

Innovations in Sustainable Medicines Manufacturing

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Innovate UK is the UK's innovation agency

As part of UK Research and Innovation (UKRI), **Innovate UK** is publicly funded to drive innovation and productivity across the UK.

It works to create a better future by inspiring, involving and investing in businesses that are developing life-changing innovations.



At Innovate UK we:



Accelerate innovation, investment and productivity through a world class suite of services that supports UK businesses to grow and develops the innovation talent and skills pipeline.

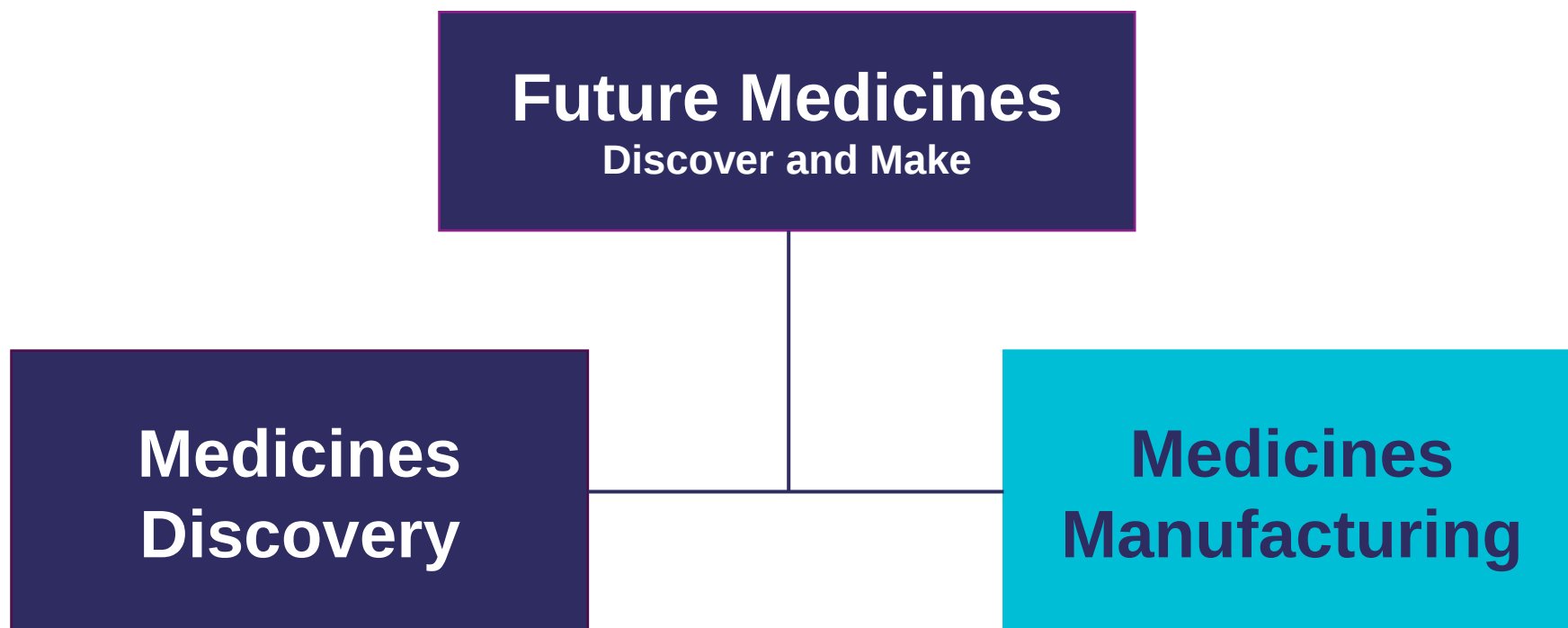


Inspire and invest in **emerging technologies and cutting-edge science, research and development** to directly benefit the UK's industrial future.



Create powerful connections that catalyse and create benefit from the **ethical and safe development of innovative technologies** across the whole of the UK.

Future proofing medicines through new innovation and emerging modalities delivered by sustainable supply chains



Medicines Manufacturing



* UKRI Challenge Fund allocation



Transforming Medicines Manufacturing (TMM)

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£45 million programme
2022-2026

Programme portfolio

Strategic
Investments

Smart
Bioprocessing
Grand
Challenge

Oligonucleotide
Grand
Challenge

Intracellular
Drug Delivery
Centre

Collaborative
R&D
Streams

Digitalisation &
Automation

Nucleic Acids

Intracellular
Drug Delivery

Flexible, Agile,
Scalable and
Sustainable
Manufacturing

Community of Practice



Automation &
Digitalisation



Skills



Manufacturing

Equality, Diversity and
Inclusion



Formulation



- Bring together stakeholders within a cohesive environment of shared learning and collaboration, to drive forwards innovation and enterprise
- Representation from all experience levels and backgrounds
- Launched October 2023
- 400+ members and counting...

TMM project leads

OUTFOX BIO

Theragenics

Vitarka
Therapeutics

MNS

REACH
INDUSTRIES

Sixfold.

Sferola

MESOX

RS&RS
Scientific

MICRON DESIGN
Complete Engineering Solutions

ALMAC

Biologix
Technologies



cpi

TECREA

Spliceor



TOUCHLIGHT



EXACTMER

THERAKIND

BioToolomics

imophoron



medicsen

phycoworks

The London Dermatology Centre®

ID HEALTH

Micropore
Technologies

RNAassist

intellegens

CATAPULT
Cell and Gene Therapy

Causeway
Sensors

elixi

OCTOPODA
RESEARCH & INNOVATION

Aston Particle
Technologies

autolomous

Rentschler
Biopharma

MEDCO HOLDINGS, INC.

ALGREEN
Treat Nature With Nature

nuclera

Plurify

4 FOUR
PLUS

CELL
guidance systems

康龙化成
PHARMARON

aqdot

TMM in a snapshot

As a result of this funding, so far funded companies have...



Raised over **£3.7M+** in match funding, of which £2.7+ by micro- or small-size enterprises



Established **54** new collaborations



8 products, **9** services and **13** processes developed or improved



Registered **3** new patents



Sustainability Improvements



Published **12** new papers



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UK

Case Study: Digital_Lyo

Lead: Lyosenz

Collaborators: Siemens, IS-Instruments, De Montfort University, Micron Design, Qrometric, MHRA, AstraZeneca

Value of Grant: £1 million

Competition: Digitalisation and Automation of Medicines R&D and Manufacture

Innovation area: PAT, freeze-drying

The project aimed to transform freeze-drying for biopharmaceuticals into a more sustainable, efficient process. By integrating real-time multiplexed Process Analytical Technology (PAT), it shortens cycle times, reduces energy use, and **cuts CO₂ emissions by up to 700 tonnes per product**. This approach minimizes waste, bioburden, and batch failures, while enabling continuous manufacturing and adoption of all-electric Peltier cooling systems, eliminating high-GWP refrigerants and liquid nitrogen. These innovations support renewable energy use, improve product quality, and align with the UK Clean Growth Strategy, delivering significant environmental and economic benefits across pharmaceutical supply chains.



Shorter freeze-drying cycles to cut CO₂ emissions



Enables continuous manufacturing and real-time process control, reducing waste



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Case Study: Maximising Efficiency of Liquid Phase Oligo Synthesis (MELOS)

Lead: Exactmer

Collaborators: Centre for Process Innovation, AstraZeneca, Queen Mary University of London

Value of Grant: £1.8 million

Competition: Innovative technologies for nucleic acid medicines manufacturing

Innovation area: oligonucleotides synthesis

Oligonucleotide medicines are transforming treatment for common diseases, but current manufacturing methods are costly and highly polluting. Solid Phase Synthesis consumes vast amounts of solvent and generates waste levels 10x higher than typical drug production. The MELOS project is pioneering Nanostar Sieving, a greener Liquid Phase Synthesis technology. By recycling solvents, improving chemical use efficiency, and **reducing waste by up to 40%**, MELOS is delivering cleaner, more affordable oligos.



Developed the proprietary Nanostar Sieving™ platform, which can be integrated into existing manufacturing assets

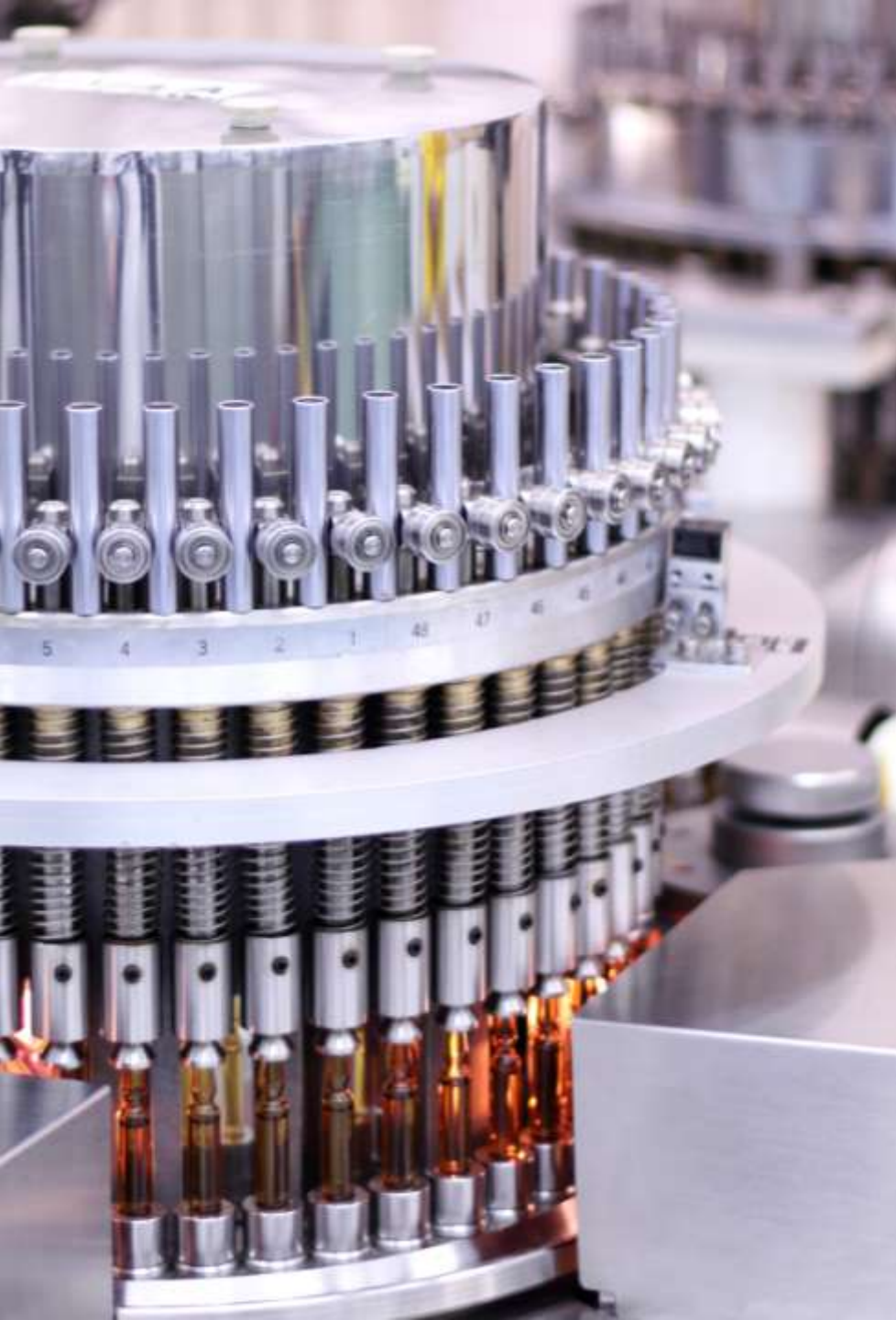


Reduced total solvent consumption and Process Mass Intensity (PMI)



Innovate
UK





The Sustainable Medicines Manufacturing Innovation Programme (SMMIP)

Introduction to SMMIP

Up to £80M funding between FY24/25 and FY28/29 to invest in innovation to drive sustainable medicines manufacturing practices.

SMMIP objectives:



Drive disruptive and novel technologies or processes in medicines manufacturing to optimise production efficiency, minimise waste and reduce emissions, aligning with global sustainability goals.



Facilitate the effective implementation of innovative solutions and promote their adoption across the medicines manufacturing sector, ensuring scalability and widespread utilisation.



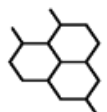
Enhance the UK's attractiveness as a prime location for investment in medicines manufacturing, thereby stimulating economic growth and enhancing resilience in the sector.



Strengthen the UK's manufacturing innovation ecosystem through collaborative partnerships between academia, industry, and government entities, promoting knowledge exchange and collaborative initiatives to enhance sustainable manufacturing practices.

SMMIP - Scope

Core Pillars



Green Chemistry

New Technologies

Solvent free systems

Biomanufacturing

Technology switches



Circularity

Recycle & re-use of solvents, water, plastics

Materials with potential for circularity

Standardised packs



Productivity & Resource Efficiency

Continuous processing

Digitalisation, automation, robotics

Shared data to enable use of AI & ML

Critical Enablers

Regulation:
What regulatory issues are raised by the innovation and how will these be addressed?

Measurements, Standards & Data:
Development of common techniques to enable comparable measurement and reporting of resource efficiency metrics across the sector and supply chain.

Projects must demonstrate how they address both Critical Enablers

Projects must deliver innovation related to at least one of the core pillars

What we have funded so far:

14 CR&D awards

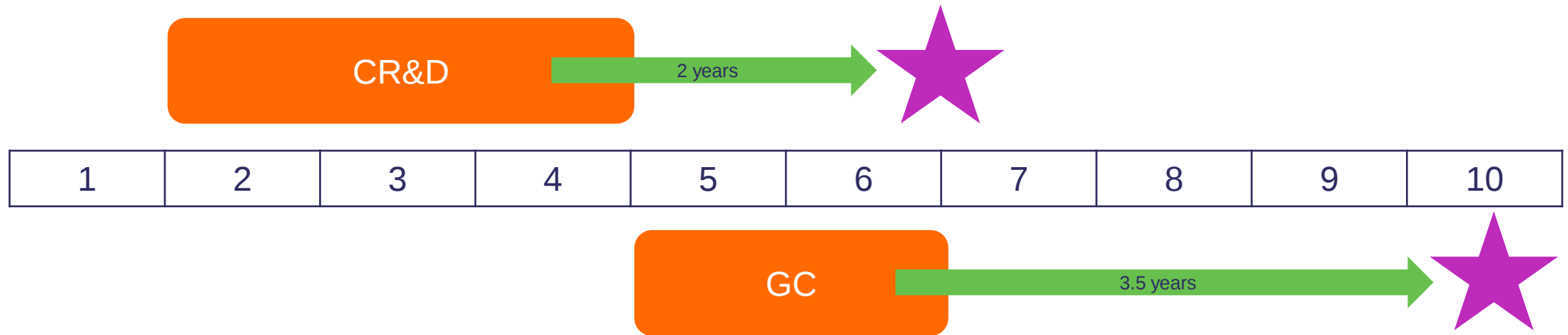
- For collaborative medium-scale projects involving at least two organisations
- More information: [*Innovate UK championing sustainable innovations in medicines manufacturing*](#)
- 14 projects started February 2025
- £13 million awarded to 31 companies

8 Grand Challenges awards

- For large-scale innovation projects, involving at least three partners across the medicines manufacturing supply chain
- More information: [*Sustainable Medicines Manufacturing Innovation Programme drives growth and sustainability*](#)
- 8 projects started November 2025
- £54 million awarded to 70 organisations



What is the expected improvement on TRL?



SMMIP - Partners

Strategic Partners	 Medicines & Healthcare products Regulatory Agency			 RESILIENCE UK Medicines Manufacturing Skills Centre of Excellence		
Delivery Partners	 Medicines & Healthcare products Regulatory Agency		 NPL National Physical Laboratory	 NML THE NATIONAL MEASUREMENT LABORATORY FOR CROSSLINK AND BIO-MATERIALS BODDED BY LSC		 Cell and Gene Therapy  Medicines Discovery

Grand Challenges Brochure



Sustainable Medicines Manufacturing Innovation Programme

Grand Challenges



Related Opportunities



- **Event:**

[From molecules to manufacturing: The role of metrology in medicines development and manufacturing – a sustainability focus \(NPL, NML\)](#)

10th December 2025, Online

- **Funding:**

- [Biomedical Catalyst 2025 small projects](#), closes 10th December
- [Biomedical Catalyst 2025 large projects](#), closes 10th December
- [National Materials Innovation Programme](#), closes 17th December
- Future SMMIP rounds to be announced

Join our [community of practice](#) and/or [LinkedIn group](#) to stay in up to date on all the latest events and funding opportunities.

Thank you



Sustainable Medicines Manufacturing Innovation Programme

Supporting innovation in medicines
manufacturing to drive economic growth,
sustainability and efficiency



<https://linktr.ee/InnovateUKSustainableMedsManu>