

Advanced biopolymer-based manufacturing techniques

To date, the **BUTTERFLIES** project has successfully completed **Work Package 1**, which is critical as it **sets the scene for the project execution and delivery** through establishing a strong foundation for **advanced biopolymer-based manufacturing techniques**. WP1 focused on defining material, process, and product specifications for two innovative applications: a biodegradable thumb orthosis and a chitosan-based organoid scaffold through advanced additive manufacturing technologies. Key achievements include capturing **industrial requirements**, outlining digital data strategies for process monitoring, and aligning technical development with **business and operational KPIs**.

The project emphasises **sustainability**, aiming to replace conventional materials with **biodegradable alternatives** and reduce environmental impact through circular economy principles.

Future plans involve transitioning from specification to experimental validation, optimising manufacturing processes, and scaling up production for real-world applications.

Aspirations for the coming months include advancing **prototype development**, conducting rigorous testing for safety and performance, and preparing for regulatory compliance and market readiness. Thank you for following our journey. Stay tuned for more updates as we continue to **innovate** and deliver **sustainable solutions for healthcare and beyond**.

Chitin – Nature’s Most Underrated Supermaterial

Why we will use it in medical technology, too

If nature had a “hidden champion,” chitin would be a top contender. Few materials are as widespread, as robust, and as versatile. And yet, many people barely know it—unless they’ve peeled shrimp in the kitchen.

Where Chitin Shows Up – Far Beyond Crab Shells

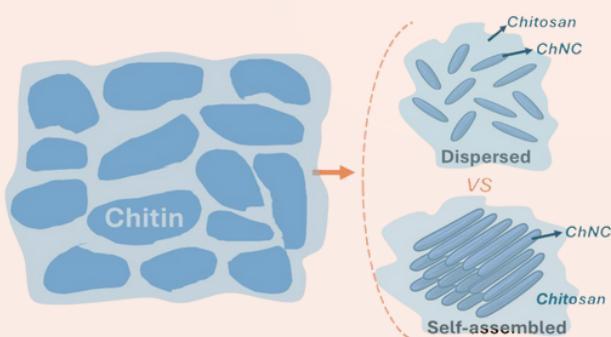
Chitin is a natural biopolymer—a kind of biological plastic fiber—and appears in some surprising places:

- **Insects:** From dragonflies to houseflies, their protective exoskeletons rely heavily on chitin.
- **Crustaceans:** Shrimp, crabs, and lobsters use it to build their sturdy shells.
- **Fungi:** Even mushrooms contain chitin in their cell walls—the structural framework of your everyday champignon.
- **Cephalopods:** Squid and octopuses incorporate chitin into their hooks and beak-like structures.

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Non-reactive bio-adhesive for binder jetting of chitin powder

Binder jet printing (BJP) of robust and crystalline materials such as chitin poses several challenges arising from the powder characteristics, binder formulations, and the process parameters. Among these, the binder exerts a strong influence, as it governs not only the printing behavior but also the structural cohesion and mechanical performance of the final printed component. To achieve high-quality parts, the binder must be chemically compatible with chitin to promote effective interparticle bonding and meet the targeted performance requirements.



To follow single-component additive manufacturing, chitin nanocrystals (ChNCs) and chitosan have been selected as the primary binder components. Their common origin ensures chemical compatibility with the chitin powder, while their complementary roles enhance the binder's performance: ChNCs contribute to reinforcement, whereas chitosan offers excellent adhesion and film-forming ability.

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The Algorithm That Picks the Perfect Glue

How a behind-the-scenes task is setting up smarter binder-jet printing with chitin.

If you want to make binder-jet printing with chitin actually work at scale, you don't start with a machine—you start with a shared notebook. In BUTTERFLIES, that notebook is the Digital Requirements Analysis (DRA). It's the rulebook that says what every team logs (and how), which targets matter, and how those pieces flow into WP5's "Digital Biosphere"—the project's AI-assisted brain for binder-jet optimization.

What makes BUTTERFLIES Digital Biosphere a game changer

WP5's Digital Biosphere isn't just another dashboard. It's where the agreed-upon data turns into actionable recommendations: which binder recipe and which settings to try next for chitin-based prints—ranked against the targets everyone signed up to at the start.

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