

The immune response of slow-growing broiler chickens fed black soldier fly larvae meal

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Verenigde Nederlandse
Insectenkwekers



Knowledge Institute



Wageningen Livestock Research



Study Design

- Experimental period: 0-56 days
- Breed: Hubbard JA757
- 8 treatments X 8 replicates

Experimental facility:
Wageningen
Bioveterinary Research,
Lelystad, WUR, The
Netherlands



Dietary Treatment

Stand. Diet with Soybean (Ref)

1% BSF meal

5% BSF meal

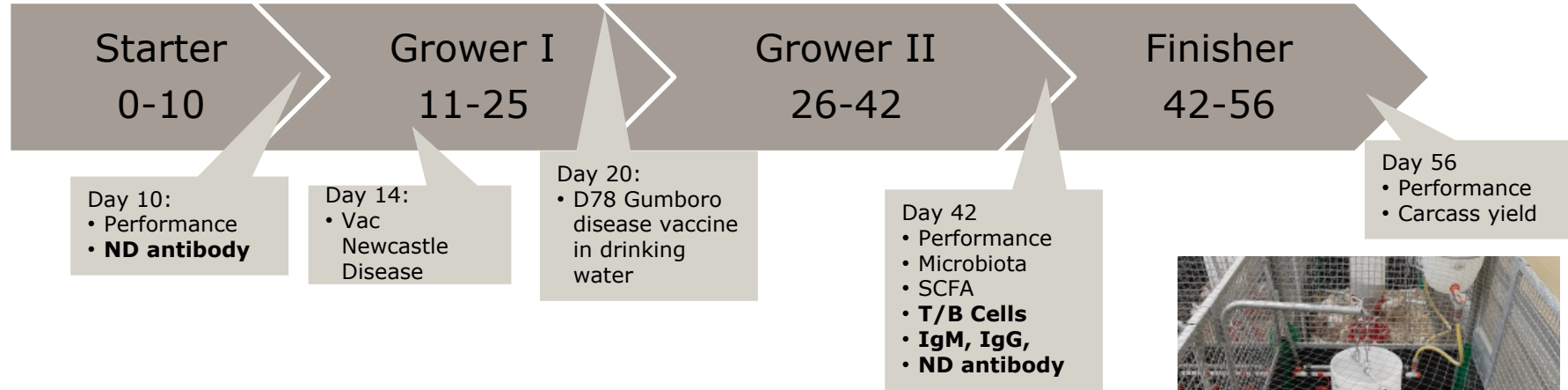
1% BSF meal with extra chitin

5% BSF meal with extra chitin

1% BSF oil

2.5% BSF oil

Experimental Period



Immune measures

Blood samples collected in day 42

- subsets cell population of **T lymphocytes** (CD4+, CD8+, CD4+ CD8+), **B cells**, **leukocytes** (CD45+), and **natural killer cells** (NKC)
- antibody titers to New-Castle Disease Virus
- immunological markers like IgA, IgM & IgY



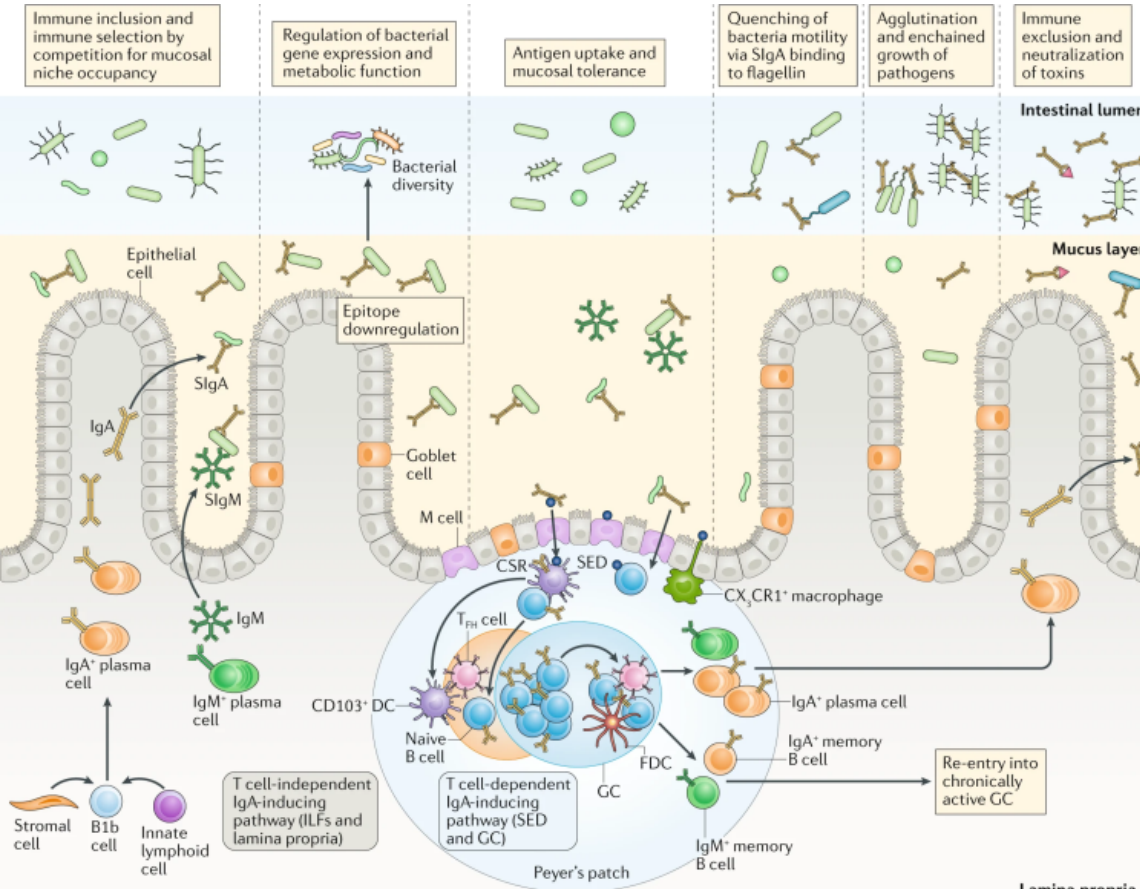
Results

	Control	1% BSF meal	5% BSF meal	1% BSF meal PLUS	5% BSF meal PLUS	1% BSF oil	2.5% BSF oil	F-prob
IgA (mg/ml)	417.0 (82.52)	308.4 (82.53)	449.7 (80.20)	258.9 (82.53)	238.2 (80.20)	225.7 (82.53)	313.3 (80.20)	0.3735
IgM(ng/ml)	66.2 (22.42)	73.2 (22.42)	58.4 (22.42)	64.4 (22.42)	89.9 (22.42)	56.4 (22.42)	41.2 (22.42)	0.7778
IgY(ng/ml)	860.0 (274.27)	1104.5 (282.66)ab	509.6 (274.27)ab	409.5 (282.66)b	1565.2 (292.58)a	1130.4 (292.5)ab	533.0 (274.3)ab	0.0343
ND day 10	640.4.4	543.4	557.4	561.5	498.4	498.7	554.8	0.9967
ND day 42	834	2034	1221	797	504	478	482	0.1871
CD45	3797.0 (536.40)	4090.3 (470.30)	4426.5 (470.30)	3749.8 (470.30)	3717.9 (470.30)	3661.3 (499.7)	3810.9 (499.7)	0.9060
B cell	333.2 (66.42)ab	527.3 (57.73)a	426.7 (57.73)ab	327.6 (57.73)ab	275.0 (57.73) b	429.9 (61.60)ab	294.3 (61.60) ab	0.0505
T cell	2775.9 (475.65)	2847.7 (418.13)	2826.9 (418.13)	2612.6(418.13)	2855.7(418.13)	2645.8 (443.69)	2942.0 (443.69)	0.9903
T cell CD4	651.4 (112.08)	628.1 (98.75)	639.0 (98.75)	538.4 (98.75)	602.4 (98.75)	608.6 (104.67)	701.6 (104.67)	0.8746
T cell CD8	1154.3 (217.89)	1068.8(188.98)	1193.6 (188.98)	1160.6(188.98)	1309.7(188.98)	1140.3 (201.88)	1186.0 (201.88)	0.9929
T cell CD4CD8	107.4 (39.94)	125.8 (39.94)	103.2 (34.59)	181.6 (36.98)	53.8 (34.59)	117.2 (36.98)	45.6 (36.98)	0.1658
NK cells	118.5 (26.06)	105.6 (22.68)	145.8 (22.68)	127.4 (22.68)	99.4 (22.68)	113.9 (24.19)	110.2 (241.9)	0.8741

Results

	Control	1% BSF meal	5% BSF meal	1% BSF meal PLUS	5% BSF meal PLUS	1% BSF oil	2.5% BSF oil	F-prob
IgA (mg/ml)	417.0 (82.52)	308.4 (82.53)	449.7 (80.20)	258.9 (82.53)	238.2 (80.20)	225.7 (82.53)	313.3 (80.20)	0.3735
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IgA production & secretion



1. B-cell Activation
2. Differentiation into IgA-Producing Plasma Cells
3. Migration to Mucosal Tissues
4. Production and Secretion of IgA
5. Transport Across Epithelial Cells

IgA production & secretion

- B-cell Activation
- Differentiation into IgA-Producing Plasma Cells
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[Immunology](#). 1974 Oct; 27(4): 683–692.

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Quantification and distribution of chicken immunoglobulins IgA, IgM and IgG in serum and secretions

[Anne-Marie Lebacqz-Verheyden](#), [J.-P. Vaerman](#), and [J. F. Heremans](#)

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Abstract

IgA was found to be present in **chicken serum** in a concentration of 0.33 mg/ml, thus representing less than **4 per cent** of **total immunoglobulins**. Of this amount, **about 20 per cent** appeared to be **monomeric**, most of the rest consisting of **polymers greater than dimers**.

Conclusion

Low inclusion level of BSF in slow growing broiler chicken diet resulted in a higher humoral immunity



Implications

Further research is needed to determine the efficacy and mode-of-action of BSF and BSF derived products on humoral immune system in chicken

- Hypothesis to be tested:
 - Direct interaction of BSF- *ex vivo* and/or *in vitro*
 - Indirect interactions of BSF – studying the presence and function of microbiome

Questions & Discussion



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