

# DISC DEGENERATION – BASIC FEATURES

- Notochordal cells – mechanical, biological
- Proteolysis – fragmentation, retention
  - altered function – FN, HA
- Nutrition – O<sub>2</sub>, glucose
  - end-plate calcification
- Mechanics - load magnitude, frequency, duration
  - signal induction
- Macromolecules – synthesis, **retention**
- GF – synthesis, **receptors**
- Proteinases – synthesis, **activation**
- Message analysis – **correlation with proteins**

• For any questions on this summary  
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# DISC DEGENERATION - PRIMARY

- Progressive – variable rate
- Age-related
- Not necessary painful
- Genetic predisposition
- Little influence life-style (?)
  - Occupation - Loading
  - Nutrition – Smoking
- Mechanism of pain induction ?
- Susceptibility genes
- Protective genes

# DISC DEGENERATION - SECONDARY

- Consequence of trauma
  - Mechanical induction
  - Reflect most animal models
- Accelerated degeneration?
- Influence of external factors?

# DISC DEGENERATION – ANIMALS MODELS

- **Rat, Rabbit, Dog, Sheep, Goat, etc**
  - Trauma models – AF or EP disruption
- **Different to humans**
  - Age of animal
  - Size of disc
  - Cellularity
  - Notochordal cells
  - Distinct growth plate
  - Genetically different
- **May not be a common mechanism of degeneration**
- **Essential for evaluation of therapy**

# DISC DEGENERATION - DIAGNOSIS

- **Imaging**

- X-ray
- MRI - quantitative
- Other - acoustic

**Need greater discriminatory power**

- **Biomarker - serum**

**Difficult because of slow release of degradation products**

- **Cannot predict painful disc**
- **Cannot predict rate of progression**

# Treatment of DD – late stage

- **Spinal fusion**

- Multiple techniques – cage, insert
- Adjacent disc degeneration, non-fusion

- **Disc arthroplasty**

- Multiple prostheses
- non-physiological mechanics
- revision difficult
- no long term observations

- **Disc replacement - biological**

- Fresh/frozen allografts
- Tissue engineered disc (motion segment)

# Treatment of DD – intermediate stage

- **Nucleoplasty – synthetic**
  - Replacement by contained gel
  - Require AF disruption
- **NP supplementation – biological**
  - Injectable
  - Cell-based – type, scaffold
  - Growth factor-based - direct injection, gene therapy
  - Cytokine-based - block receptors/signaling
  - **Nutrient supply not support increased metabolism**
  - **Viral vector may induce immuno response**
  - **Growth factors ectopic effect**
  
  - Matrix based – PG/HA (?)
  
  - Chemonucleolysis
  
  - Oral
  - Drug based – glucosamine, esculatin (?)
  - Prophylaxis (no side effect)
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