

CASE STUDY



Development of Sustainable Bionanocomposite Materials for Perishable Foods & Drinks Shelf Life Extension

Better Food For All

Project Type:

Collaborative R&D

Project Duration:

1st Jul 2023 - 31st Jul 2025 (25 months)

Project Summery:

This project, funded through the Better Food for All – Nutrition Mid-Stage competition (CR&D), seeks to create advanced, sustainable food packaging capable of extending shelf life and improving food security. Led by METALCHEMY in collaboration with the University of Reading, the initiative has produced bionanocomposite packaging incorporating silver nanoparticles (AgNPs) with antimicrobial and antioxidant properties. These materials target perishable goods such as meat, fruits, and dairy, aiming to improve nutrition, reduce waste, and support affordable food systems.

Objectives & Scope

The core aims of the project were to:

- / Extend shelf life of perishable foods via active antimicrobial packaging.
 - / Complete a Life Cycle Assessment (LCA) and Techno-Economic Analysis (TEA).
 - / Model the societal, environmental, and economic impact of shelf-life extension.
 - / Develop scalable, regulation-compliant packaging to replace petroleum-based plastics.
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Key Achievements

Product Development (WP1):

- / Completion of shelf-life modelling and validation on multiple food types (bread, beef, salad).
 - / Delivery of 400 kg of AgNP-LDPE processed film.
 - / Submission and/or publication of scientific papers on packaging lifecycle and economic impact.
 - / Identification of future optimisation opportunities in the cost of plasma-treated LDPE.
 - / All project milestones and deliverables completed within time.
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Project Impact

The project aligns closely with Innovate UK's vision to enhance food quality and reduce waste. The new packaging materials can:

- / Prolong freshness of highly perishable items.
 - / Reduce foodborne illness risk.
 - / Support environmental goals through biodegradable alternatives.
 - / Foster cross-sector collaboration between academia, SMEs, and food retailers.
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Final Reflections

This project exemplifies the strength of research-industry partnerships in solving global challenges like food waste and climate impact.

Project Management & Delivery

The core aims of the project were to:

/ **Timeline:**

Extended by one quarter (to 15 months) due to supplier delays. Despite this, the project met all key milestones and concluded successfully.

/ **Finances:**

Project delivered within budget, with minor reallocations (e.g. £22,750 from Frutarom to JNCK Bakery to support additional brownie trials). Frutarom reported a small underspend (£670), which was reallocated accordingly.

/ **Compliance:**

All claims submitted and approved. All reporting obligations and documentation completed on time.

Exploitation & Impact

Commercial impact:

/ Tesco retail launches already generating traction and follow-on SKUs.

/ Commercial discussions ongoing with Waitrose, Ocado, and others.

/ JNCK Club, a growing ambassador community, supports brand promotion.

IP Strategy:

/ Trade secrets approach (non-patented, recipe-based confidentiality). Trademark and IP audit completed.

Social Benefit:

/ Over the next three years, JNCK expects to remove 2,400 tonnes of sugar and 600 tonnes of saturated fat from the UK food supply and add significant dietary fibre. The project also supports HFSS compliance and government obesity reduction strategies.

Sustainability:

/ Use of frozen distribution model helps reduce food waste and plastic use; recyclable packaging further supports environmental goals.

Lessons Learned

- / Not all product development milestones are guaranteed (e.g., muffin prototype).
 - / Change management processes were initially perceived as burdensome but became manageable over time.
 - / Early and sustained engagement with manufacturing and retail partners is crucial for product commercialisation success.
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Conclusion

This project delivered significant innovation in healthier, indulgent bakery, with real-world commercial success already realised through Tesco launches. The strategic use of partners (IFF and YF), a nimble technical approach, and responsive project management ensured that even with challenges, the project remained on track and exceeded expectations in impact and exploitation.

As Monitoring Officer, I confirm that all deliverables were met or rationalised, and that the project team has maintained compliance throughout. JNCK Bakery is well-positioned for further commercial success and sector leadership in HFSS-compliant, nutritionally enhanced baked goods.

As Monitoring Officer (MO), Gilly Brunton played a pivotal role in steering the project towards success. Leveraging her expertise as The Wellness Expert, she provided strategic oversight, ensured compliance with Innovate UK guidelines, and supported risk mitigation. Her guidance enabled the project to overcome challenges, optimise processes, and achieve key milestones.