

## Editorial

---

### Use of anti-inflammatory medication in healthy athletes – no pain, no gain?

Since the discovery of aspirin in the latter part of the nineteenth century, a host of nonsteroidal anti-inflammatory drugs (NSAID) has emerged, providing pain relief in many disease conditions. Naturally, the sporting world, where pain (albeit often self-imposed) is commonplace, has also taken advantage of the analgesic properties of NSAIDs. Athletes take this type of medication in order to continue training when faced with injury, to alleviate delayed-onset muscle soreness (DOMS), and also on a prophylactic basis. While it is difficult to get a handle on the extent of NSAID use in this population, there have been reports suggesting, for example, that up to one in seven adolescent high school football players takes NSAIDs on a daily basis (Warner et al., 2002), and, although the concern about chronic NSAID use has centred on potential gastrointestinal problems and kidney function, there is growing evidence in the literature for negative effects of NSAIDs on skeletal muscle metabolism and growth. There is no doubt that NSAIDs are an invaluable tool in the treatment of injuries, but investigations into whether NSAIDs can alleviate DOMS have shown little to no reduction in soreness. In light of the latter, it is worthwhile considering the merit of taking anti-inflammatory medication for the sake of an unlikely/minimal reduction in pain at the risk of negating the anabolic processes that take a great effort to initialise in the first place.

Evidence for a negative influence of NSAIDs comes from studies that have focussed on the cyclo-oxygenase (COX) pathway, the target of NSAID action. Cell culture and animal models show quite clearly that COX activity and its downstream prostaglandins (PGs) are important for skeletal muscle myogenesis. This has been shown for myoblasts at the key stages of proliferation, differentiation and fusion. Furthermore, several studies using animal models have shown that inhibition of COX activity can delay muscle regeneration. Convincing data from a recent study indicate that inhibition of COX activity by ingestion of Ibuprofen can attenuate over-

load-induced hypertrophy in rats (Bondesen et al., 2006). In this study, chronic overload was imposed on the plantaris muscle by surgical removal of the synergist muscles. After a period of 14 days, it was observed that the plantaris muscles of the rats in the control group had increased in mass by 60%, compared to only 30% in the group that consumed Ibuprofen. The strength of this study is that it involved adult rats as opposed to immature animals, making it more relevant for the strength training human.

In humans, the influence of NSAID ingestion on muscle protein synthesis and on myogenic precursor cells has been investigated. Twenty-four hours following a bout of resistance exercise consisting of at least 100 eccentric contractions of the quadriceps, the fractional synthesis rate of mixed muscle protein was approximately halved by the ingestion of NSAID (Trappe et al., 2002), a good indicator that COX activity is necessary for the anabolic response of muscle to resistance exercise. With regard to myogenic precursor cells, similar numbers of satellite cells were observed 8 days after a 36 km run when compared to pre-exercise levels, in contrast to an increase of 27% in the placebo group (Mackey et al., 2007). The purpose of the new satellite cells in the placebo group was not determined, so it is difficult to speculate on the functional consequences of a blunted satellite cell response in the NSAID group. It is known, however, that satellite cells are necessary for muscle maintenance, growth and regeneration as a source of new myonuclei and myoblasts, so a block or delay in these processes could reduce the maintenance level or enhanced muscle mass that would otherwise have been gained in the absence of NSAIDs. It is possible that such a block in satellite cell proliferation could explain the reduced hypertrophy observed with NSAID ingestion in the rat study by Bondesen et al. (2006).

The findings mentioned here, taken together with others, point to a negative influence of NSAID ingestion on the normal response of skeletal muscle

## **Mackey**

to exercise in humans. While the precise mechanisms by which this occurs remain to be fully uncovered, the current knowledge certainly urges caution against the casual use of NSAIDs, especially in the treatment of DOMS. Perhaps it is more beneficial in the long run to put up with the pain (where possible) in order to maximise the gain.

*A. L. Mackey  
Institute of Sports Medicine Copenhagen  
Bispebjerg Hospital and Faculty of Health Sciences  
University of Copenhagen  
Copenhagen  
Denmark  
E-mail: abigail.mackey@gmail.com*

## **References**

- Bondesen BA, Mills ST, Pavlath GK. The COX-2 pathway regulates growth of atrophied muscle via multiple mechanisms. *Am J Physiol Cell Physiol* 2006; 290: C1651.
- Mackey AL, Kjaer M, Dandanell S, Mikkelsen KH, Holm L, Dossing S, Kadi F, Koskinen SOA, Jensen CH, Schroder HD, Langberg H. The influence of anti-inflammatory medication on exercise-induced myogenic precursor cell responses in humans. *J Appl Physiol* 2007; 103: 425–431.
- Trappe TA, White F, Lambert CP, Cesar D, Hellerstein M, Evans WJ. Effect of ibuprofen and acetaminophen on postexercise muscle protein synthesis. *Am J Physiol Endocrinol Metab* 2002; 282: E551–E556.
- Warner DC, Schnepf G, Barrett MS, Dian D, Swigonski NL. Prevalence, attitudes, and behaviors related to the use of nonsteroidal anti-inflammatory drugs (NSAIDs) in student athletes. *Journal of Adolescent Health* 2002; 30: 150.