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A phytogenic feed additive suppresses inflammatory signals in the gut by controlling the activation of the MAPK pathway and decreasing the level of *Enterobacteriaceae* in broiler chickens

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Certain feed ingredients, such as non-starch polysaccharides, may put considerable stress on the digestive system. When passing a certain threshold, even in the absence of any specific pathogens, this may damage the health status of the gastro-intestinal tract, leading to partial loss of function. Therefore, the aim of this study was to investigate the impact of a phytogenic feed additive on the activation of the mitogen-activated protein kinase (MAPK) signaling pathway and intestinal microbiota in an experimental dysbiosis-challenge model.

Male broiler chickens (Ross 308) were fed either a dysbiosis challenge diet or a dysbiosis challenge diet supplemented with a phytogenic feed additive (150 g/ton) (5 pens/group, 18 birds/pen). Sampling was performed at day 13, 26 and 39. Intestinal microbiome profiling was performed by next-generation sequencing of 16S ribosomal DNA. mRNA expression of genes involved in the MAPK pathway was evaluated by qRT-PCR.

Supplementing the diet with phytogenic feed additive resulted in a significantly decreased abundance of *Enterobacteriaceae* family and increased abundance of *Peptostreptococcaceae* in the ileum at the age of 13 days. A significant decreased mRNA expression of the genes encoding c-Jun N-terminal kinase (JNK) 2, P38 MAPK α, β2, and δ, tumor necrosis factor-α, interferon (IFN)γ, and nuclear factor kappa-light-chain-enhancer of activated B-cells (NF-κβ1) were observed in the caecum of chickens (13 and 26 days old) fed the phytogenic supplemented feed.

These findings suggest that phytogenic feed supplementation results in a decreased level of lipopolysaccharide containing *Enterobacteriaceae* and a decreased pro-inflammatory cytokine release, reducing the NF-κβ1/JNK/P38 MAPK pathway activation, decreasing the inflammatory response.