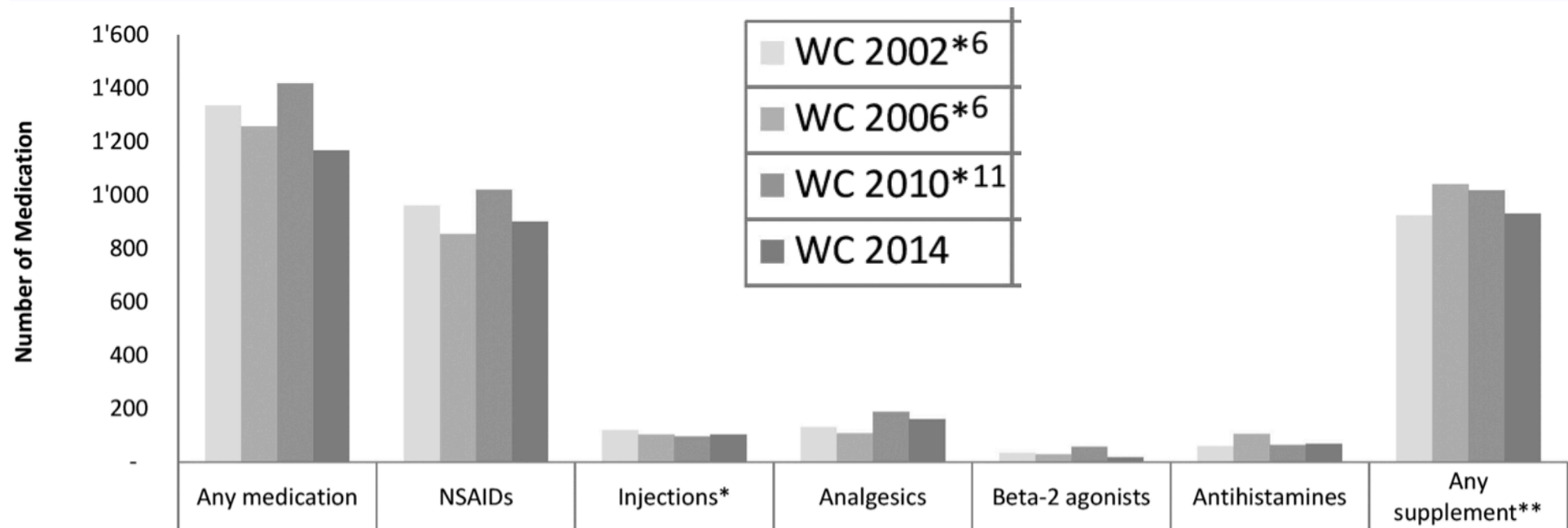


# USE OF NON-PROHIBITED MEDICATION IN SPORTS

Dr. med. Maximilian Schindler & Dr. med. Philippe Tscholl



# Use of medication in FIFA WC



Per game 30%

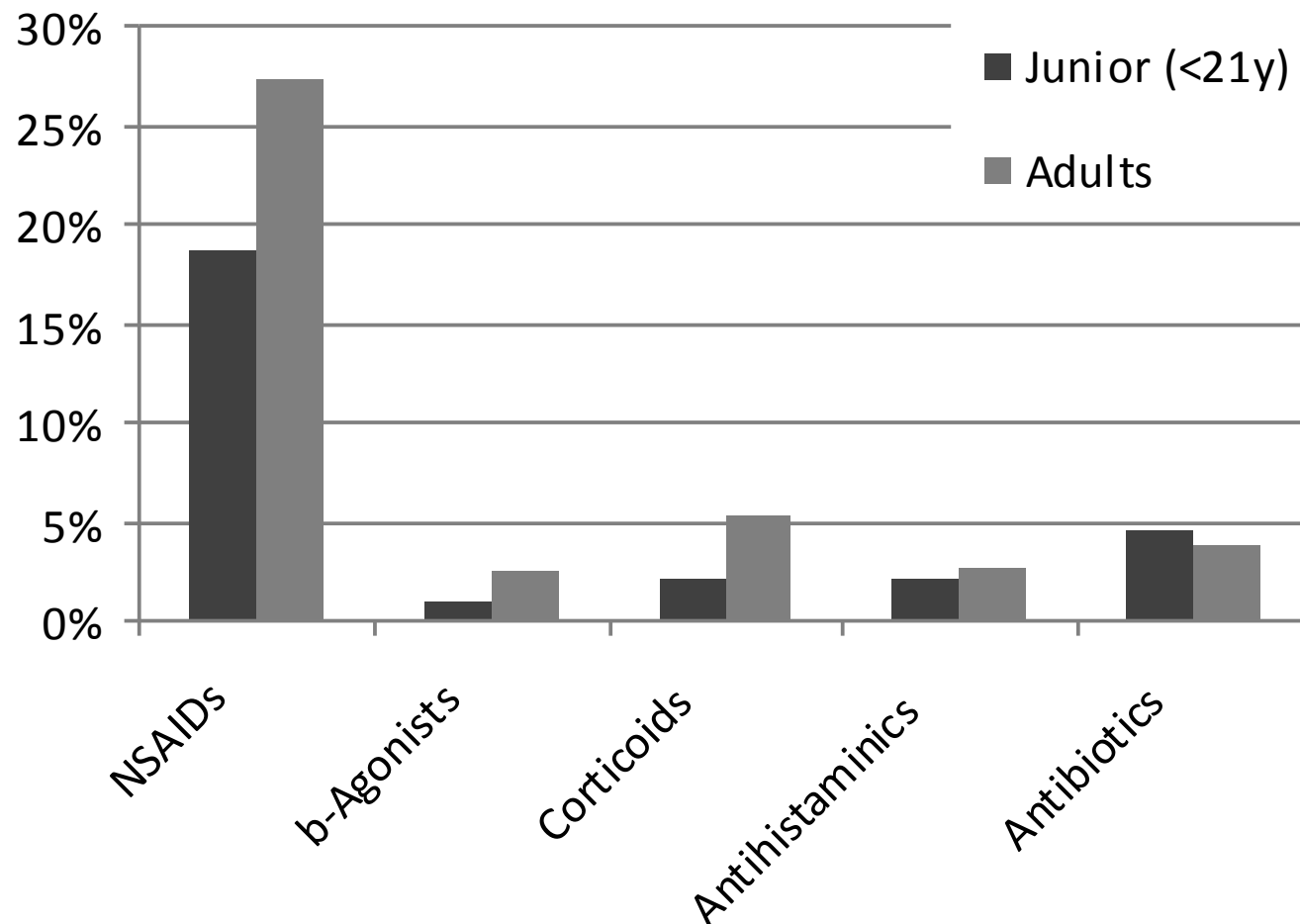
35%

Per tournament 50-60%

> 60%

# The use of medication in elite athletes

% of athletes using medication prior to competition



# Marathon – Bonn / El Andalus

47-61 % were using pain-medication (60% NSAIDs)

11% started with pain

> 30% were not aware of potential side-effects

## Source

OTC 22%, friends 56%, physician 6%

# Citations of professional footballers

“Prior to every match one, prior to competition two – sometimes more.”

„I used to use pain medication like sweets.”

# Why are painkillers so frequently used ?

Therapeutic use

Recreational use

Performance enhancement

# Associated factors

## Pubmed-based review

„The use of medication in professional athletes 72 h prior to competition“.

→ 8 publications

2003 – 2010, published in AJSM, BJSM, IJSM, CJSM

→ 33'233 athletes

track & field, football, winter and summer olympics

# Associated factors

Team physician

Origin

Age

Type of sport

Gender (f > m)





# Associated factors

*Team physician*

Type of sport

Origin

Gender (f > m)

Age

## ***2002 FIFA World Cup™***

22 out of 23 were using pain medication throughout the championship

Allopurinol in 20% of the players of one team

# Non-associated factors

Reported injuries

Team success

Starting formation, bench-players

In– vs. out- of competition

# **Why are painkillers so frequently used ?**

Therapeutic use

Recreational use

Performance enhancement

**Medical indication**

**Making sports participation possible**

**Improving sports performance**

**Doping**

# NSAIDs – the largest group

## Indication

analgesic, anti-inflammatory, antipyretic

## Mode of action

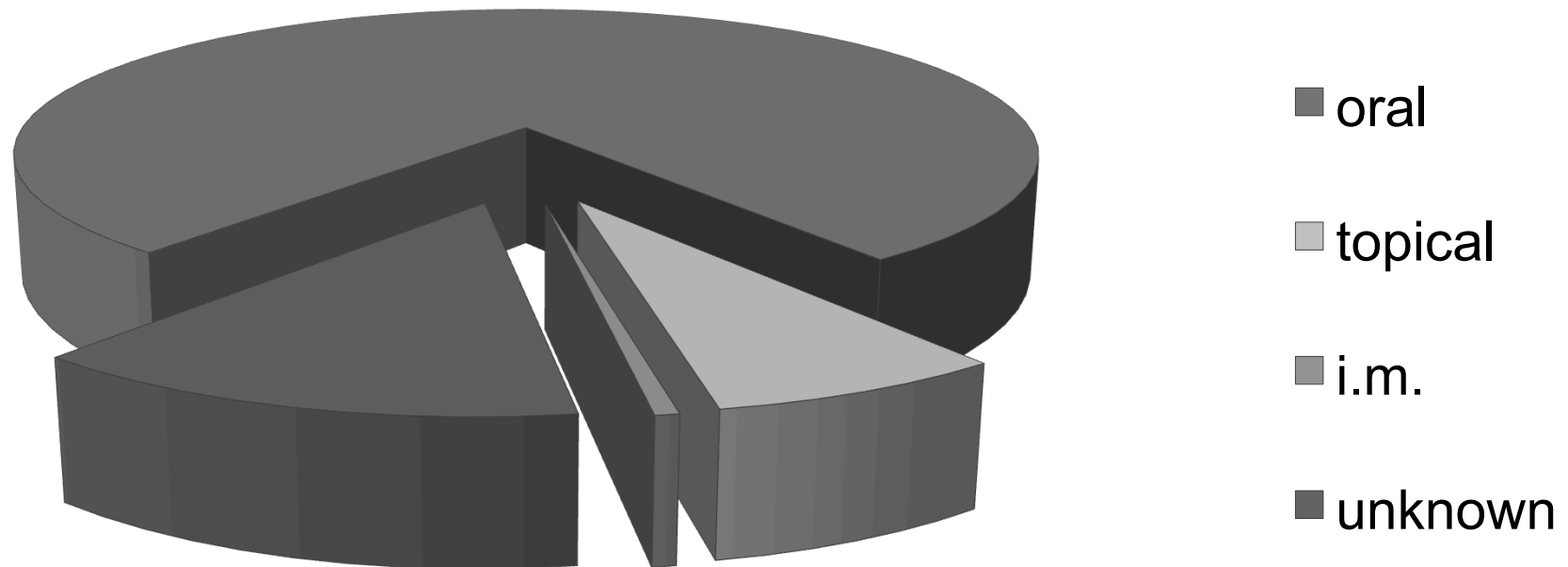
Inhibiting prostaglandin synthesis

## Application

per oral, transdermal, intramuscular

# Application

During FIFA World Championships



Tscholl PM (2008) BJSM / (2009) AJSM

# Local application

Diclofenac-Gel is effective in acute soft-tissue injuries.

10-20 fold concentration in soft-tissues than in synovial fluid and serum

Higher concentration in soft tissues (tendon, muscle periost) via patch than per oral application (less in bone and plasma).

# NSAIDs – side effects

Dyspepsia in 20 %

Decreased renal blood flow

Hyponatremia in long extensive sports activities?

Potentially decreased respiratory function

In asthmatics



Non-steroidal anti-inflammatory drugs

# MUSCULAR TISSUE

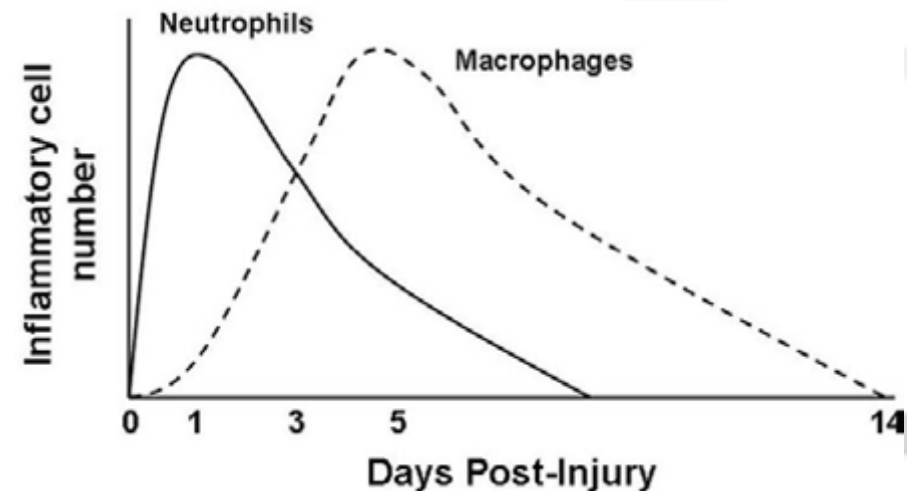


# Inflammatory process

## Neutrophile Granulocytes

Additional tissue damage due to early inflammatory phase

Knock-out mice have no decreased tissue healing



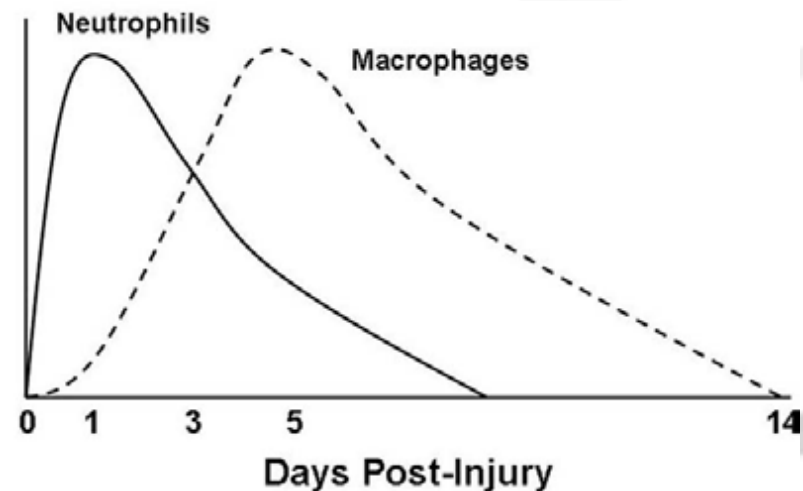
Croisier JL (2004) Sports Med, Prisk V (2003) Histol Histopathol  
Koh TJ (2009) Frontiers in Bioscience

# Inflammatory process

## Macrophage cells

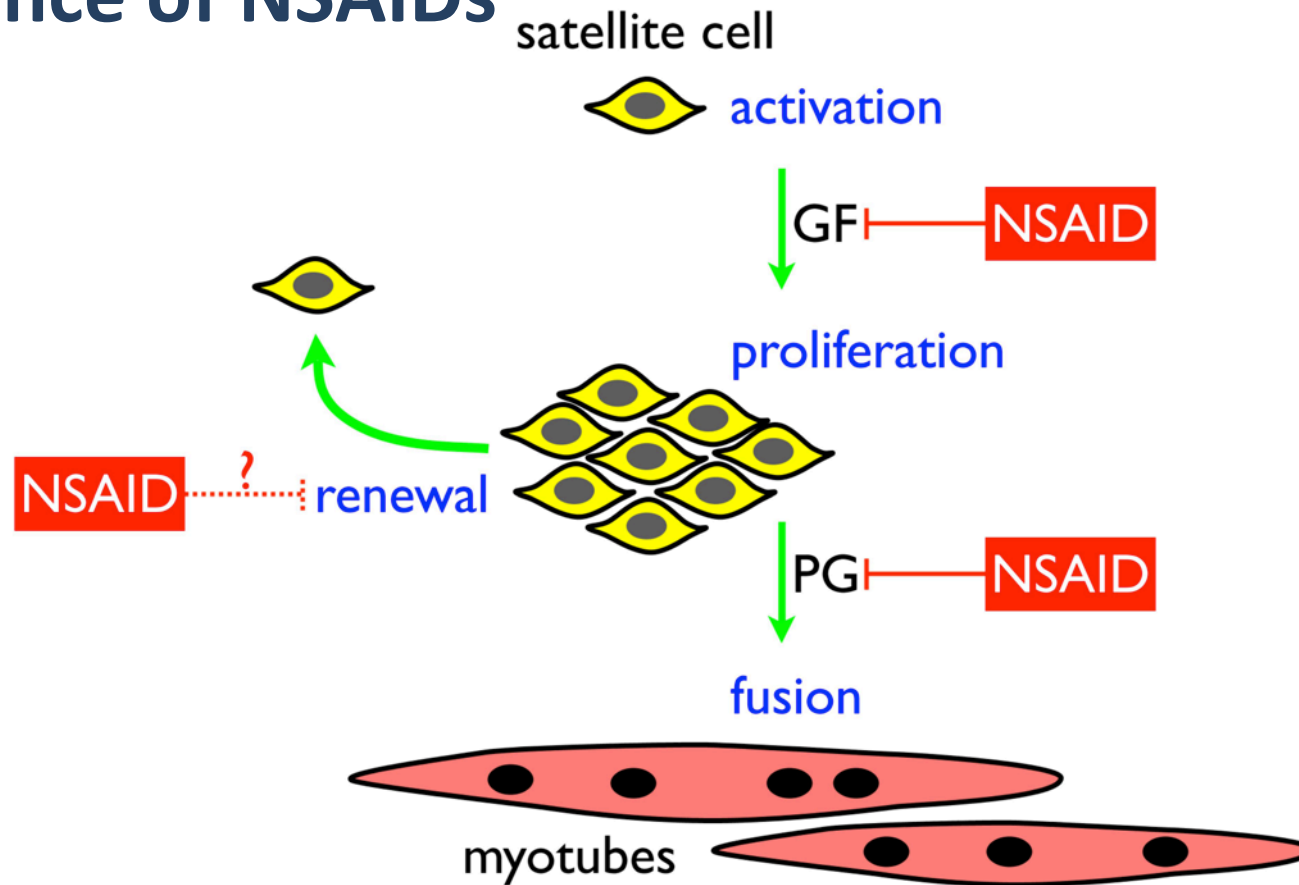
Phagocytosis of the cell damage

Macrophage cells stimulate IL-6, IGF-1 (which are both important for muscular adaptation to exercise) by producing PGE2 and radicals

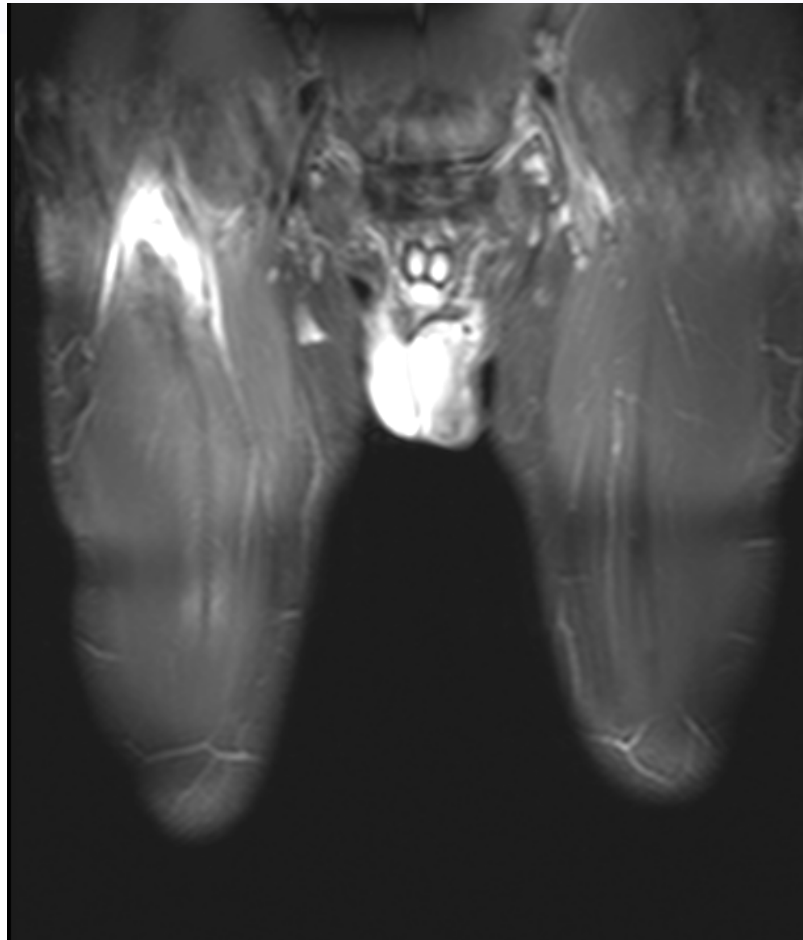


# Proliferation process

## Influence of NSAIDs



# Clinical relevance



DOMS

→ earlier RTS with NSAIDs

Contusion

Intramuscular lesions

Myotendinous injury

# Clinical relevance

Potential early benefit in structural muscle damage  
(eccentric work-out?)

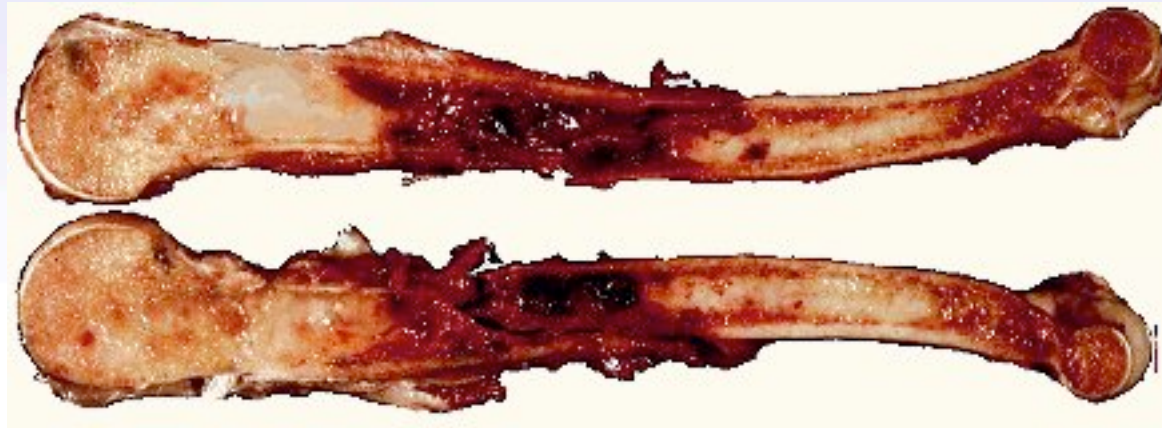
Decreased hypertrophic adaptation process 50-70%

1200mg Ibuprofen per day (no influence measured at 400mg daily)

Lower activity of satellite cells

Long-term intake with negative influence on muscle  
adaptation process (beneficial in older patients?)

***Ideal intake during 2 (-3) days***



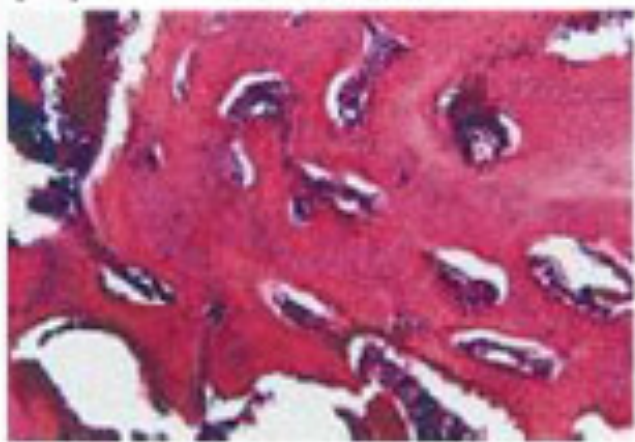
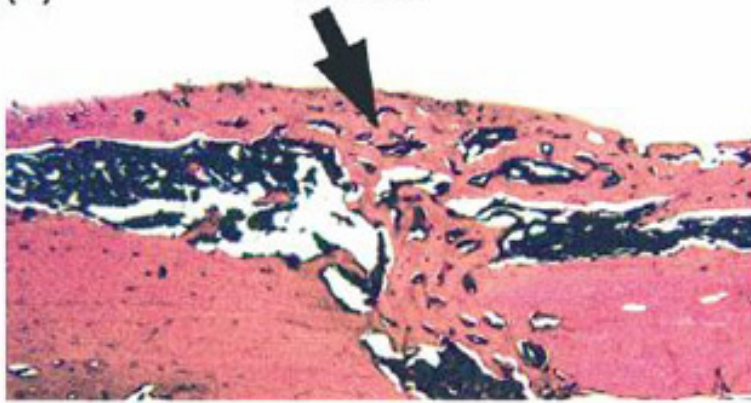
Non-steroidal anti-inflammatory drugs

**Bone**

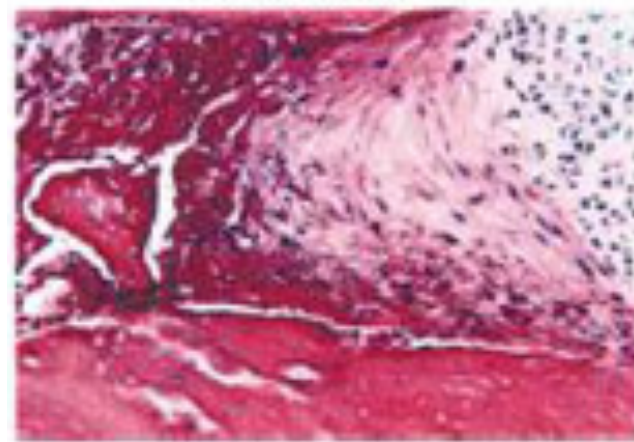
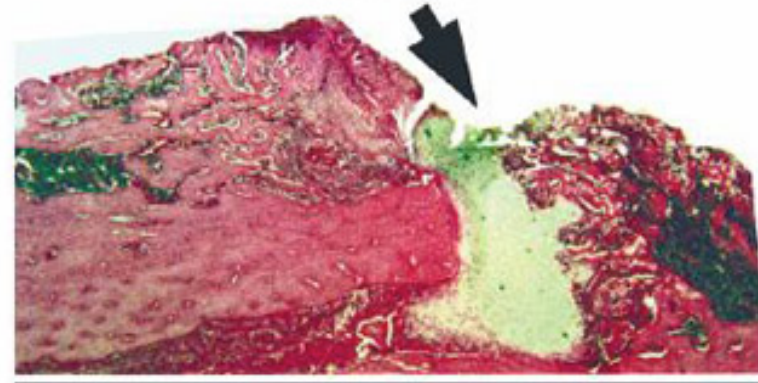
# Fracture healing

(A)

Control



Ketorolac



Also by inhibiting PGE pathway, which activates osteoblasts and osteoclasts



# Fracture healing

## **Analgesic effect or side-effect?**

Acetaminophen however has no influence on bone quality in fracture healing

Celecoxib has a dose-dependant interaction with decreased bone microstructure



# Clinical relevance

Prophylactic use of Indomethacin (heterotopic ossification) lead to significantly higher non-union rates (26% vs 7%).

Same tendency in *retrospective* analysis of humeral fractures and spinal fusion.



Non-steroidal anti-inflammatory drugs

# **Tendon**



# Adaptation to exercise

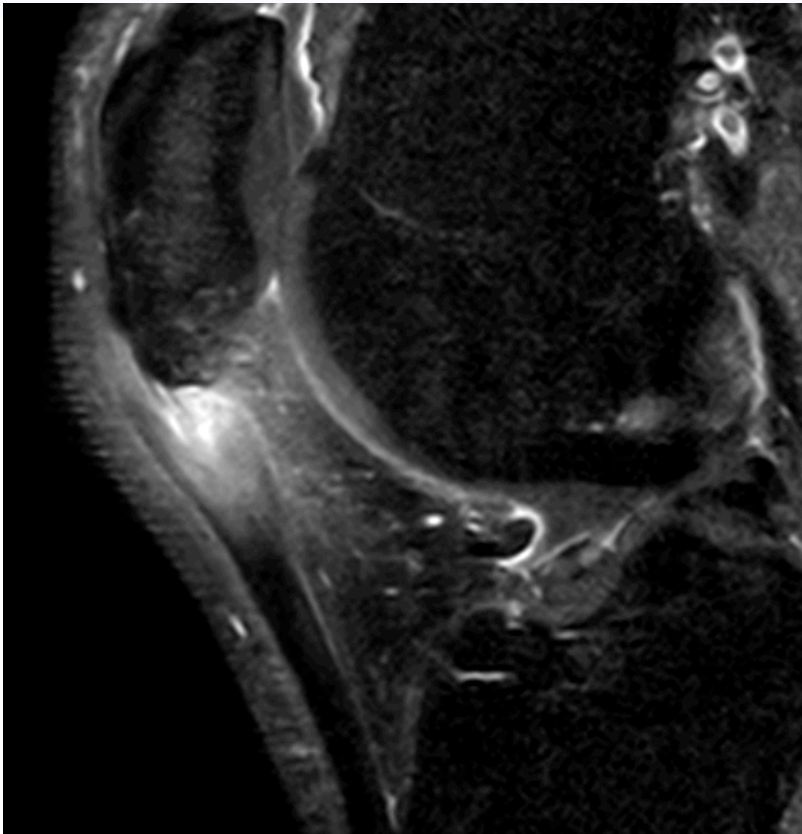
Inflammatory process is driven by PGE2, IGF, IL-6 but also PDGF

## Influence of NSAIDs

Decreased blood flow of up to 30% (PGE2)

Decreased peritendinous collagen formation (after 3 days of NSAIDs)

# Tendinopathy



(almost) no inflammatory cells

Rather a degenerative process

*„poor inflammatory process  
may be the cause“*

# Clinical relevance

## Adaptation to exercise

Inflammatory reaction after exercise is inhibited

Decreased growth (thickness)

Mechanical properties are identical

## Any benefit?

Not in chronic tendinopathy

For acute pain and peritendinous fibrin production

Hand surgery



Non-steroidal anti-inflammatory drugs

# Ligaments

# Ligamentous injury

## NSAIDs and COX-2

Less pain, earlier return, higher loads possible, BUT...

Decreased ROM, more swelling, more instability after 14 days.

Decreased mechanical properties (laxity); 32% less strength on MCL





# The Dilemma

*„There is inflammation without healing, but there is no healing without inflammation“*

Leadbetter WB (1990)





Non-steroidal anti-inflammatory drugs

# **CONCLUSIONS**



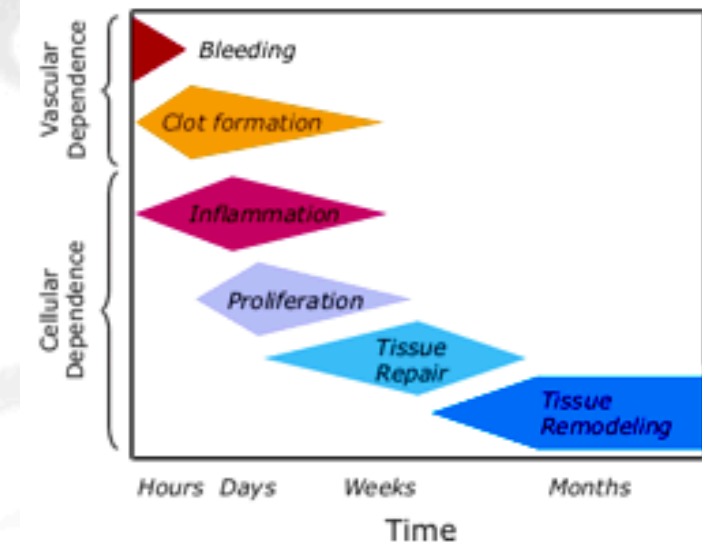
Excessive use of medication, especially of NSAIDs  
→ *Athletes (and physicians) are not quite informed ?*

NSAIDs are no purely pain-killing agents

Healing and adaptation to exercise might be compromised

No longer than 2-3 days

Should be avoided in early  
fracture healing





Dr. med. Philippe Tscholl & Maximilian Schindler

