Technical Note no. 7 **May/June 2018**

To be, or not to be inflammatory?!

Inflammation is an essential immune response that seeks to contain microbial infection and *repair damaged tissue* (Barton, 2008). However, there remains much focus on only the negative consequences of inflammation (e.g. nutrient cost) and thus promotion of (oral) 'anti-inflammatory' strategies/products in farm animal production. Does this perspective miss the whole picture? The points below outline some of the positive aspects of inflammatory responses:

1. Inflammatory processes are vital innate responses, providing crucial signals to engage and activate adaptive immunity (Barton, 2008).
2. Inflammatory responses maybe particularly important in young animals due to the better development and responsiveness of innate immunity (Broom and Kogut, 2018).
3. Coccidiosis, a primary infectious gut challenge in poultry, enhances the expression of the anti-inflammatory cytokine IL-10 (Wu et al., 2016). Feeding antibodies against IL-10 reduces intestinal lesions and improves bird performance following coccidiosis challenge (Sand et al., 2016).
4. Reducing IL-10 concentrations has been proposed as a target to improve the efficacy of mammalian vaccines (Wu et al., 2016).
5. Selecting birds for increased pro-inflammatory mediators increases resistance to *Salmonella*, coccidiosis and *Clostridium perfringens*-induced necrotic enteritis (Swaggerty et al., 2016).
6. *Salmonella* serovars that cause minimal intestinal inflammation breach the intestinal barrier and cause systemic infection (Wigley, 2017).
7. Suppressed IL-6, IL-8, and cellular inflammatory response was associated with increased intestinal injury and clinical disease in enterotoxigenic *Escherichia coli* challenged weaned pigs (McLamb et al., 2013).
8. Immune cells from systemic *Salmonella* resistant birds produce more rapid pro-inflammatory cytokine responses, with greater magnitude, and clear infection more efficiently (e.g. Wigley, 2017).
9. Avian immune cells expressing higher pro-inflammatory and lower anti-inflammatory cytokines clear infectious bursal disease virus more effectively (see Broom and Kogut, 2018).

10. Suggestions that chronic intestinal disorders in humans (e.g. Crohns Disease) result from an impaired acute inflammatory response, which delays clearance of invading microbes and leads to on-going, low-level inflammation (see Broom and Kogut, 2018).

Discussion

It seems apparent that rapid, effective inflammatory responses are likely to contribute to robust host defences, whereas chronic, non-resolving inflammation would not be desirable. We should distinguish between inflammatory responses in different body compartments. The potential for enhanced intestinal inflammatory responses may contribute to better gut protection, while broader systemic inflammation, which would be indicative of breached mucosal surface(s), is likely to have greater nutrient cost. We should also differentiate between the triggers of inflammation, for example, pathogens, dietary components, cellular damage (sterile) or nutrient excess (metabolic). It is desirable for animals to mount effective inflammatory responses to pathogens, while it would be advantageous to minimise unhelpful sterile or metabolic triggers. Therefore, greater clarity is needed when discussing (oral) 'anti-inflammatory' strategies/products for animal production. Beneficial 'anti-inflammatory' effects could include reducing negative (inflammation-inducing) interactions between elements of the gut microbiome and the intestinal mucosa and/or minimising tissue pathology and promoting tissue repair pathways, without compromising the ability of the immune system to contain/control infection.

For more discussion on this topic, please see Broom and Kogut (2018) and Kogut et al. (2018).

References

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