TRANSFORM RESEARCH RESULTS BRIEF
DOI: https://doi.org/10.3390/ani14060866
TR-SUBAG-FAA-2022-01 | November 7, 2022 - July 31, 2023

IMPROVING BROILER HEALTH AND PERFORMANCE WITH IN-FEED ADDITIVES IN INDIA

The United States Agency of International Development (USAID)-funded TRANSFORM project partnered with West Bengal University of Animal and Fishery Sciences to examine the effects of two immunity supporting in-feed additives on foodborne and antimicrobial-resistant pathogens, post-vaccination immune responses, gut-health, and growth performance in broiler chickens.

METHODOLOGY

- 324 one-day-old broiler chicks
- 3 dietary treatments: a control, a probiotic (*Bacillus subtilis)* and postbiotic (*Saccharomyces cerevisiae fermentation product*, SCFP)
- 42-day trial

MEASURED

- Growth performance
- Post vaccination antibody titers against Newcastle disease and infectious bursal disease viruses
- Gut microflora: *Enterobacteriaceae,* including *Salmonella sp.*, *Escherichia coli* and extended spectrum β-lactamase producing (ESBL) *Enterobacteriaceae* (Enterobacteriaceae that carry an antimicrobial resistance (AMR) gene)
- Intestinal villus height: crypt depth (VH:CD) and reflecting capacity of the gut to absorb nutrients

RESULTS

SCFP improved (P<0.05) feed conversion ratio (FCR) and increased (P<0.05) antibody titers against infectious bursal disease virus vaccine (Fig 1)

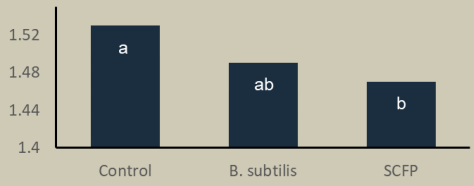
Both SCFP and the *B. subtilis* increased (P<0.05) antibody titers against Newcastle disease virus vaccine (Fig 2)

Both SCFP and *B. subtilis* increased VH:CD (P<0.05) but SCFP had a greater impact than the *B. subtilis* (P<0.05) (data not presented)

Both SCFP and *B. subtilis* reduced (P<0.05) counts of *Salmonella*, *E. coli,* Enterohaemorrhagic *E. coli, and* ESBL- *Enterobacteriaceae* (Table 1)

SCFP was more effective (P<0.05) at reducing counts of *Salmonella*, and ESBL- *Enterobacteriaceae* than the *B. subtilis* (Table 1)

Fig 1. Effect of *B. subtilis* and SCFP on Feed Conversion Ratio of broiler chickens



ab Means bearing different superscripts differ significantly (P < 0.05)

Fig 2. Effect of *B. subtilis* and SCFP on antibody titres against Newcastle disease virus

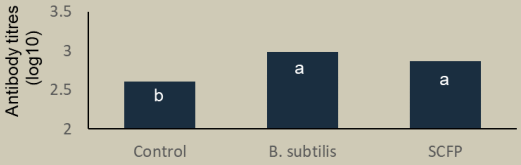


Table 1. Effect of *B. subtilis* and SCFP on viable bacteria numbers (log_{10} CFU/g) in pre-cecal contents of broiler chickens

Attribute	Treatment		
	Control	*B. subtilis*	SCFP
Lactobacillus spp.	5.898	5.928	5.890
Total *E. coli*	7.377[a]	7.136[b]	7.058[b]
Enterohaemorrhagic *E. coli*	3.882[a]	3.245[b]	3.140[b]
ESBL producing *Enterobacteriaceae*	3.109[a]	2.833[b]	2.298[c]
Salmonella spp.	7.526[a]	7.045[b]	6.813[c]

INTERPRETATION AND IMPACT

SCFP and *B. subtilis* can improve animal growth performance and could provide an alternative production practice to using antibiotics as growth promoters
SCFP improved feed conversion ratio, with broiler chickens consuming less feed to achieve the same weight gain as the control. An increase in VH:CD was observed in birds fed either additive, suggesting a larger intestinal surface area with greater nutrient absorption capacity.

SCFP could increase effectiveness of Newcastle disease and infectious bursal disease virus vaccines
An increase in antibody titers following Newcastle disease and infectious bursal disease virus vaccinations suggests better protection from infections. This is the first time SCFP has been reported to increase antibody titer production following administration of an infectious bursal disease virus vaccine.

SCFP can lower levels of foodborne pathogens carrying antimicrobial resistance genes in poultry
SCFP was the most effective at reducing counts of antimicrobial resistant ESBL-*Enterobacteriaceae* and *Salmonella sp*. This is the first time a dietary supplement has been reported to reduce antimicrobial resistant *Enterobacteriaceae* in poultry.

TRANSFORM RESEARCH PORTFOLIO

Over 1.3 billion people depend on livestock as their source of income. Not only are farmers responsible for feeding their families and contributing to the food security of their communities, they're also on the frontlines of global health security. Zoonotic diseases that transfer from animals to humans have the potential to cause the next pandemic, and antimicrobial resistance threatens our ability to treat infections in both animals and humans.

TRANSFORM leverages locally led research to understand how animal nutrition could have the greatest impact on pathogens that threaten human health. By working with research partners in-country and using locally available products and breeds, research trials mimic local farm conditions more closely than domestic lab settings.

The TRANSFORM research portfolio spans more than 20 trials, testing 18 priority pathogens and antimicrobial resistant genes. Nutrition interventions are evaluated across poultry, dairy, swine, and shrimp to identify solutions that both improve farmer outcomes, like increased animal productivity and reduced animal mortality, and global health security outcomes, like decreased disease levels and a reduction of antimicrobial resistant carrying genes.

By taking a localized approach to gathering global insights, TRANSFORM is working to better understand the role animal nutrition can play in helping solve some of our greatest global health security challenges.

ABOUT TRANSFORM

Transformational Strategies for Farm Output Risk Mitigation (TRANSFORM) is a USAID-funded initiative working to strengthen global health security through improved animal health and increase access to safe, affordable, animal-sourced nutrition. Led by a private-sector consortium that includes Cargill, Heifer International, and the International Poultry Council, TRANSFORM works in India, Kenya, and Vietnam to advance market-driven animal health solutions that increase global health security by combatting zoonotic disease and antimicrobial resistance. By working throughout the value chain leveraging a total systems approach, TRANSFORM aims to drive lasting, systemic change through on-farm practices, holistic animal nutrition research, antimicrobial use stewardship, and access to finance to support animal health and economic sustainability.

For more information visit www.cargill.com/sustainability/transform.

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This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Cargill and do not necessarily reflect the views of USAID or the United States Government.