

Molecular Oncology

WP25, 1

Projects

Contact:

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1.

Area: Immunology/Immunogenetics

Title: Analysis of DMBT1 genetic polymorphisms in caries risk

Goal: Determine whether a deletion polymorphism in DMBT1 is associated with increased risk for caries, a problem that remained unsolved over the past 30 years.

Techniques:

DNA preparation from blood samples

Development of a sensitive and robust quantitative PCR approach

PCR analyses

Statistical evaluation

2.

Area: Immunology

Title: The role of the pattern recognition molecule DMBT1 in complement cascade activation

Goal: Functional studies of complement cascade activation via DMBT1 in vitro

Techniques:

Complement activation assays

ELISA

Bacterial interaction studies

Western blotting

3.

Area: Nanomedicine/pharmacology/cancer

Title: Conception of novel drug delivery devices

Goal: Testing transfer of DNA/RNA to cancer cells via synthetic peptides, determination of selective cell binding of these peptides

Techniques:

Bacterial aggregation assays

Plasmid/siRNA transfection

Fluorescence microscopy

Eventual: FACS

Fluorescent labeling of peptides

Immuncytofluorescence

Cell culture

Quantitative RT-PCR

Western Blotting

4.

Area: Medical Biotechnology

Title: Development of novel protein purification systems

Goal: Setting up an easy system for fast protein purification from cell culture supernatants

Techniques:

Recombinant cloning techniques

Construction of stable cell lines via recombination

Cell culture

Protein enrichment via bacteria

Western blotting

5.

Area: Cancer/cell biology/genomics

Title: Targeted functional scan for novel breast cancer genes

Goal: Determination of the effect of a defined gene/miRNA set (10-20) on breast cancer growth

Techniques:

Gene cloning via state-of-the-art techniques

In vitro gene shuttling between vectors via recombination

Site-directed mutagenesis

Construction of stable cell lines via site-specific recombination

Cell viability assays

Data analysis

6.

Area: Cancer/cell biology/genomics

Title: Targeted scan for novel metastasis modulators in breast cancer

Goal: Determination of the effect of a defined gene/miRNA set (10-20) on breast cancer metastatic spread

Techniques:

Gene cloning via state-of-the-art techniques

In vitro gene shuttling between vectors via recombination

Site-directed mutagenesis

Construction of stable cell lines via site-specific recombination

In vitro cell invasion assays

Data analysis

Biotechnological methods. Methods with mammalian cells

7.

Area: Cancer/genomics/drug discovery

Title: Set up of robotic drug screens

Goal: Testing initial parameters for genome-wide siRNA screens with the new high-throughput robot

Techniques:

Cell culture

siRNA transfection

Cell viability assays

Working with robot hardware and software

8.

Area: Cancer/diagnosis/cell biology

Title: Development of biochip-based cancer stem cell marker detection

Goal: Setting up a robust method for cancer stem cell marker detection on a biochip

Techniques:

Cell culture

Preparation of cell lysates

Working with spotting robot

Design and production of biochips

Antibody-based detection of marker proteins on biochip

Data analysis

Biotechnological methods. Methods with mammalian cells

9.

Area: Cancer/therapy/drug development

Title: Characterization of a novel cancer drug target

Goal: Role of a novel protein kinase in cancer and construction of devices with selective cancer cell killing activity

Techniques:

Gene cloning via state-of-the-art techniques

In vitro gene shuttling between vectors via recombination

Site-directed mutagenesis

Construction of serially deleted gene variants

Construction of stable cell lines via site-specific recombination

Cell viability assays

Potentially: apoptosis/cell cycle assays

Data analysis

10.

Area: Cancer/therapy/drug development

Title: Characterization of a synthetic lethal drug target

Goal: Further studies on selective killing of cancer cells (skin cancer) via tumor suppressor targeting

Techniques:

siRNA knock-downs

Cell culture

Cell viability assays

Determination of drug resistance/drug sensitivity of cancer cells

Combined siRNA/drug treatments

Biotechnological methods. Methods with mammalian cells

11.

Area: Cancer/therapy resistance

Title: Melanoma resistance to BRAF-inhibitors

Goal: BRAF-inhibitors are a new generation of drugs for the treatment of advanced (metastatic) melanoma. While effective in first instance, tumors rapidly develop resistance. The goal of this project is to create BRAF-inhibitor resistant melanoma cells for exploring the resistance mechanisms and to find new ways of overcoming them

Techniques:

qRT-PCR

Cell culture

Construction of stable cell lines via site-specific recombination

Western blot

12.

Area: Medical biotechnology

Title: Construction of cancer cells for easy genetic manipulation

Background/goal: The construction of cancer cells with engineered changes is still a challenging task. We have been developing a new cutting-edge technology, which makes this convenient and easy. This project aims at constructing modified cancer cell lines, which can easily be manipulated for research and drug discovery approaches.

Techniques:

Cell culture

Stable transfection and selection of cells

Subcloning of cancer cells

qRT-PCR

FACS

Fluorescence microscopy

Biotechnological methods. Methods with mammalian cells

13.

Area: Cancer/cancer genomics

Title: Targeted screen for novel melanoma genes

Background/goal: Recent genome-wide sequencing approaches, addressing alterations in all human genes, recovered a set of about 70 new genes with mutations in melanoma. The goal of this project is to clone a subset (10-20) of these genes and to analyze their impact on cancer growth in melanoma.

Techniques:

PCR

RT-PCR

Advanced gene cloning techniques

Analysis of sequencing results

Construction of stable cell lines via new technologies

Cancer growth assays