

## **C-REACTIVE PROTEIN AS A BIOMARKER OF AGING**

R. Kalani (P), C. Carter, M. Pahor, C. Leeuwenburgh

University of Florida, College of Medicine, Department of Aging and Geriatrics Research

Purpose: Persistent, unwarranted immunological episodes and other pivotal inflammatory events are involved with the aging process and many age-related pathologies, which may have the ability to reduce total plasma antioxidant levels. The two most prevalent life prolonging strategies, life-long caloric restriction (CR) and life-long exercise, have been shown to increase mean and maximum life span, respectively. Hence, we evaluated the effects of age, CR and exercise on plasma C-reactive protein (CRP), interleukin-6 (IL-6) and total antioxidant capacity. Methods: Short-term CR was started in 4-month old male Fisher-344 rats, fed 40% less of ad libitum fed animals for a 2-month period and then sacrificed at 6-months of age. Long-term CR (40% less of the ad libitum control rats) was started at 4-months of age and animals were sacrificed at 26-months of age. In a separate study, 8% CR sedentary Fisher-344 male rats (n=20), life-long wheel running 8% CR (n=20) and ad libitum fed sedentary controls (n=20) were all housed in the same facilities until sacrifice at 24-months of age. Results: Short-term CR in young animals dramatically reduced CRP levels compared to age-matched controls (by 61%), but had no significant effect on IL-6 content or total plasma antioxidant status. Plasma CRP levels increased dramatically (by 258%) in the 26-month old animals compared to the young 6-month old rats, whereas 26-month old caloric restricted rats only showed a 42% increase compared to the 6-month old animals. Antioxidant status was significantly decreased in the 26-month old animals and tended to be higher in the 26-month old CR rats compared to the 26-month old animals. Circulating IL-6 levels, on the other hand, did not show significant changes with age or long term CR. Life-long exercise + 8% CR showed a marked decrease in CRP levels (38%) compared to the 8% CR sedentary control rats, and an even greater reduction (53%) compared to the ad libitum fed rats. 8% CR reduced circulating CRP levels by 25% compared to the same age, ad libitum fed rats. In contrast, plasma antioxidant levels were the highest in the life-long exercising + 8% CR group compared to either the 8% CR or ad libitum fed animals. Again, no changes were found in IL-6 levels between any of these treatment groups. In addition, the heightened levels of inflammation (CRP) seen in both studies were inversely associated with plasma antioxidant status. Conclusions: CR and wheel running, the two most prevalent life prolonging strategies, significantly attenuate chronic inflammation (CRP) that is shown to increase with age. These studies show that CRP levels may be useful as a biomarker for longevity studies.