

TANNIC ACID EXTRACT FOR INTESTINAL INTEGRITY



PHYTOGENICS AND PROBIOTICS FOR BOOSTING GUT HEALTH

VANNIX™ C4 is a proprietary blend of natural, phytogetic ingredients and a probiotic (*Bacillus subtilis* PB6) used to minimize the impact of enteric challenges on poultry performance. Research has shown that the combination of phytoGENICS and the direct-fed active microbial in VANNIX C4 can work synergistically to reduce the impact of enteric pathogens — like *Eimeria* and *Clostridium perfringens* — on poultry intestinal integrity, thereby supporting optimal performance. VANNIX C4 also helps coccidiosis-vaccinated poultry maintain performance.

VANNIX C4 works to minimize factors that challenge gut health — like pathogens, leaky gut, inflammation and dysbacteriosis — thereby allowing birds to reach their full performance potential. **One key phytogetic ingredient in VANNIX C4 is a tannic acid extract, a novel hydrolysable tannin, which supports intestinal integrity.**

VANNIX C4 IS A COST-EFFECTIVE SOLUTION TO **SUPPORT GUT HEALTH AND PERFORMANCE.**

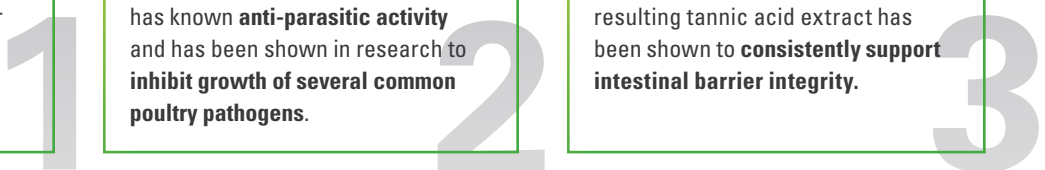
UNDERSTANDING THE 3 Ts

Not all tannins are created equal. There are specific distinctions between tannins, tannic acid and the proprietary Kemin tannic acid extract. VANNIX C4 employs tannic acid extract to reduce oxidative stress, enhance epithelial barrier protection and reduce performance losses resulting from enteric health challenges.

TANNINS are plant-derived polyphenolic molecules which are classified into two groups: hydrolysable tannins and condensed tannins. Feeding high levels of condensed tannins from sorghum is often considered anti-nutritive for poultry, but hydrolysable tannins from gallnuts offer **exceptional intestinal health benefits.**

TANNIC ACID is a type of hydrolysable tannin, which may provide benefits to intestinal health through antioxidant, anti-inflammatory and astringent activities. Additionally, tannic acid has known **anti-parasitic activity** and has been shown in research to **inhibit growth of several common poultry pathogens.**

TANNIC ACID EXTRACT (TAE) comes from tannic acid sourced from gallnuts (60-70% hydrolysable tannins), which is further processed in Iowa, to enhance bioactivity towards poultry pathogens. The resulting tannic acid extract has been shown to **consistently support intestinal barrier integrity.**



MODE OF ACTION

Tannic acid extract may help control oxidative stress and inflammatory response through modulation of pro-inflammatory gene expression, supporting redox balance and maintaining mucosal immunity. The astringent activity of tannic acid positively impacts the small intestine. When delivered to the small intestine, tannic acid can contract the mucus membrane, which can then prevent a leaky intestinal barrier.

The anti-pathogenic benefits of tannic acid extract are seen by the molecule acting directly on the organism to inactivate it, not allowing the pathogen to grow (Figure 1). **Tannic acid extract is effective at destroying sporozoite membranes and reducing their viability** — including those of *Eimeria tenella* sporozoites (Figure 2).

The tannic acid extract benefits on intestinal health are numerous, but one of the most intriguing could be its impact towards reducing enteric challenges. Tannic acid extract can be added for potential pathogen control at the intestinal barrier.

Tannic acid extract may inhibit parasitic enzymes, disrupt the parasite membrane or inhibit parasite metabolism.

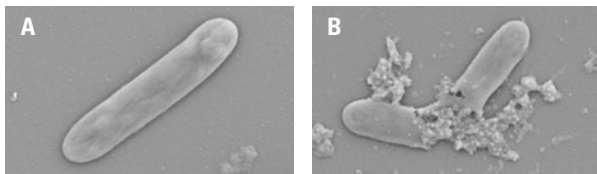


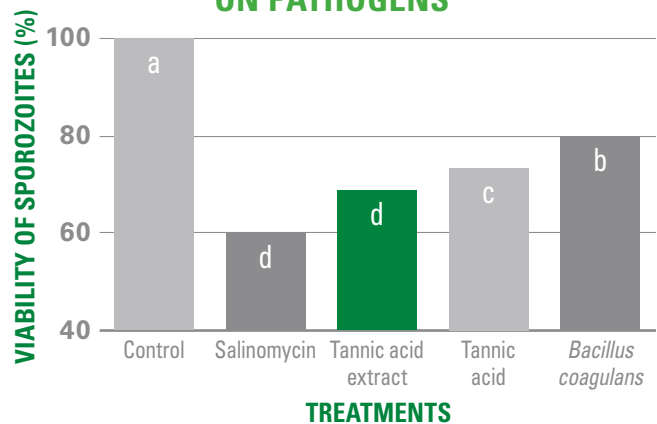
Figure 1: Disruption of the membrane of *Eimeria* sporozoites, reducing their viability. A: no TAE. B: with TAE.

REFERENCES:

Tonda, R., et al. 2018. Effects of tannic acid extract on performance and intestinal health of broiler chickens following coccidiosis vaccination and/or a mixed-species *Eimeria* challenge. *Poultry Science*, 97:3031-3042.
Jayaraman, S. et al. 2013. *Bacillus subtilis* PB6 improves intestinal health of broiler chickens challenged with *Clostridium perfringens*-induced necrotic enteritis. *Poultry Science*, 92:370-374.
VANNIX C: A novel approach to a healthier intestine, BR-2016- 00104.
Effects of tannic acid extract formulations on performance and intestinal health of *Eimeria* spp. challenged and coccidia-vaccinated broilers, PRE-16-00196.
Mueller-Harvey, I. 2006. Unraveling the conundrum of tannins in animal nutrition and health. *Journal of the Science of Food and Agriculture*. 86:2010-2037.
Protective effects of tannic acid extract towards the intestine during inflammatory challenge, 16-00002.
Tannic acid extract and *Bacillus coagulans* a one two punch against poultry enteric challenges, 15-00033.

ONE OF THE MOST INTRIGUING TANNIC ACID EXTRACT BENEFITS IS ITS IMPACT TOWARDS REDUCING ENTERIC CHALLENGES.

EFFECT OF TANNIC ACID EXTRACT ON PATHOGENS



Means with different superscripts are significantly different ($P < 0.05$).

Figure 2: *In vitro* MTT assay for reducing the viability of *E. tenella* sporozoites, as shown in Figure 1.

Kaleem, Q.M., Akhtar, M., Awais, M.M., Saleem, M., Zafar, M., Iqbal, Z., Muhammad, F., and Anwar, M.I., Studies on *Embilca officinalis* derived tannins for their immunostimulatory and protective activities against coccidiosis in industrial broiler chickens. *The Scientific World Journal*, 2014; 378473-378483.
Chung KT, Wong TY, Wei CI, Huang YW, Lin Y; Tannins and Human Health: A Review; *Crit Rev Food Sci Nutr*; Aug 1998; 421-64.
Hamza O.O., Rehman M.U., Tahir M., Khan R., Khan A.Q., Lateef A., Ali F., Sultana S.; Amelioration of 1,2 Dimethylhydrazine (DMH) Induced Colon Oxidative Stress, Inflammation and Tumor Promotion Response by Tannic Acid in Wistar Rats; *Asian Pacific Journal of Cancer Prevention*, 2012; 13:4393-4402.



**GUT HEALTH
SOLUTIONS**

KEMIN

The Kemin Gut Health Triple Check program helps establish intestinal integrity and protection. Kemin offers products to **CLEAN UP** contaminants in feed and water prior to animal exposure, **BUILD UP** intestinal strength and immunity to reduce leaky gut and **KNOCK OUT** harmful pathogens for healthier and better performing poultry.

VANNIX C4 was developed for the **KNOCK OUT** category by supporting intestinal balance to inhibit or eliminate harmful pathogens from infiltrating the body.