

# Analytical Services

Analysis is one of the major tools for successful problem solving and trouble-shooting, especially when conducted by experts with the experience to interpret the results. The techniques can be applied to any commodities where structure, trace elements, contamination and packaging are the subject of investigation. The TARRC analytical laboratories are equipped with a wide range of instrumentation and experienced staff. This facilitates the analysis of a wide range of materials from low molecular weight volatiles to complex molecules, mixtures and polymers.

TARRC can provide certification of compliance with European regulations. Its analytical expertise is recognised extensively in the polymer sector and the pharmaceutical industry, and its Consultancy reputation has been built up over 25 years.

## Main areas of expertise

- Micro-structure analysis
- Polymer experience with respect to packaging
- Compliance with European Directives
- Contamination investigation
- Pesticide residue analysis
- Biomass composition
- Oils and plasticisers
- Working to GMP (pharmaceutical standards)

## Instrumental techniques

- Spectroscopy: FTIR, FTIR-ATR, PIR, UV, NMR
- Chromatography: GC-MS, GC-FID, GC-NPD, GC-NCD, TLC, HPLC, GPC, IC, LC-MS, GC-HID, Headspace analysis
- Thermal Analysis: TGA, TGIR, DSC
- Microscopy: light, SEM, STEM, TEM, AFM, ultramicrotomy
- Elemental: SEM-edx, ICP, IC

## Pharmaceutical standard analysis

- Method development
- Method validation
- Substances of high concern

- Extractables or migration testing (eg from packaging to product)
- Formaldehyde analysis

## Typical areas of work

- Reject product testing
- Checking against specification
- Compliance with European requirements
- Method development for regulatory bodies
- Trace metal analysis
- Wax characterisation
- Preservatives / antioxidants
- Surface finishes
- Residual processing chemicals

## Packaging analysis

- Analysis of existing materials or development products
- Compliance testing with European / US food contact regulations
- Leachables and extractables
- Migration testing

## Oils analysis

- Saturated, unsaturated, polyunsaturated fatty acid levels
- Biofuels analysis
- Aromatic oils analysis

## Accreditation

- Many of the analytical methods are approved by UKAS to ISO17025
- Site-wide accreditation to ISO9001
- In 2009 TARRC's pharmaceutical facility was audited by an independent US agency with no critical findings

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# Biotechnology and Analytical Services



# for all commodities

# Biotechnology Services

Today more than ever, the introduction of any improvements into an organism requires a deep understanding of its structure, function and behaviour. Furthermore, comparison of an organism's detailed genetic characteristics, both between clones and across species, can also provide valuable information that may be used to derive its improvement. The application of modern biotechnological methods has a key role to play in facilitating such improvements and in their monitoring.

TARRC's Biotechnology Consultancy expertise is available in areas of :

- *plant genomics* The area focuses on activities aiming to determine the entire genome sequence of organisms, as well as fine-scale genetic mapping efforts);
- *plant molecular biology / genetics* (investigating the roles and functions of single or complexes of genes);
- *plant proteomics* (consisting of comprehensive study of proteins, particularly their structures and functions);

with advice and practical assistance available in troubleshooting and results interpretation.

A wide range of both routine and specialised molecular biology techniques is available for nucleic acid and protein studies. Application of these techniques is generally common to all living organisms and therefore can be applied in improvement of a wide range of economically important species.

TARRC's geographical location, in the centre of the UK's 'Biotech Triangle', facilitates opportunities for training and collaborative work with a wide range of the UK's leading research centres and companies.

The new purpose built biotechnology laboratory is fully functioning and space in the fully equipped facility can be offered on a 'bench fee' basis.

## Main areas of expertise

- Gene cloning and protein expression in plant or bacteria heterologous systems
- Generation of protein mutants for studies on protein stability and functionality

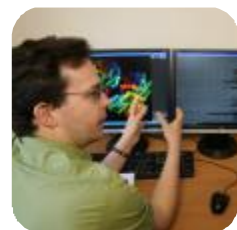
- Studying protein processing, maturation and targeting using both *in vivo* and *in vitro* approach
- Production of recombinant proteins in *E. coli* or plant systems such as *Arabidopsis thaliana* and *Nicotiana tabacum*
- Protein purification from bacterial cultures or plant tissues and protein characterisation
- Quantitative and qualitative analysis of total protein content using a 'proteomic' approach
- Measurement of stability and kinetics of protein-protein and protein-antibody interaction
- Molecular marker development and validation
- Genotyping using range of molecular markers – SNP, SSR, AFLP, RFLP and others
- Genetic mapping
- QTL mapping and its utilisation in Molecular Marker Assisted Selection (MAS) and Molecular Marker Assisted Breeding (MAB).
- Sanger sequencing
- Sequence assembly and annotation using combination of NG and Sanger sequencing data
- Gene Expression Analysis
- Bioinformatics

## Instrumental platforms

- Low volume, high-precision pipetting platform: Nanodrop II
- Automated nucleic acid purification: QIAcube
- Protein purification, FPLC: AKTAavant
- Analysis of two-dimensional protein gels: Delta2D
- Capillary electrophoresis: Applied Biosystems Prism 3130xl
- Automated electrophoresis system: Experion
- Fluorescence and absorbance assays: Labtech LT-4000 Microplate Reader
- Real Time - PCR: Applied Biosystems 7900 HT

## Typical areas of work

- Genome sequencing
- Molecular marker development and application
- Gene Expression Analysis
- Lateral flow diagnostics
- Proteomics
- Bioinformatics
- Training of staff in specialised research areas / degree training / mentoring through UK university attachment with experimental work at TARRC



# Bioinformatics Services

Bioinformatics addresses the challenges of analysing, storing and interpreting biological data with a range of computational and statistical techniques. This can involve analysing DNA and protein sequences, gene expression patterns, interaction and regulatory networks, protein structure prediction and a host of other applications.

## Hardware resources at TARRC

Currently TARRC has a 55-core high-performance Linux computing cluster with 136GB RAM and 10TB dedicated storage and using Platform LSF software for job management. This can facilitate a wide range of computationally intensive applications including sequence assembly and annotation and gene expression analysis.

## Bioinformatics at TARRC

TARRC's main bioinformatics efforts are currently in sequencing, assembly and annotation of the rubber tree genome and in comparative studies of the rubber tree and related species.

## Main areas of expertise

- *De Novo* sequence assembly from next generation platforms and Sanger sequencing
- Functional annotation of genomic sequence
- Gene and protein sequence analysis
- Data curation

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