The Fraunhofer-Society is the largest organization for applied research in Europe

- Research of direct utility to private and public enterprise and of wide benefit to society

- Customers: Industry, Service sector, Public administration

- 7 Groups: Information and Communication Technology, Life Sciences, Light & Surfaces, Microelectronics, Production, Defence and Security, Materials and components
FOUNDATION OF THE FHG-EMB

Founding group at the University of Lübeck „Intracellular transport“ and mother institute FhG-IBMT

2004: FhG-IBMT Working group: Cell differentiation & Cell technology at the UzL (250 m²/2 Mio €)

2008: Fraunhofer-Institution for Marine Biotechnology (1.200 m²/15 Mio €)

2015: New FHI with focus on medical and marine biotechnology (5.000 m²/30 Mio €)
WORKING GROUPS AND CENTRAL FACILITIES

Head of Institution
Prof. Dr. Charli Kruse

Cell differentiation
Dr. M. Brandnburger

Cell technology
Dr. D.H. Rapoport

Aquatic cell technology
Dr. M. Gebert

Aquaculture
Dr. R. Marquardt

Translational medicine
Dr. S. Danner

Cell culture and analysis

Tools and devices
ADULT STEM CELLS - A SHORT INTRODUCTION

- asymmetric division gives rise to new stem cells (blue) and various progenitor cells (colored)

- progenitor cells differentiate into finally terminated cells (differently shaped)
ISOLATION & ANALYSIS OF MULTI-POTENT GLAND-DERIVED STEM CELLS

- Pancreas
- Sublingual gland
- Submandibular gland
- Parotid gland
- Sweat gland

Mesodermal cells

Endodermal cells

Ectodermal Cells

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WORK GROUP “CELL DIFFERENTIATION”

Tissue Engineering

Ureter

Patient specific in-vitro-testsystems

Biologization of implants for minimizing the foreign body reaction

Electrodes for deep brain stimulation

Cell based therapies
- Dermal wound healing
- Peripheral nerves
- Heart
- Intestine
- ...

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ORGANOTYPIC TEST AND MODEL SYSTEMS

Human 3D skin equivalent, e.g. for analyzing wound healing

Heart slices for analyses of pharmaceuticals

Aggregates of spontaneously contracting cardiomyocytes from rainbow trout

Cryopreservation of organotypic systems
WORK GROUP „CELL TECHNOLOGY“

Automated cell tracking using time-lapse microscopy

3D cell culture/ cell transplantation:
- adherence measurements
- biologization of surgery materials

Bioreactors for adherently growing cells
Cryoconservation of stem and progenitor cells from vertebrates
Cooperation with several zoos (Hagenbeck, Rostock, Neunkirchen, SeaLife Center, …)
Currently: 3118 samples from 80 different species of mammals, birds, fishes and reptiles
8 fresh water and 4 marine fish species
→ one of the worlds biggest collection of living cells for scientific purposes
MOBILE STEM CELL LABORATORY
WORK GROUP „AQUATIC CELL TECHNOLOGY“

Cell cultures from aquatic organisms

In vitro manipulation of fish cells and eggs

Cellular test systems (e.g. cytotoxicity, aquatic ecotoxicology, diagnostics for fish diseases)

Development of molecular tools for fish
PRODUCTION OF FISH MEAL FROM FISH CELL CULTURES

target markets: aquaculture, nutrition, pharma, medicine

continuous cell culture
Utilization of marine resources for:

- Development and analyses of dietary supplements for human and animal nutrition, food and feed
- Development of innovative processing-technologies
- Cooperative and mandate research
- Cooperation with universities, practical trainings
“FISHING DOWN THE FOODWEB”

(Pauly et al. 1998 Science)
TO AVOID ENVIRONMENTAL PROBLEMS SOMEWHERE ELSE
Aquaculture in the Baltic Region

- Salmon cages in the sea ??
- Trout cages in clean lakes ???
Ökologisch besonders wertvolle marine Gebiete im Deutschen Ostseebereich
2. überarbeitete Auflage, Januar 2001

© Bundesamt für Naturschutz (BNH)


Die Karte ist regelmäßig aktualisiert. Anmerkungen und Ergänzungen können über das Bundesamt für Naturschutz, INA Insel Vilm, 18561 Putbus, erbeten werden.

Aquaculture in the Baltic Region

- Salmon cages in the Baltic
- Trout cages in our clean lakes

- landbased (but with multi-trophic concepts)
- new species
- new products
WORK GROUP „AQUACULTURE“

Landbased integrated multitrophic aquaculture

Clean water

Sea bass

Particulary nutrients

Blue mussel

Dissolved nutrients

macro algae

Biofilter

Protein-skimmer

Circulary pump

UV-Light

Working Group: Landbased integrated multitrophic aquaculture

1. **Clean water**
   - **Sea bass**
   - **Particulary nutrients**

2. **Blue mussel**
   - **Dissolved nutrients**

3. **macro algae**

4. **Biofilter**

Additional notes:

- UV-Light
- Protein-skimmer
- Circulary pump
Benefits

1 t Fish

salmonfarm: 1500 t salmon → 85.5 t nitrogen

91 kg N

57 kg N

34 kg N

*1) Mente et al. 2006
*2) Abreu et al. 2009

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Extracts from algae for cell culture media

effects of extracts on rat cell culture (Rattus norvegicus) RApan 5bP8;

Extracts from different Baltic Algae with different effects on cell proliferation
biofilm inhibition against *Staphylococcus epidermidis* via Rhodophyta

effects of metabolites of different Rhodopita species on Biofilms: strong inhibition through *Chondrus crispus* (-99%, -98%), *Dumontia contorta* (-95%, -87%) und *Polysiphonia fucoides* (-95%, -92%).
THANKS

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