

Effects of Anion in the Rat with Adjuvant-induced Arthritis

Seok Cheol Choi¹, Mi-Ha Joo², Gil-Hyun Lee², Joon-Sun Lee², Dae Sik Kim³, Kyung Mo Oh⁴, Jae-Hyun Choi⁵ and Kyung Yae Hyun^{3†}

¹Department of Clinical Laboratory Science, College of Health Sciences, Catholic University of Pusan, Busan 609-757, Korea, ²Department of Clinical Laboratory Science, Dong-Eui University, Busan 614-714, Korea, ³Department of Clinical Laboratory Science, Dongnam Health College, Suwon 440-714, Korea, ⁴Department of Physical Education, Pukyong National University, Busan 608-737, Korea, ⁵Coodmorning21 Co, Namsan-Dong, Geumjeong-Gu, Busan 609-816, Korea

†, corresponding author, E-mail: kyhyun@deu.ac.kr

Abstract. This study was performed to elucidate the effects of anion in the rats with adjuvant-induced arthritis. Rats were divided four groups: control (group I, n=10), arthritis (group II, n=10), arthritis with non-operation of anion generator (group III, n=10) and arthritis with operation of anion generator (group IV, n=10). Serum IL-6 and TNF- α levels were measured and histological findings of knee joints were observed in all groups. The IL-6 and TNF- α levels in group III and IV were significantly lower than those of group II. The IL-6 and TNF- α levels in group IV were significantly lower than those of group III. The inflammatory and damage degrees on the knee joints were lower in group III and IV than in group II. The degree of joint injury in group IV was less than that of group III. We first revealed that anions made by anion-generator may attenuate inflammatory and damaging effects of the arthritis. However, further study should be performed in human.

Key Words: Rheumatoid arthritis, Anion, Rat, IL-6, TNF- α , Histological finding.

1 Introduction

Rheumatoid arthritis (RA) is a chronic, progressive, and systemic inflammatory disease (Mayada et al, 2014) characterized by synovial proliferation and joint erosions. Nonsteroidal anti-inflammatory drugs (NSAIDs) are used as an important part of therapeutic regime to inhibit the pain and inflammation associated with RA. However, NSAIDs are strongly related to severe side effects such as gastrointestinal complications, renal failure, and hepatic toxicity (Johnson and Day, 1991; Whelton and Hamilton, 1991; Biskupiak et al., 2006). The present study was performed to elucidate the effects of anion in the rats with adjuvant-induced arthritis.

2 Materials and Methods

Sprague-Dawley strain male albino rats (aged-6 weeks, weighing 160-180 g) had free access to standard laboratory feed and water *ad libitum*. The study was approved by the Animal Ethics Committee of Catholic university of Pusan. The rats were divided into 4 groups; each group containing 10 animals. Control (group I, n=10), arthritis (group II, n=10), arthritis with non-operation of anion generator (group III, n=10) and arthritis with operation of anion generator (group IV, n=10). Group III was leg immersion in non-operation of anion generator with 37°C water for 4 weeks (one hr a day). Group IV was leg immersion in operation of anion generator with 37°C water for 4 weeks (one hr a day). Arthritis was induced in rats by injection of 0.5 ml of Complete Freund's Adjuvant (CFA) containing 10 mg/ml *Mycobacterium tuberculosis* (Sigma, St, Louis, Mo, USA) into the foot pad of the right and left hind paws and articular capsule, respectively. At four days after such procedures, the same injection was also applied into the rats. At five days after a third injection, the rats having grade 4 of arthritis index were selected and were used for this study (Trentham et al., 1977). After the four weeks of experiments, all of rats were fasted for 24 hours, were anesthetized by ether and 7 mL of blood was collected directly from the abdominal cava. The blood was used for measuring tumor necrosis factor- α (TNF- α) and interleukin-6 (IL-6) concentrations.

3 Results

Serum TNF- α concentrations in group IV (29.70 \pm 8.74 pg/mL) were significantly lower than those of group II (68.05 \pm 7.86 pg/mL) and III (51.00 \pm 10.02 pg/mL) (p <0.001) but similar to group I (23.21 \pm 8.44 pg/mL) (Fig. 1). Serum IL-6 concentrations were significantly lower in group IV (124.50 \pm 11.58 pg/mL) than in group II (195.03 \pm 13.62 pg/mL) than in group III (166.94 \pm 16.46 pg/mL) (p <0.01 or p <0.001) (Fig. 2). IL-6 concentrations in group IV were significantly lower than those of group III but similar to group I (90.14 \pm 9.55).

4 Discussion

Recently, beneficial effects have been reported on remedy of atopic dermatitis, following the use of anion textiles (Kim et al., 2012). The present study showed that treatment of anions on the rats with adjuvant-induced arthritis provided decreased inflammation and improvement effect.

References

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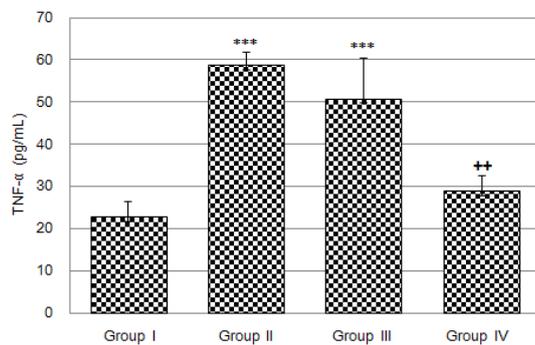


Fig. 1. Serum tumor necrosis factor- α (TNF- α) concentrations in four groups. TNF- α concentrations in group IV (generation of anion with adjuvant-induced arthritis) were lower than those of group II (adjuvant-induced arthritis) and group III (non-generation of anion with adjuvant-induced arthritis). There was no difference between group I (control) and IV ($p > 0.05$). ***, $p < 0.0001$ (compared with group I); $p < 0.01$; **, $p < 0.001$ (compared with group II and III).

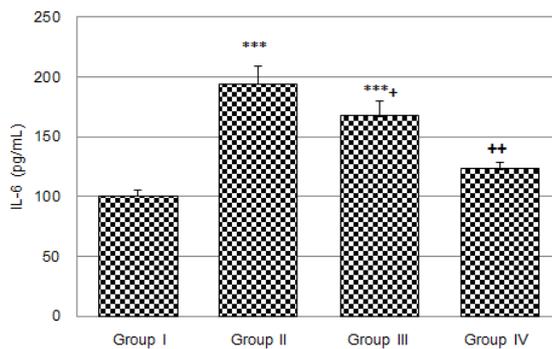


Fig. 2. Serum interleukin-6 (IL-6) concentrations in four groups. IL-6 concentrations in group IV were lower than those of group II and group III. There was no difference between group I (control) and IV ($p > 0.05$). ***, $p < 0.0001$ (compared with group I); +, $p < 0.01$; **, $p < 0.001$ (compared with group II and III).