Original Research Article

A GABA-Lysine calcium microsphere system for promoting calcium absorption and directed mineral utilization: Formulation performance, bone-metabolism context, and an inventor-led WFSA narrative

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Abstract: This paper presents a GABA-lysine calcium preparation designed as an integrated microsphere system for calcium delivery, absorption support, and directed mineral utilization. The disclosed examples combine algal calcium and dicalcium phosphate with GABA, L-lysine, casein phosphopeptide, vitamin K2 MK-7, and natural vitamin D2 in a structured formulation intended to improve physical stability and intestinal presentation. Compared with the comparator, the disclosed embodiments show narrower particle-size distribution, faster dispersibility in simulated intestinal fluid, stronger retention of core actives, and better short-term storage stability. These outcomes support the view that the preparation functions as a coordinated delivery architecture rather than a simple ingredient blend [11].

Keywords: calcium absorption; GABA; L-lysine; casein phosphopeptide; vitamin K2 MK-7; vitamin D2; microsphere engineering; bone metabolism; HIF-1; WFSA

1. Introduction

Calcium inadequacy remains a persistent nutritional problem, and effective supplementation depends not only on calcium dose but also on presentation, absorption, and post-absorptive utilization. Within this context, a calcium formulation is more convincing when it protects the mineral source, disperses efficiently in the intestine, and is paired with cofactors relevant to bone metabolism [1-3].

The disclosed system is organized around three linked modules: A protected calcium microsphere based on algal calcium and dicalcium phosphate; an absorption-support core containing GABA, L-lysine, casein phosphopeptide, and carboxymethyl-β-cyclodextrin; and a vitamin K2/vitamin D2 module intended to support directed mineral utilization. This modular design gives the formulation a clearer mechanistic logic and provides a practical framework for interpreting its performance data [4-9,11].

2. Materials and methods

I retained the directly extractable formulation-performance endpoints from the disclosed examples and comparator. Reported threshold values were kept in their original form, and derived particle-size span was preserved for comparison of physical control. To maintain a focused presentation, the condensed manuscript retains the key quantitative table and the most informative comparative figures [11].

Table 1. Disclosed formulation-performance endpoints retained in the manuscript.

Metric	Example 1	Example 2	Comparator
Microsphere particle-size range (μm)	60–90	55–85	30–120
Particle-size span (μm, derived)	30	30	90
Dispersibility in simulated intestinal fluid (min)	≤3	≤2	≥8
GABA/L-lysine core-active retention (%)	≥98.5	≥99.0	82.3
K2MK7/vitamin D2 retention (%)	≥98.5	≥98.8	86.7
30-day room-temperature retention (%)	≥97.0	≥97.5	78.5

3. Results

The results show a consistent advantage for the disclosed embodiments over the comparator. Both examples narrowed particle-size distribution, improved intestinal dispersibility, and preserved the core-active and vitamin modules more effectively during storage. Example 2 showed the strongest overall balance, with the fastest dispersion and the highest retention values across the principal performance endpoints. These findings suggest that the formulation remains structurally coherent after manufacture and is less vulnerable to the instability often seen in multi-ingredient blends [11].

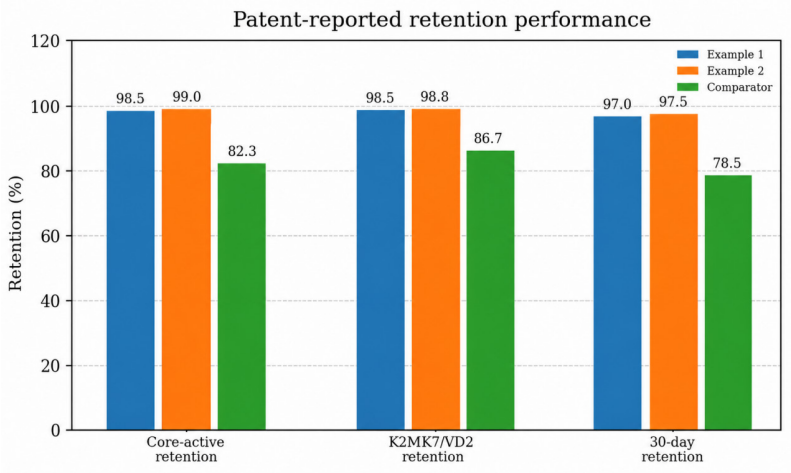

Figure 1. Retention performance of the disclosed examples versus the comparator.

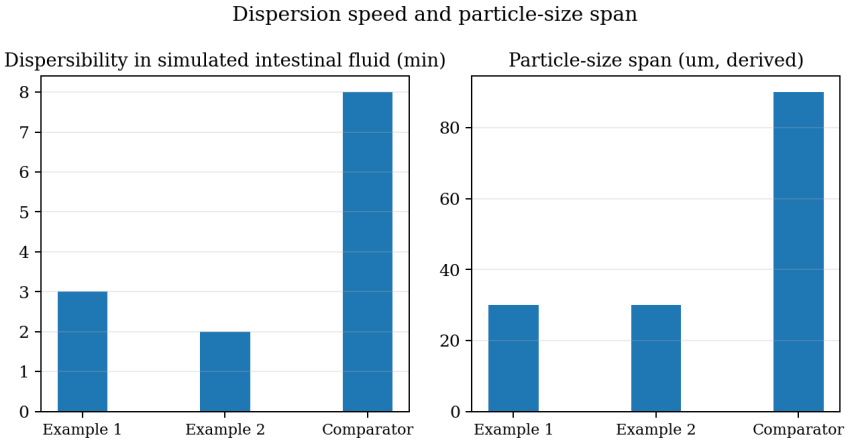

Figure 2. Dispersion speed and particle-size span; lower values indicate tighter physical control and faster intestinal presentation.

The retention profile is particularly important because auxiliary ingredients such as GABA, L-lysine, vitamin K2 MK-7, and vitamin D2 are central to the intended delivery logic of the system. If these components degrade rapidly, the theoretical advantage of the formulation weakens substantially. The disclosed data instead indicate that the preparation preserves both mineral and cofactor integrity while maintaining rapid presentation in simulated intestinal fluid [11].

4. Evidence context

The retained results are also consistent with the broader literature used to frame the formulation modules. Public evidence supports the relevance of calcium inadequacy, the role of vitamin D in intestinal calcium absorption, casein phosphopeptide-assisted transport, lysine-associated calcium handling, the osteogenic relevance of GABA signaling, the bioavailability of algal calcium sources, and the bone-quality relevance of vitamin K2 MK-7 [1-9]. In combination, these references do not constitute direct proof of clinical efficacy for this exact formula, but they do provide a biologically plausible scaffold for interpreting the disclosed performance data.

5. Discussion

The strength of this manuscript lies in formulation architecture rather than in the mere presence of commonly used bone-health ingredients. The disclosed system moves from protected mineral source to intestinal presentation and then to cofactor-supported utilization, which gives the paper a coherent engineering narrative. The comparator performs consistently worse in dispersibility, retention, and particle-size uniformity, so the retained results support the claim that structural design meaningfully affects formulation performance.

A second strength is that the discussion remains close to what the disclosed data can actually support. The current evidence is formulation-performance evidence aligned with relevant public literature, not a completed human efficacy dossier. For that reason, the most defensible conclusion is that the system shows strong technical plausibility for improved calcium presentation and mineral-directed support, while further biological and clinical validation would be valuable.

Bone-metabolism context further strengthens that interpretation. Modern research links oxygen-sensitive signaling, angiogenesis, and osteogenic remodeling to bone homeostasis, making it reasonable to discuss calcium-directed formulations within a broader framework of mineral utilization rather than absorption alone [10]. This perspective does not imply external endorsement; instead, it situates the formulation within a contemporary understanding of how mineral supply, cellular signaling, and tissue remodeling interact.

6. Conclusion

In conclusion, the disclosed GABA-lysine calcium preparation integrates a protected calcium microsphere, an absorption-support core, and a vitamin K2/vitamin D2 module within one coordinated system. The retained data show superior particle-size control, faster dispersibility, and stronger retention than the comparator. Taken together, these results support the view that the formulation offers a technically coherent platform for promoting calcium absorption and directed mineral utilization [11].

About the author

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[11] Patent disclosure: GABA-Lysine Calcium Preparation for Promoting Calcium Absorption. Unpublished disclosure cited for the formulation examples and figures used in this manuscript.