Urinary Glycosaminoglycans Excretion: Effects of Acute and Chronic Physical Activities

Guedes, P.L.R.¹; Porto, S.R.¹; Bonin, C.R.¹; Menezes, P.P.L.¹; Freitas, V.H.²; Michelacci, Y.M.³; Bara-Filho, M.G.²; Aguiar, J.A.K.¹

¹Laboratório de Análises de Glicoconjugados, Depto de Bioquímica, ICB-UFJF/MG; ²Núcleo de Pesquisa de Controle de Carga de Treinamento, FAEFID –UFJF/MG; ³Depto de Bioquímica, UNIFESP/SP, Brasil

Introduction: The intensity and frequency of exercise would play different roles in cartilage metabolism. Analysis of degraded matrix metabolites, like glycosaminoglycans (GAGs), which are released on synovial fluid and may be recycled or excreted on urine, would be a good way to understand cartilage turnover. The aim of this study was to compare urinary GAGs excretion between two groups: sedentary people and professional volleyball athletes.

Material and Methods: Sedentary urine samples were collected for three consecutive days (morning and night) and before, immediately after and 24 hours after a moderate and controlled exercise. Athletes’ urine samples were collected for six weeks, before and after training. Urinary GAGs were extracted and purified by ion exchange chromatography. GAGs were analyzed by agarose gel electrophoresis on PDA buffer. Urinary creatinine was measured to correct urine dilution.

Results and Discussion: Sedentary and athletes showed similarities in age (22,80±0,52 and 26,94±1,15) and BMI (22,00±0,50 and 25,04±0,60). Chondroitin sulfate (CS) was the major GAG found in urine, but small amounts of dermatan sulfate and heparan sulfate could also be found. The average sedentary CS/creatinine ratio is 0,34±0,06 mg/g before exercise and 0,28±0,06 mg/g after exercise (p=1). The average athletes CS/creatinine ratio is 3,22±0,12 mg/g before exercise and 3,10±0,16 mg/g after exercise (p=0,987). Athletes and sedentary showed significant different CS excretion on every conditions (p<0,001). Among volleyball players, the opposite, who is always jumping and striking (2,56±0,18 mg/g), excreted less CS than libero (3,97±0,39; p=0,015) and setter (3,45±0,19; p=0,065), players with minor load bearing requirements.

Conclusion: Significant difference between groups shows that chronic, but not acute, exercise changes urinary CS excretion. Repetitive loads on important joints, such as knees, hips and shoulders, may cause great changes on cartilage metabolism. Urinary GAGs analysis is an important tool to follow-up cartilage healthy during an athlete career.

Keywords: Exercise, Extracellular matrix, Glycosaminoglycans. Chondroitin Sulfate.