

## Naše storitve

**NIB ponuja konkretne storitve in rešitve za razvojne projekte ter tudi rutinske storitve, navedene v brošuri.** Znanstveniki in visoko usposobljeni strokovnjaki pri svojem delu upravljajo s sodobno raziskovalno opremo in prostori.

**NIB posluje skladno s standardom ISO 9001.** Nekateri raziskovalni laboratoriji delujejo tudi v skladu s **standardom ISO/IEC 17025**. NIB je imenovan kot predstavnik države v evropski organizaciji za zaščito rastlin (EPPO) in evropski mreži laboratorijev za analizo GSO (ENGL).

**NIB je nosilec državnega pooblastila za biološki monitoring voda, vključno z morskim okoljem** (hidrološki monitoring morja z oceanografsko bojo Vida in HF radarjem) ter zahtevnim ocenjevanjem ekološkega statusa obalnega morja v skladu z Vodno direktivo in Morsko strategijo (monitoring strupenih morskih alg).

Od leta 2015 **inštitut izvaja teste mutagenosti** v skladu s standardi dobre laboratorijske prakse (GLP), oblikovanimi na podlagi smernic OECD.

## Reference - sodelovanje s poslovnim sektorjem in certifikati

- **Lek – Sandoz-Novartis, Slovenija:** Podpora in razvoj zdravil in celičnih linij s pristopi sistemske biologije, nadzoru kakovosti in testi genotoksičnosti zdravil. Podpora pri razvoju 3D sferoidnih humanih celičnih linij za testiranje zdravil.
- **De Ceuster Meststoffen, Belgija:** Karakterizacija bioagensov, čiščenje in kvantificiranje virusov, testi citotoksičnosti.
- **BIA Separations d.o.o., Slovenija:** Novi pristopi za koncentriranje, ločevanje in kvantificiranje virusov za genske terapije, cepiv in bakteriofagov. Obogatitev vzorcev virusov pred NGS in elektronsko mikroskopijo.
- **Norveški inštitut za veterino – Nacionalni referenčni laboratorij, Norveška:** Analiza prisotnosti GSO v hrani in krmi.
- **Cinkarna Celje d.d., Slovenija:** Biološki monitoring odpadnih voda.
- **Radenska d.d., Slovenija:** Genotoksični testi naravne in ustekleničene mineralne vode.
- Oddelek za biotehnologijo in sistemske biologije je akreditiran pri Slovenski akreditaciji s št. akreditacije LP-028 na področju **preskušanja za določanje GSO in mikroorganizmov – povzročiteljev bolezni rastlin**.
- NIB je nosilec **nacionalnega etalona** za področje množine snovi/bioanalize nukleinskih kislin, zlasti na področju GSO in mikroorganizmov.
- Oddelek za Genetsko toksikologijo in biologijo raka je akreditiran za izvajanje **določanja mutagenosti v skladu z načeli OECD** glede dobre laboratorijske prakse (GLP).
- NIB izvaja **test bakterijske reverzne mutacije ali Ames test** (OECD 471) v skladu s standardi dobre laboratorijske prakse (GLP).

## Agronomsko-industrijske storitve

- Določanje gensko spremenjenih organizmov (GSO) v rastlinah, hrani, krmi in semenih.
- Določanje mikroorganizmov – rastlinskih patogenov, to je virusov, viroidov, bakterij in fitoplazem.
- Toksikološke študije prisotnosti agrokemikalij in biocidov.
- In vitro testi genotoksičnosti agrokemikalij in biocidov (Ames, mikronukleus, Comet in g-H2AX testi).
- Ekotoksikološke študije ter biomonitring vodnih in kopenskih organizmov.
- Testi kakovosti površinskih voda in sedimentov, spremljanje organskega onesnaženja, povezanega s kmetijsko dejavnostjo.
- Ekspresija rekombinantnih proteinov v rastlinah.
- Presoja učinkovitosti antimikrobnih snovi.
- Določanje sestave mikrobnih združb v različnih vzorcih z molekularnimi metodami.

## Izobraževanje in svetovanje

- Analitika GSO in rastlinski patogeni: praktično izobraževanje, delavnice, svetovanje in tehnično revidiranje, organizacija testiranja znotraj omrežja laboratorijev.
- Razvoj protokolov in usklajevanje poteka dela v skladu s standardi ISO/IEC 17025 in ISO 9001.
- Organizacija delavnic s področja kvantitativne molekularne in sistemske biologije.

## Storitve za farmacevtsko, prehrabeno in biotehnoško industrijo

- Študije produkcijskih celičnih linij (karakterizacija, iskanje biomarkerjev, optimizacija proizvodnega procesa, zmanjševanje proizvodnega tveganja) z uporabo orodij sistemske biologije.
- Določanje in kvantifikacija nukleinskih kislin, določanje rezidualne DNA.
- Določanje in kvantificiranje na molekularnem nivoju ter elektronska mikroskopija tarčnih mikroorganizmov in biomolekul.
- Koncentracija in čiščenje virusov, bakteriofagov in virusom podobnih delcev.
- Kvantificiranje virusov pri genski terapiji/cepivih ter bakteriofagov za razvoj storitev in izdelkov.
- Celični testi za ocenjevanje viabilnosti in toksičnosti.
- Testi apoptoze, senescence, celične migracije/ invazivnosti pri testiranju zdravil na kompleksnih večceličnih sferoidih.
- In vitro genotoksični testi (Ames, SOS/umuC, mikronukleus, Comet, g-H2AX).
- In vitro študije toksičnosti (citotoksičnost, apoptoza, aktivnost mitohondrijev, oksidativni stres, analiza celičnega cikla, toksikološka regulacija genov).
- Presoja biokompatibilnosti medicinskih materialov naprav in pripomočkov.
- Ocenjevanje formacije mikronukleusov in poškodb DNA v krvnih in epiteljskih celicah (klinične študije, humani biomonitring).

## Okoljski monitoring in analize kakovosti voda

- Določanje učinkovitosti čistilnih naprav (meritve BPK, KPK in mikrobne aktivnosti ter analiza sestave mikrobnih združb, toksičnosti in genotoksičnosti iztoka).
- Določanje učinkovitosti čiščenja vode (metode inaktivacije in odstranjevanja, učinkovitost filtrov-toksikološke in mikrobiološke analize vključno z virusi).
- Koncentriranje in določanje virusov v vodah ter elektronska mikroskopija.
- Analize vode in sedimentov (fizikalno-kemijski parametri, cianotoksini, biološke analize: virusov, fito- in zoobentosa ter fito- in zooplanktona).
- Ekotoksikološki testi z uporabo alg, cianobakterij ter zarodkov navadne cebrice.
- Ocena ekološkega in okoljskega stanja morskih in celinskih voda v skladu z zakonodajo ES (Vodna Direktiva WFD 2000/60/EC, Morska strategija MSFD 2008/56/EC).
- Citotoksični in genotoksični testi vzorcev vode (testi Ames, SOS/umuC, Comet in mikronukleus).
- Raziskovalno potapljanje (potapljaška baza, izkušena ekipa potapljačev s podvodnimi sistemi kamer za snemanje videov in fotografij; spremljanje morske gladine z dronom).
- Svetovanje investitorjem pri načrtovanju posegov znotraj zavarovanih območij.
- Svetovanje in izdelava varstvenih predlogov za izbrane skupine kopenskih in sladkovodnih živali.
- Študije vpliva na okolje.

**Nacionalni inštitut za biologijo – NIB** je vodilni slovenski javni raziskovalni zavod za temeljne in aplikativne raziskave na področju bioloških znanosti. Delovanje NIB se financira iz projektnih sredstev Javne agencije za raziskovalno dejavnost Republike Slovenije (ARRS), z mednarodnimi projekti, s sodelovanjem z državnimi agencijami ter z domačimi in tujimi podjetji.

**NIB je vzpostavil vrsto močnih poslovnih povezav z industrijo doma in po svetu ter z raziskovalni mi institucijami, ki delujejo na področjih farmacije, biotehnologije, kmetijstva, prehrane, okolja ter znanosti o morju.**

Na NIB od leta 2010 deluje **Pisarna za prenos tehnologij**, ki predstavlja enovito točko za podporo raziskovalcem pri upravljanju z intelektualno lastnino, povezavo z gospodarskimi subjekti ter pri razvoju poslovnih strategij, tržnih analiz ter pridobivanju sredstev za raziskave in razvoj produktov ter valorizacijo znanja. Pisarna za prenos tehnologij deluje v okviru Konzorcija za prenos tehnologij iz javnih raziskovalnih organizacij v gospodarstvo.

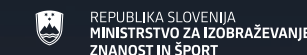
Delovanje pisarne za prenos tehnologij sofinancirata Republika Slovenija in Evropska unija iz Evropskega sklada za regionalni razvoj.

**The National Institute of Biology - NIB** is leading public research institute in Slovenia for basic and applied research in biosciences. It is funded by the Slovenian Research Agency, through EU and international grants, by various governmental organisations and agencies, as well as by companies in Slovenia and abroad.

**NIB maintains strong collaborations with Slovenian and international industry and research institutions in the fields of pharmacy, biotechnology, agriculture, food and environment, including marine sciences.**

The NIB **Technology Transfer Office** has been active since 2010 and represents an integral point that provides researchers with support in dealings with intellectual property, a link with economical subjects, assistance with business strategy development, market analyses, acquiring funds for research and product development as well as knowledge valorisation. The NIB Technology Transfer Office is a part of the Consortium of Slovenian Technology Transfer Offices connecting Public Research Organisations with national economy.

The NIB Technology Transfer Office is co-financed by the Republic of Slovenia and the European Union through the European Regional Development Fund.



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## Our Services

NIB provides custom problem solving projects and routine services listed in this brochure. Highly skilled scientific and professional staff have up-to-date and advanced research instrumentation and facilities at their disposal.

The institute holds ISO 9001 certificate for management. Some analytical laboratories of NIB are also operating in compliance with the ISO/IEC 17025 standard.

NIB is government authorized state Laboratory for Plant Health and National Reference Laboratory for GMOs. NIB is nominated state representatives in European Plant Protection Organisation (EPPO) and European Network of GMO Laboratories (ENGL).

NIB holds government authorized license for implementation of biological monitoring of waters including the marine environment (hydrological monitoring of the sea by oceanographic buoy Vida and HF radar, assessment of ecological status of coastal sea according to Water Directive and Marine Strategy, monitoring of marine toxic algae).

Since 2015 mutagenicity testing is performed in compliance with Good Laboratory Practices (GLP) according to the OECD guidelines.

## References on Collaboration with Industrial Sector and Certificates

- **Lek – Sandoz-Novartis, Slovenia:** Support in development of drugs and cell lines using systems biology approach, quality control and genotoxicity testing. Support in development of 3D spheroid human cell lines for immunotherapy of cancer.
- **De Ceuster Meststoffen, Belgium:** Bioagent characterization, virus purification and quantification, cytotoxicity testing.
- **BIA Separations, Slovenia:** New approaches for concentration, separation and quantification, gene therapy viruses, vaccines and bacteriophages. Virus sample enrichment prior to NGS and electron microscopy.
- **Norwegian Veterinary Institute - National reference laboratory, Norway:** GMO analysis of food and feed samples.
- **Cinkarna Celje, Slovenia:** Biological monitoring of waste waters.
- **Radenska, Slovenia:** Genotoxicity testing of natural and mineral bottled waters.
- The Department of Biotechnology and Systems Biology is accredited according to the ISO/IEC 17025 standard by the Slovenian Accreditation, Reg. No. LP-028 for detection of GMOs and microorganisms – plant pathogens.
- NIB is the holder of National Standard in the Field of Amount of Substance/Bioanalysis of Nucleic Acids/GMOs and Microorganisms.
- The Department of Genetic Toxicology and Cancer Biology is accredited for performing the mutagenicity studies in compliance with OECD Principles of Good Laboratory Practice (GLP).
- **Bacterial Reverse Mutation Assay or Ames Assay** (OECD 471) is performed in the compliance with the principles of Good Laboratory Practice (GLP).

## Services in Agricultural Industry

- Detection of Genetically Modified Organisms (GMOs): plants, food, feed, seeds.
- Detection of Microorganisms – plant pathogens: viruses, viroids, bacteria, phytoplasmas.
- Toxicology studies for agrochemicals and biocides.
- In vitro genotoxicity testing of agrochemicals and biocides (Ames test, micronucleus assay, Comet assay,  $\gamma$ -H2AX assay).
- Ecotoxicity studies and aquatic and terrestrial organisms biomonitoring.
- Quality of surface water and aquatic sediments related to organic pollution due to agricultural activities.
- Recombinant protein expression in plants.

- Activity assessment of antimicrobial substances.
- Determination of microbial community composition using molecular techniques in different samples.

## Training and Advisory Services

- Analysis of GMOs and plant pathogens: hands on training, workshops, consulting and technical auditing, organization of inter-laboratory testing.
- Development of protocols and workflows compliant with ISO/IEC 17025 and ISO 9001.
- Organization of workshops on quantitative molecular and systems biology.

## Services in Pharmaceutical, Food and Biotechnology Industry

- Systems biology studies of production cell lines (characterization, biomarkers identification, production process optimization, production risk reduction).
- Nucleic acid detection and quantification, residual DNA detection.
- Molecular detection, quantification and electron microscopy imaging of target microorganisms and biomolecules.
- Concentration and purification of viruses, phages and VLPs.
- Quantification of viruses for gene therapy/vaccines, bacteriophages in product development.
- Cell based assays for viability and toxicity evaluation.
- Complex multicellular spheroid assays for drug testing, including apoptosis, senescence, migration/invasion assays.
- In vitro genotoxicity testing (Ames test, SOS/umuC assay, micronucleus assay, Comet assay,  $\gamma$ -H2AX assay).
- In vitro toxicity studies (cytotoxicity, apoptosis, mitochondrial activity, oxidative stress, cell cycle analysis, toxicological gene regulation).
- Biocompatibility assessment of medical devices.
- Evaluation of micronuclei formation and DNA damage in blood and exfoliated epithelial cells (clinical studies, human biomonitoring).

## Environmental Monitoring and Water Services

- Validation of waste water treatment plants (WWTP) efficiency (measuring BOD, COD, microbial activity and community analysis, toxicity and genotoxicity of WTP effluents).
- Validation of water purification methods (inactivation and removal, filters efficiency, toxicology and microbiology, including viruses).
- Waterborne viruses concentration, detection and electron microscopy imaging.
- Water and sediment analyses (physicochemical parameters, cyanotoxins, biological analyses of: viruses, phyto- and zoobenthos, phyto- and zooplankton).
- A ecotoxicology testing on algae, cyanobacteria and zebrafish embryo).
- Assessment of the ecological and environmental status of marine and fresh waters following EU legislation (Water Directive WFD 2000/60/EC, Marine Strategy MSFD 2008/56/EC).
- Cytotoxicity and genotoxicity testing of un-concentrated and concentrated water samples (Ames assay, SOS/umuC assay, Comet assay, micronucleus assay).
- Scientific diving (diving base and skilled diving team with underwater camera systems for video and photo recording, survey of marine surface by drone).
- Consulting investors in the developmental planning within protected areas.
- Consulting and designing of nature conservation plans for selected terrestrial and freshwater animal groups.
- Environmental fate studies.



NACIONALNI INŠTITUT ZA BIOLOGIJO  
NATIONAL INSTITUTE OF BIOLOGY

Kdo smo? Who we are?

storitve  
services