Original Research Article

An IgA-oriented bifidobacterial composition for mucosal immune support: Formulation design, postbiotic synergy, and evidence context

Clara Braun, Anas Ziraoui*, Charlotte Blanchard
European Life Science Research Association, Kington, Herefordshire, HR5 3DJ, United Kingdom

Abstract: We examined a disclosed BALIMONT probiotic composition built around a live three-strain core, a heat-inactivated postbiotic fraction, prebiotic substrates, and a double-layer protective system. The retained dataset points to a coherent IgA-oriented design logic. In the screening phase, the equal-ratio live-strain group (2:2:2) produced the strongest secretory IgA signal and the highest proliferation index among the tested combinations. In the postbiotic-loading screen, a 1:1 ratio between heat-inactivated Lactococcus lactis and the live probiotic core provided the best balance between secretory IgA output and short-term viable-count retention. In the 28-day murine study, medium- and high-dose groups showed higher serum IgA, intestinal mucosal sIgA, and fecal sIgA than the blank and low-dose groups. Storage results further indicated meaningful viability preservation under standard and accelerated conditions. Public studies on bifidobacteria, encapsulation, prebiotic support, and non-live microbial preparations provide a compatible evidence backdrop for the disclosed formulation strategy. Taken together, the composition can be read as a technically integrated mucosal-immune-support platform whose distinctiveness lies in the coordination of strain balance, postbiotic synergy, and delivery engineering.
Keywords: BALIMONT; IgA; mucosal immunity; bifidobacterium; postbiotic; prebiotic; microencapsulation

1. Introduction

Secretory immunoglobulin A (sIgA) is a central effector of mucosal immunity and an informative endpoint for evaluating microbial interventions directed at intestinal barrier support. The BALIMONT composition is notable because it does not rely on a single strain or a single mechanism. Instead, it combines Bifidobacterium bifidum, Bifidobacterium longum, and Lactobacillus rhamnosus as a live core, pairs them with a heat-inactivated Lactococcus lactis fraction and fermentation-associated components, and places both within a prebiotic and protective-delivery framework. This architecture gives the formulation a narrower and more technically defined identity than routine digestive-health probiotic blends, because the biological target is presented not as general gut support but as IgA-associated mucosal immune modulation.

2. Formulation architecture and manufacturing rationale

The disclosed active module uses an equal-ratio live-strain design window within a high-potency viable-count range, while the companion postbiotic module contributes non-live microbial structures aligned with current postbiotic concepts. The excipient system includes FOS, GOS, and inulin together with skim milk powder, trehalose, mannitol, hydroxypropyl methylcellulose, resistant starch, and gelatin. Functionally, the formulation can be understood as an integrated delivery system: the live core supports active microbial signaling, the postbiotic fraction broadens immunologically relevant inputs, the prebiotic blend provides substrate support, and the protectant plus wall-material system addresses freeze-drying tolerance, storage stability, and gastrointestinal transit protection. The design is therefore distinctive not only because of ingredient choice, but because multiple formulation layers are coordinated toward a single mucosal endpoint.

3. Core experimental findings retained from the disclosed dataset

The retained screening data indicate that compositional symmetry matters. Among the tested live-

strain combinations, the 2:2:2 group generated the strongest secretory IgA value (21.35 ug/mL) and the highest probiotic proliferation index (5.62-fold), outperforming the unequal-ratio groups. In the postbiotic-loading screen, a 1:1 cell-count ratio between heat-inactivated L. lactis and the live probiotic core yielded the most balanced profile, maintaining secretory IgA at 21.35 ug/mL while preserving 92.47% viable-count retention at 30 days. The 28-day murine study then showed higher serum total IgA, intestinal mucosal sIgA, and fecal sIgA in the medium- and high-dose groups than in the blank and low-dose groups. Storage findings remained supportive as well, with viable-count retention of 91.45% at 4 C/45% RH, 86.72% at 25 C/60% RH, and 75.18% at 40 C/75% RH after 6 months. Collectively, these results support an IgA-oriented formulation logic rather than a purely descriptive probiotic blend.

Figure 1. Mouse dose-response endpoints over 28 days

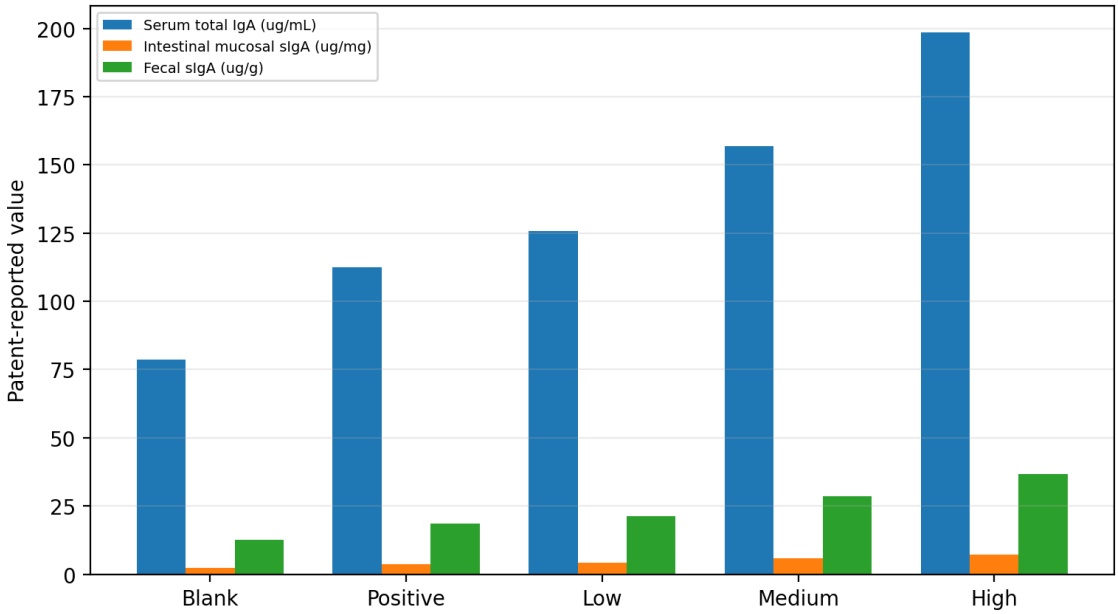

Figure 1. Twenty-eight-day murine IgA endpoints (original figure retained).

4. Public evidence that matches the disclosed mechanistic logic

Publicly retrievable studies align with the main design principles of the disclosed composition. Bifidobacterial administration has been associated with enhanced mucosal IgA signaling in animal models, while encapsulated B. bifidum has been reported to augment intestinal IgA production, which is especially relevant because the disclosed work treats delivery technology as part of biological performance rather than as a packaging detail [4,5]. Infant studies also support the plausibility of non-live bifidobacterial preparations and mucosal humoral effects, and prebiotic supplementation has been linked to higher fecal sIgA in healthy infants [6-7]. Taken together, the published literature does not verify the exact BALIMONT formula, but it does support the scientific rationale for combining live probiotics, non-live microbial fractions, and prebiotic support around an IgA-centered mucosal objective [2-7].

5. Discussion

The strongest feature of this formulation is the way immune support is operationalized through a traceable design logic. Rather than presenting a broad digestive-health blend, the composition narrows its purpose to mucosal IgA support and organizes strain ratio, postbiotic loading, substrate selection, and protective processing around that endpoint. This gives the work translational interest because live probiotics, postbiotics, prebiotics, and encapsulation technologies are not merely co-listed ingredients; they are configured as interacting parts of one system. The retained results are therefore best read as formulation-support evidence for a technically coherent immune-support platform with meaningful industrial feasibility.

6. Conclusion

The disclosed BALIMONT composition presents a technically coherent architecture built from an equal-ratio live probiotic core, a balanced heat-inactivated postbiotic companion, a defined prebiotic substrate system, and a protective delivery strategy. The retained dataset supports its IgA-oriented rationale, and the selected public literature provides a credible evidence context for the underlying mechanistic logic. On that basis, the formulation can be regarded as a scientifically plausible and formulation-driven platform for mucosal immune support.

About the author

*Corresponding author: Anas Ziraoui.

References

[1] Hill C, Guarner F, Reid G, et al. Expert consensus document. The International Scientific Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. Nat Rev Gastroenterol Hepatol. 2014, 11(8): 506-514. PMID: 24912386.

[2] Salminen S, Collado MC, Endo A, et al. The International Scientific Association of Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of postbiotics. Nat Rev Gastroenterol Hepatol. 2021,18(9): 649-667. PMID: 33948025. doi:10.1038/s41575-021-00440-6.

[3] Gibson GR, Hutkins R, Sanders ME, et al. The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. Nat Rev Gastroenterol Hepatol. 2017, 14(8): 491-502. PMID: 28611480. doi:10.1038/nrgastro.2017.75.

[4] Takahashi T, Ohta N, Miyaoka Y. Effects of orally ingested Bifidobacterium longum on the mucosal IgA response of mice to dietary antigens. Biosci Biotechnol Biochem. 1998, 62(1): 10-15. PMID: 9501512. doi:10.1271/bbb.62.10.

[5] Park JH, Um JI, Lee BJ, et al. Encapsulated Bifidobacterium bifidum potentiates intestinal IgA production. Cell Immunol. 2002, 219(1): 22-27. PMID: 12473264. doi:10.1016/S0008-8749(02)00579-8.

[6] Tanaka K, Fujiwara T, Nagana Gowda GA, et al. Bifidobacterium bifidum OLB6378 simultaneously enhances systemic and mucosal humoral immunity in low birth weight infants: a non-randomized study. Nutrients. 2017, 9(3): 195. PMID: 28245626. doi:10.3390/nu9030195.

[7] Terahara M, Nakamura S, Kyoui D, et al. Effects of the intake of non-live Bifidobacterium bifidum on the faecal IgA of full-term infants: a double-blind, randomised, placebo-controlled study. Biosci Microbiota Food Health. 2021, 40(4): 196-203. PMID: 34631331. doi:10.12938/bmfh.2021-018.