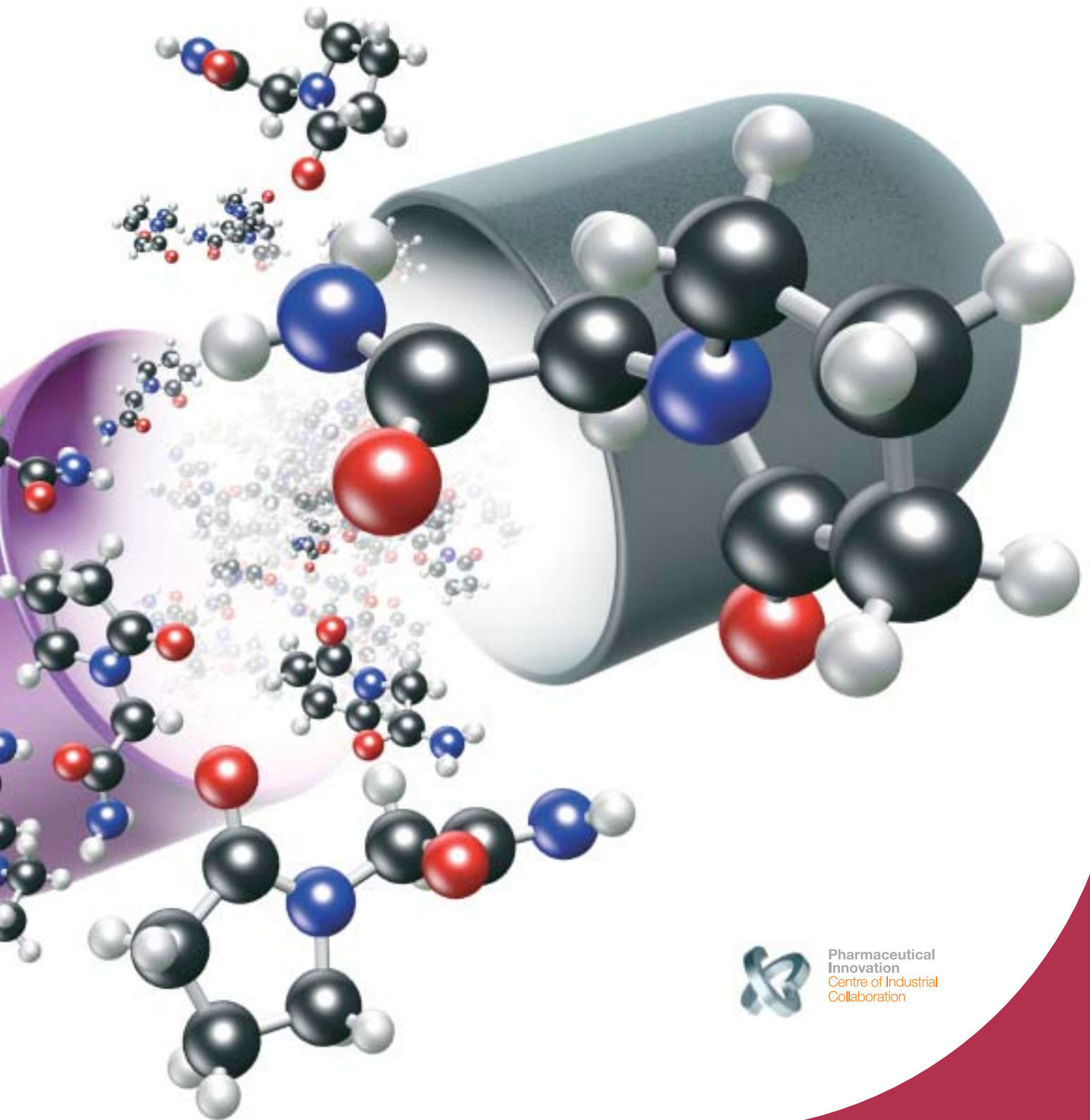


Formulation System Design

ipi

Institute of
Pharmaceutical
Innovation



Pharmaceutical
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Collaboration



The Institute of Pharmaceutical Innovation

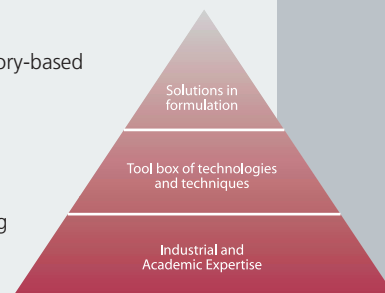
The Institute of Pharmaceutical Innovation (IPI), based at the University of Bradford in the UK, is a centre of excellence in pharmaceutical research. Research in the IPI aims to accelerate the drug development process through the application of the latest experimental and computational techniques. The IPI is an accredited Centre of Industrial Collaboration (CIC), with a mandate to deliver solutions in drug development to industry.

Overview of the formulation capability in the IPI

The team applies a combination of expertise, novel software tools, and laboratory-based techniques to support clients in the design and optimisation of formulations.

Formulation solutions include the following:

- Analysing formulations
- Crystal engineering and particle design
- Application of Artificial Intelligence to optimise formulations and processing
- Design of new delivery systems
- New simulation tools to solve common processing challenges



We can help you to manage your formulation and processing data through provision of expert systems, and help you to develop your future formulation capability through providing training and awareness in cutting-edge techniques.

The IPI formulation team

The formulation team at the IPI has been working at the forefront of pharmaceuticals formulation science for the past 20 years. Professor Peter York, co-founder of Bradford Particle Design, is renowned as a world expert in this field. Professor Ray Rowe has been leading the development of artificial intelligence and knowledge management tools in formulation for the last 20 years and has formulated over 50 ethical pharmaceutical products. Dr Robert Forbes is developing novel approaches in protein formulation for the biotech industry. World-class expertise in crystal engineering is provided by Professor Jamshed Anwar (meso-scale/interfaces), together with Dr. Frank Leusen (molecular simulation) and Dr. Ian Scowen (structural analysis). Knowledge of the latest techniques in particle design for drug delivery is provided by Dr. Nick Blagden.

Formulation solutions

- Formulation analysis

The IPI building provides access to a comprehensive range of materials and structural analysis facilities, a pilot-scale formulation suite, as well as delivery system testing, and bioanalytical laboratories. This combined capability enables comprehensive testing of formulation systems, from materials characterisation, solid-state and surface analysis to assessment of the mechanical and clinical performance of delivery devices (e.g. nebulisers).

- Crystal engineering and particle design

The IPI was founded on the success of Bradford Particle Design, which pioneered use of supercritical fluid technology to engineer drug particles. The Institute continues its groundbreaking work in crystal engineering and particle systems. Typical research solutions in this area include optimising crystallisation processes for new therapeutic agents, developing co-crystallisation systems, and surface modification to enhance drug performance or processability. The IPI continues to conduct fundamental research to simulate crystal nucleation. An ongoing area of research is in the engineering of functional drug particles.



- Formulation development using Artificial Intelligence

The IPI provides data-mining services based on core artificial intelligence technologies (e.g. artificial neural networks and genetic algorithms) to identify relationships in formulation data. Once identified these relationships can be applied to predict the design of new formulations, or to optimise manufacturing conditions for existing formulations. The IPI is working in partnership with software development companies to ensure that clients have access to the latest artificial intelligence techniques.

- Contract development of Expert Systems

Expert systems are transforming the way in which pharmaceutical companies manage and retain formulation data and know-how. The IPI has established a partnership with a software company to offer an expert system which manages information and optimises decision-making at all stages of the formulation process. The system can also incorporate data and expertise gathered through the IPI's own research into optimal formulation design. The benefits of an expert system include identifying opportunities to improve formulation, supporting the development of product line extensions, and capturing knowledge which may be lost due to staff turnover.

- Design of new drug delivery systems

The IPI has the capability to design new formulations at small scale, using modest quantities of active compounds. This process is supplemented with the application of computational techniques to predict the effect of scale-up activity. We have particular expertise in tablet manufacture, protein formulation and the design of inhalation systems.

- Novel simulation technologies under development

The IPI is working with industrial partners to develop a family of software products designed to simulate manufacturing processes. Current projects include: simulating tableting compaction; prediction of cracking in film coatings; optimisation of capsule filling (and other drug containment systems); and modelling powder packing.

Artificial Intelligence Interest Group

The IPI is host to an international consortium of multinational and regional pharmaceutical companies and software providers, which exists to provide the latest relevant information on artificial intelligence as applied to product formulation. Formerly known as the PROFITS (PROduct Formulation using InTelligent Software) group, the Artificial Intelligence Interest Group operates on a pre-competitive basis and funds pioneering research into the application of artificial intelligence. Techniques under review and development include Knowledge Based Expert Systems, Neural Networks, Fuzzy Logic, Data Mining and Genetic Programming. Members also have access to a range of software products, in-house training and consultancy services.

Who to contact:

Piers Lincoln, Commercial Manager
Institute of Pharmaceutical Innovation Centre of Industrial Collaboration
University of Bradford, Bradford BD7 1DP Tel: +44 (0)1274 236193
Mob: +44 (0)7779 669462 E-mail: p.lincoln@bradford.ac.uk





**Institute of
Pharmaceutical
Innovation**

How to contact the Institute of Pharmaceutical Innovation

Mr Paul Thorning

IPI Director
T +44 (0)1274 236151
M +44 (0)7976 121749
p.thorning@bradford.ac.uk

Professor Peter York

Professor of Physical
Pharmaceutics
T +44 (0)1274 234738
p.york@bradford.ac.uk

Dr Frank Leusen

Senior Scientist
T +44 (0)1274 236144
f.j.j.leusen@bradford.ac.uk

Professor Brian Clark

Professor of Pharmaceutical
Analysis
T +44 (0)1274 234707
T +44 (0)1274 236158
b.j.clark@bradford.ac.uk

Mr Piers Lincoln

CIC Commercial Manager
T +44 (0)1274 236193
M +44 (0)7779 669462
p.lincoln@bradford.ac.uk

Dr Ian Scowen

Analytical Centre Director
T +44 (0)1274 236191
M +44 (0)7769 886722
i.scowen@bradford.ac.uk

Dr Riddhi Shukla

Computational Formulation
Manager
T +44 (0)1274 236196
r.y.shukla@bradford.ac.uk

Address

University of Bradford
Bradford
BD7 1DP
UK

www.ipi.brad.ac.uk



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