Development of an *in vitro* arthritic joint model

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Rheumatoid Arthritis (RA):

- 100 different forms of arthritis
- RA-Prevalence: 0.5 – 1.0% worldwide
- Patients are normally aged > 50 years; mainly women
- Chronic inflammatory autoimmune disease related to joints
- Functional limitation: morning stiffness, pain, immobility
- Therapeutic strategy complex with focus on remission

→ no healing and medication with adverse effects
Pathogenesis of RA

- Autoimmune disease with unknown cause
- Inflammation originates in the synovium

Induction
- Release of inflammatory mediators & cytokines
  - Chronic inflammation of the synovial tissue
    - Proliferation forming "Pannus"
      - Cartilage and bone erosion
        - Joint destruction

Clinical Challenges in RA

Proportion of RA patients by disease activity according to DAS28-criteria

No low disease activity or remission is achieved in 26.6% of patients.

DAS = Disease Activity Score; RA = Rheumatoide Arthritis


There hasn`t been a complete therapy for this disease yet.
→ basic and translational research is needed!
Motivation from Animal Perspective

Rheumatoid Arthritis (RA)

Spontaneous

KxB / N (KRN mice x NOD mice)
SKG (mutation in the ZAP-70)
TNF-tg (overexpression of human TNFα)
IL-1-tg (overexpression of human IL-1β)
IL-1Ra-/-

Chemically-induced

Adjuvant induced (AIA)
Collagen induced (CIA)
Pristane induced
Oil induced
Proteoglycan induced
Antigen induced

Classification of Severity: Moderate/Severe

“... we are not 70 kg rats.”

Thomas Hartung, Professor of Johns Hopkins University

Alternatives and Limitations

**In vitro models:**

- Monolayer cultivation
- 3D cultivation
- *Ex vivo* cultivation of patient-derived material
- BUT: mostly cell lines are used


Aim of the Project

Development of an *in vitro* 3D **human disease model** with the combination of different cell systems in order to **replace** animal models.
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Development of an *in vitro* 3D human disease model with the combination of different cell systems in order to replace animal models.
Research on Joint Disorders *In Vitro*
Thank You for Your Attention!

Acknowledgment

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