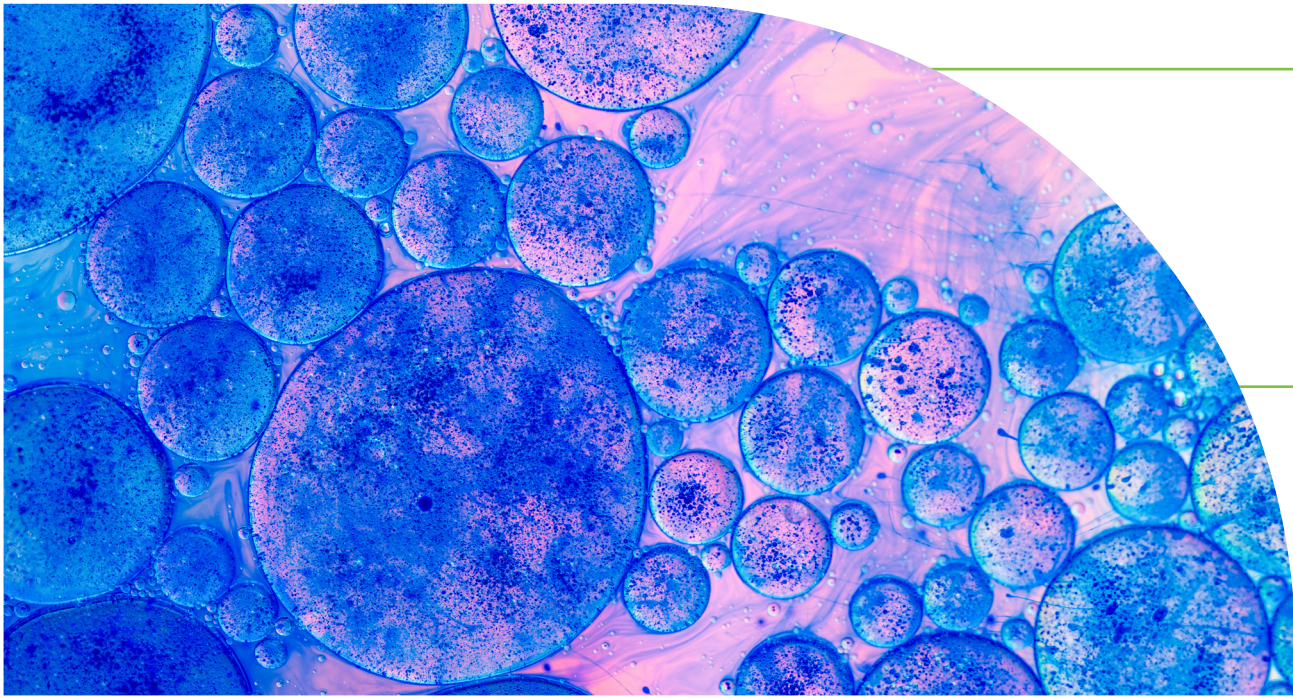
SUSTAINABLE FUTURE STARTS WITH CHEMISTRY

# BIOTECHNOLOGY

Łukasiewicz
Industrial
Chemistry
Institute



# RESEARCH OFFER

**Screening of microorganisms** – search for bioactive compounds

**Optimisation and scale-up of biotechnological processes** (up to 150 l scale)

**Preparation of biological material for long-term storage** (cell banks, lyophilisation)

**Genetic engineering of microorganisms** – design of chemical synthesis pathways, genome analysis based on sequencing, obtaining production strains

***In vitro* biological testing of substances** (e.g. cytotoxicity, anti-inflammatory properties)

# SCREENING OF MICROORGANISMS: SEARCH FOR BIOACTIVE COMPOUNDS

**in silico analysis:** genome analysis, metabolic pathway engineering, plasmid design, knock-in/knock-out mutation design

**next generation sequencing (NGS)**

**identification of microorganisms based on protein profile**

**gene expression level analysis** (RT-qPCR, ddPCR)

**determination of the microorganisms susceptibility to active substances** – MIC, MBC, MFC tests

# GENETIC ENGINEERING OF MICROORGANISMS

***E. coli's* own bacterial expression system**

**construction of new expression vectors**

**obtaining genetically modified *E. coli* production strains** – production of therapeutic proteins (e.g. monoclonal antibodies, growth factors, substitution enzymes), biopolymers, intermediates and chemical compounds

# OPTIMISATION AND *SCALE-UP* OF BIOTECHNOLOGY PROCESSES

**analysis, development and optimisation of biotechnology processes**

**execution of balances and development of kinetics of biotechnological processes**

**guidance and optimisation of microorganism culture conditions for different process modes:** batch process, fed-batch process, continuous process

**conducting and optimising processes based on the culture of microorganisms** under aerobic or anaerobic conditions at laboratory scale in flasks and in bioreactors for maximum working volumes of 5 $dm^3$, 10 $dm^3$, 30 $dm^3$, 150 $dm^3$

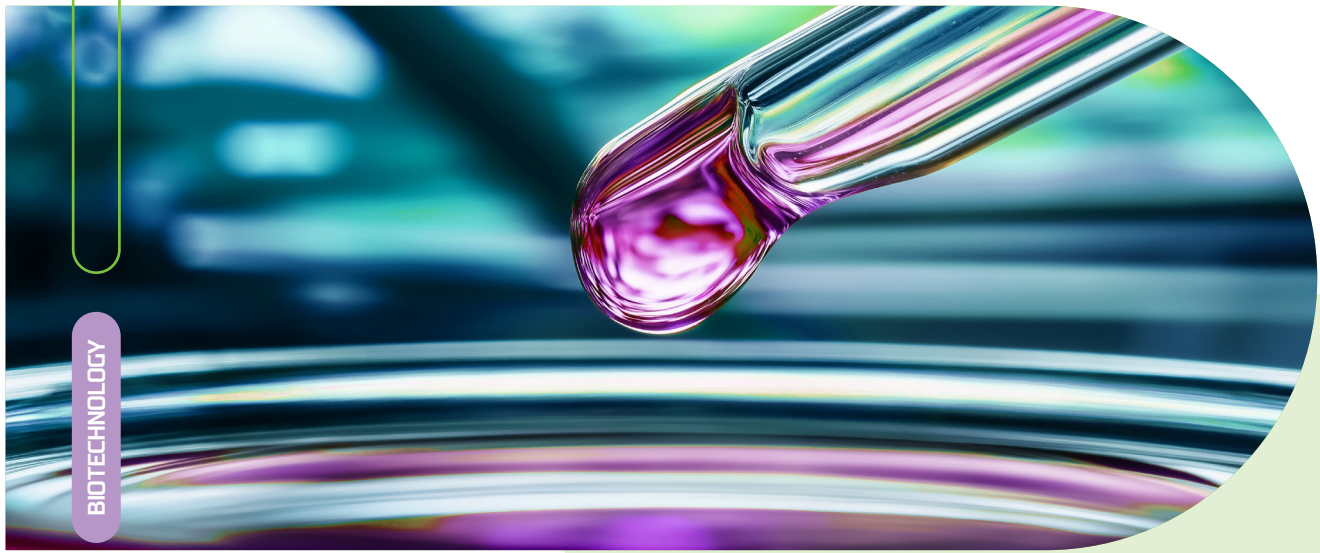
# *IN VITRO* TESTING OF BIOLOGICAL SUBSTANCES

**cytotoxicity study**

**testing of anti-inflammatory properties**

**testing of antioxidant properties**

**testing of antimicrobial properties**

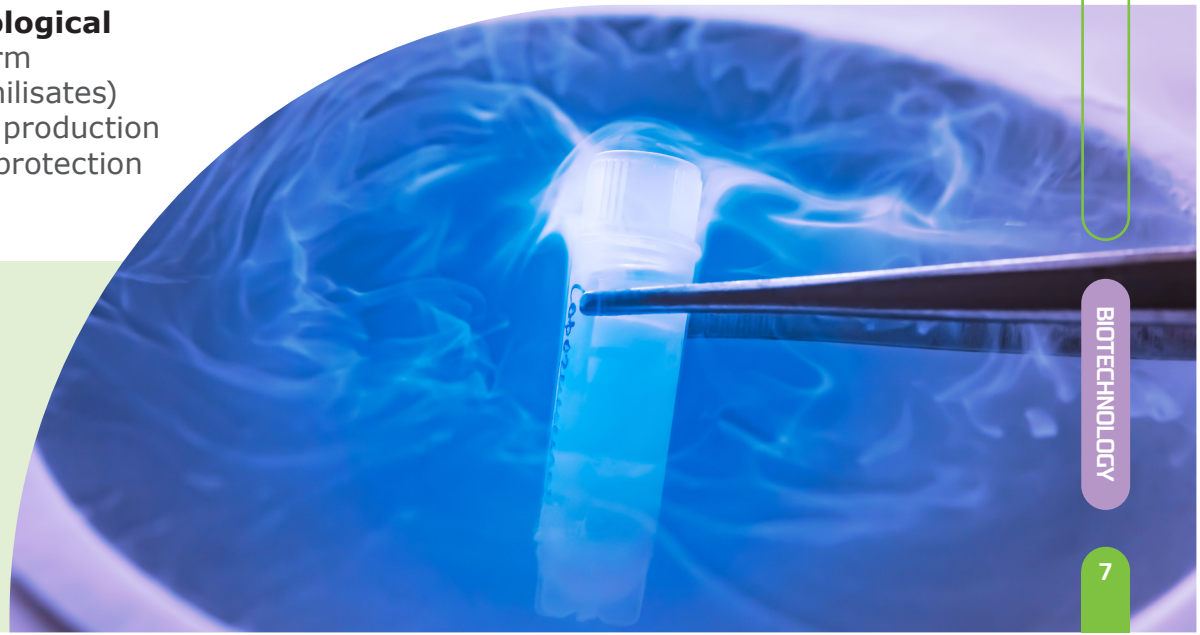


# PREPARATION OF BIOLOGICAL MATERIAL FOR LONG-TERM STORAGE

**control of stability of strains**, preparation and maintenance of the RCB, MCB, JRC Cell Bank

**preparation of biological material** (in the form of biobanks or lyophilisates) for use in industrial production and environmental protection

**performing lyophilisation** according to existing protocol, development and optimisation of the lyophilisation process for different products

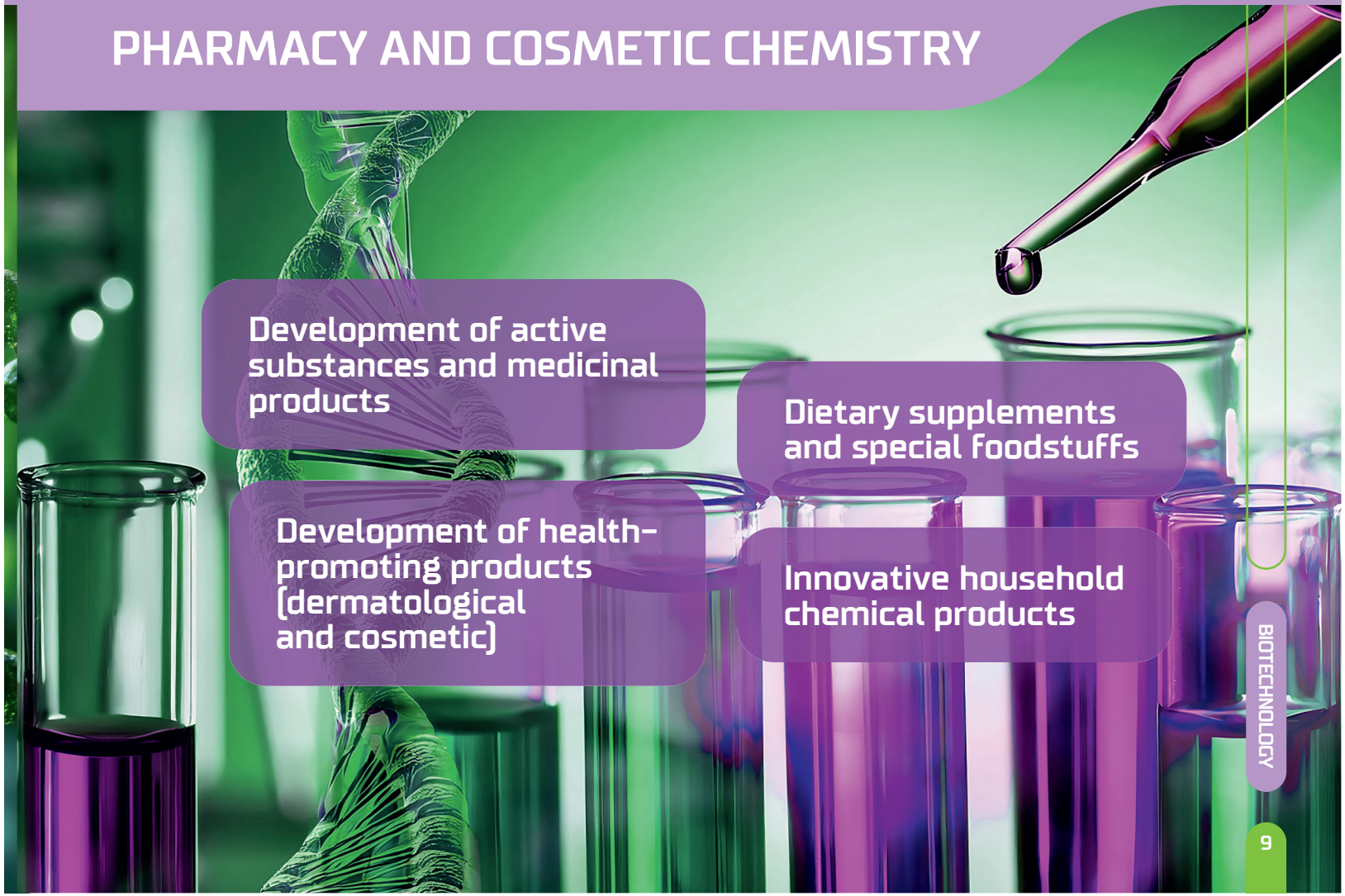


# OTHER

**fluorescence and confocal microscopy**: preparation, observation and analysis of microscopic preparations

**analysis and optimisation of biodegradation processes of organic materials (AMPTS III)**

# PHARMACY AND COSMETIC CHEMISTRY



Development of active substances and medicinal products

Dietary supplements and special foodstuffs

Development of health-promoting products (dermatological and cosmetic)

Innovative household chemical products

# DEVELOPMENT OF ACTIVE SUBSTANCES AND MEDICINAL PRODUCTS

**development of active substance (API) synthesis and technology pathways**, production of API impurity standards, production of polymorphic forms for API substances

**production of active substances** (series from grams to several hundred kilograms)

**innovative drug technologies, generic, generic with added value** (combo products, new form / route of administration, reduced dose, modified release), biosimilars, biologics

**new drug forms** based on known substances

**development of fixed dosage forms with modified release**

**development of technology and manufacturing** of investigational medicinal product and placebo (solid dosage forms)

**blinding and repackaging of the IMP,** as well as storage and distribution to research centres

**technological facilities for the manufacture of small batches of drugs** (bioequivalence studies, rare diseases, orphan drugs)

**waiver of bioequivalence studies**

***in vitro – in vivo* correlation studies**

**preparation of IMPD dossier**

**preparation of registration dossier (CTD)** and others

**implementation of the product into routine production** in the GMP manufacturing area

**post-authorisation changes** to the marketing authorisation for medicinal products (full range of cooperation)

# DIETARY SUPPLEMENTS AND FOODSTUFFS FOR SPECIAL USES

**proprietary biologically active substances** of natural, synthetic and biotechnologically modified

**encapsulation systems for bioactive plant compounds**, improved bioavailability of active substances, protection against degradation

**controlled delivery and release technologies**, transport systems for active substances

**technologies based on pharmaceutical standards** (quality certification, confirmed composition and purity, standardisation of active substances and production methods

**personalisation of supplementation** in response to the specific needs of different consumer groups

# DEVELOPMENT OF PROHIBITIONAL PRODUCTS
## (dermatological and cosmetic)

**proprietary bioactive substances** of natural origin, synthetic and biotechnologically modified

**transport systems for active substances**, protective systems for bioactive substances sensitive to degradation

**cosmetic product development** with Safety Report and registration in the CPNP system – placing the product on the Community market

**cosmetic chemistry technologies** for non-European markets

**formulation modifications** to meet changing legal regulations and consumer requirements

**modern test methods** for safety and efficacy assessment of the active substance and the finished cosmetic product, confirmation of marketing claims

**assessment of the biological potential** of substances and products (transdermal diffusion)

# INNOVATIVE HOUSEHOLD CHEMICALS

**ecological and safe product formulations with reduced irritant potential** – reduction or elimination of chlorine, SLS and synthetic colours

**effective ingredients** – replacing traditional detergents with green products

**hypoallergenic ingredients**, without intense fragrances and aggressive substances

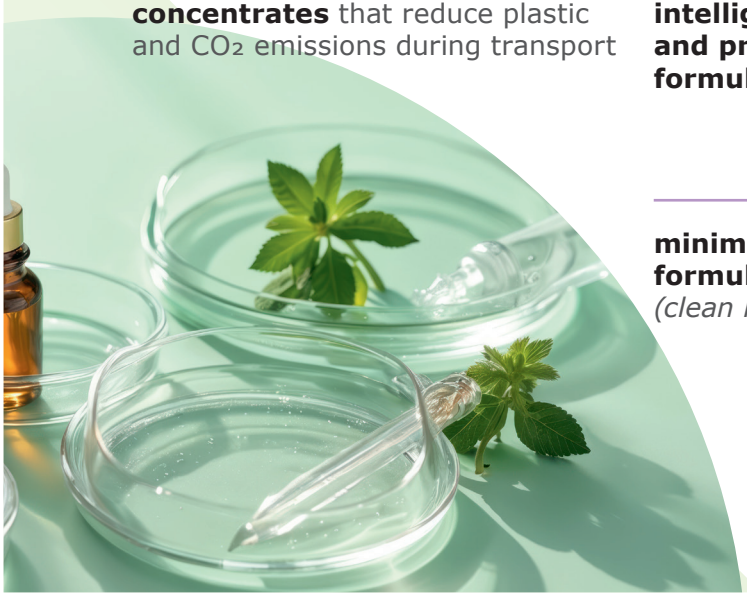
**concentrates** that reduce plastic and $CO_2$ emissions during transport

**intelligent enzyme and probiotic formulas**

**2-in-1 or 3-in-1 formulas** (e.g. cleaning, disinfecting and polishing at the same time) that reduce the number of products used)

**minimalistic formulations** *(clean label)*

**products adapted to new technologies and household appliances**

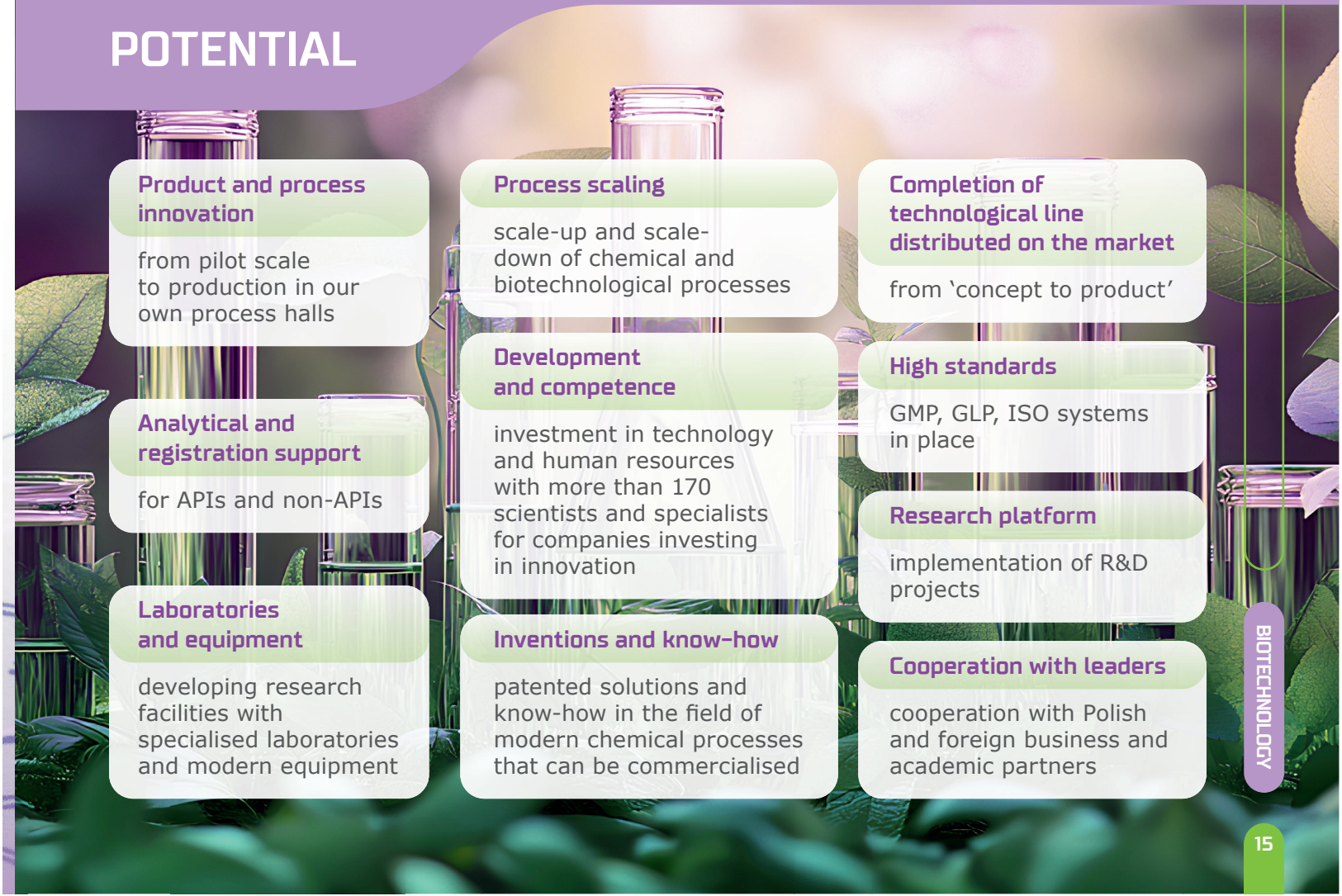


# VALUES

**We work with passion, based on:**

- Professionalism
- Commitment
- Reliability
- Partnership

# POTENTIAL



**Product and process innovation**

from pilot scale to production in our own process halls

**Analytical and registration support**

for APIs and non-APIs

**Laboratories and equipment**

developing research facilities with specialised laboratories and modern equipment

**Process scaling**

scale-up and scale-down of chemical and biotechnological processes

**Development and competence**

investment in technology and human resources with more than 170 scientists and specialists for companies investing in innovation

**Inventions and know-how**

patented solutions and know-how in the field of modern chemical processes that can be commercialised

**Completion of technological line distributed on the market**

from 'concept to product'

**High standards**

GMP, GLP, ISO systems in place

**Research platform**

implementation of R&D projects

**Cooperation with leaders**

cooperation with Polish and foreign business and academic partners

Łukasiewicz
Industrial Chemistry Institute

**We create innovations
that shape a sustainable future.
Trust our knowledge and experience!**

## LET'S MEET!

**Łukasiewicz Research Network
Industrial Chemistry Institute**

8 Rydygiera St.
01-793 Warsaw, Poland
ichp.lukasiewicz.gov.pl/en

**Jolanta Janiszewska, PhD Sc. Eng.
Area Leader. Pharmacy, Cosmetic Chemistry
and Biotechnology Research Group**

+48 604 422 011 | +48 517 883 174
jolanta.janiszewska@ichp.lukasiewicz.gov.pl

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