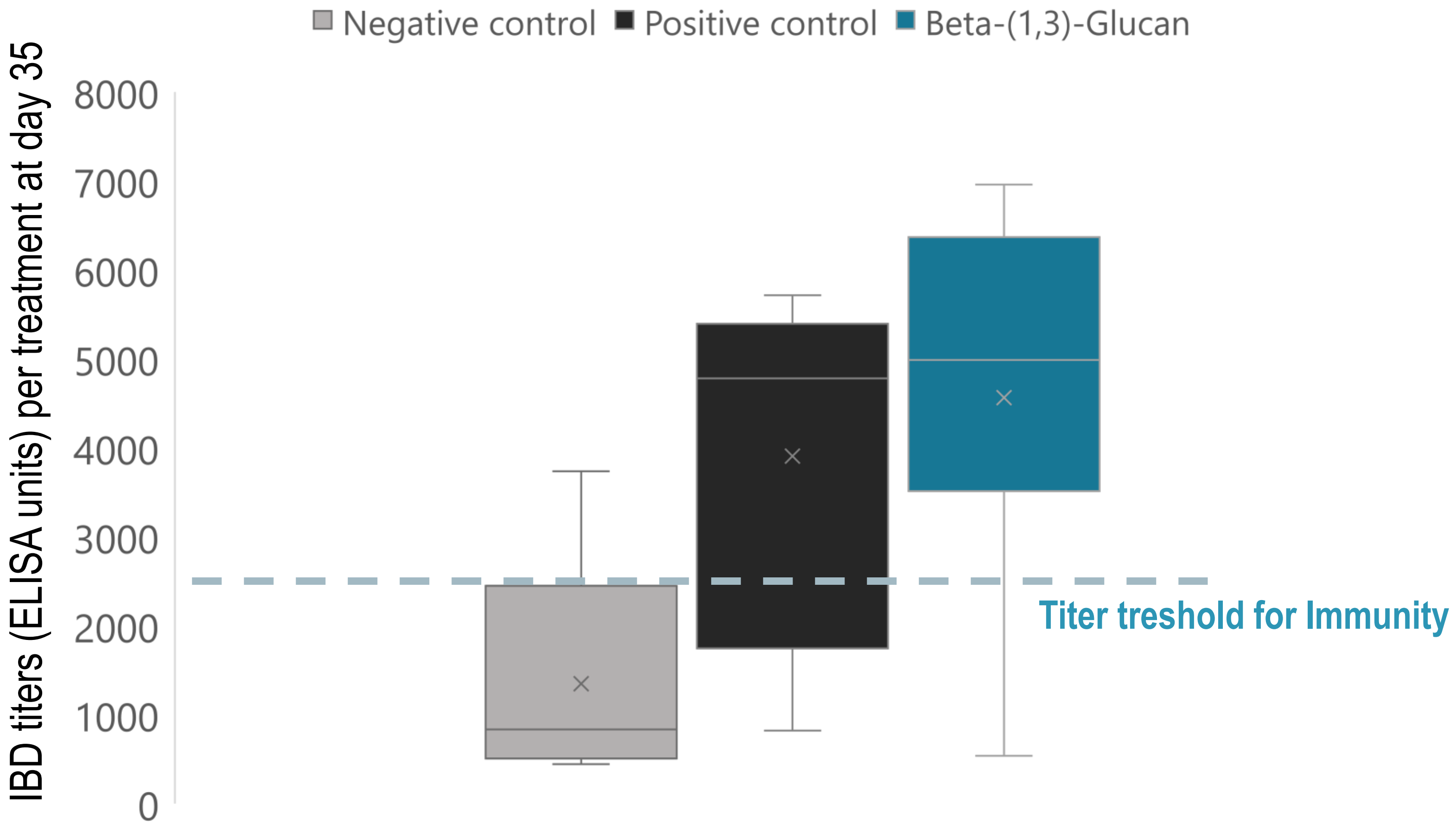
Trial 2. Role in improving vaccination efficiency

Results



β-(1,3)-glucan supplementation increased the specific antibody titers for IBD indicating an enhanced vaccination efficiency

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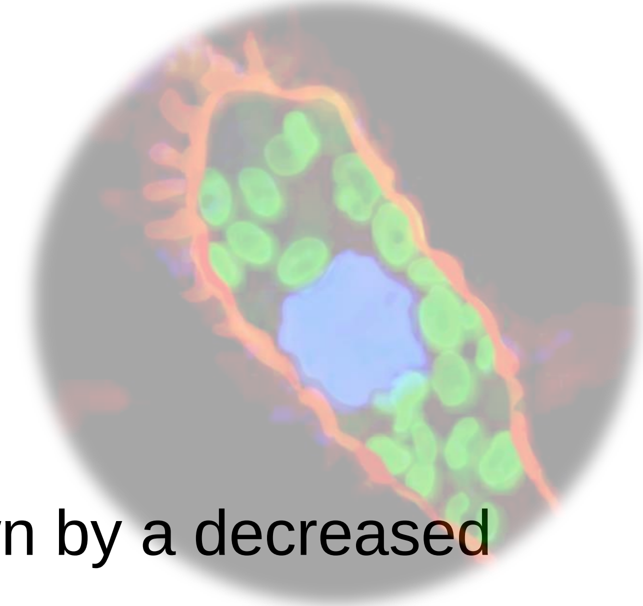
Conclusions



- New source of linear **β-(1,3)-glucan** from **algae**
- Shown to increase **innate immunity** in young pigs as shown by a decreased concentration of haptoglobin, indicating less **inflammation**
- Affects the **acquired immune system** in young pigs by enhancing the proliferation and activity of **T-cells**
- Increases the **IBD vaccination** efficiency in broilers

Thank you!!

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