The time course of DPP-IV, CD26+ T-cells and IL-6 following a DOMS protocol in college-aged participants

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Delayed onset muscle soreness (DOMS) can occur following exercise and results in damaged muscle fibers and the release of many chemicals such as potassium, histamines, and cytokines. A particular cytokine, interleukin 6 (IL-6), is known to increase in response to muscle injury and participates in the muscle recovery process. There is evidence that a serine protease, known as dipeptidyl peptidase IV (DPP-IV), cleaves IL-6, making it inactive. DPP-IV can be soluble in the blood and interstitial fluid or bound to the T-cell membrane, making T-cells CD26+. The focus of our study was to observe the time course of soluble DPP-IV, CD26+ T-cells and IL-6 during recovery from DOMS.

Our study used six healthy college-aged participants who underwent a weightlifting protocol designed to induce DOMS in the bicep brachii. We first determined the participant's one-repetition maximum bicep curl. The participant then completed 15 sets of 15 repetitions at 65% of his/her one-repetition maximum. Measurements were taken before, immediately after, and 3, 24, and 48 hours following the DOMS protocol. Measurements included blood samples from the DOMS-treated limb to measure local plasma DPP-IV activity, CD26+ T-cells, and IL-6. Plasma DPP-IV activity was measured on the untreated arm via a finger capillary draw to determine if the effect was localized or systemic. Soreness measures were also taken to ensure that the participants experienced DOMS in the treated bicep. These included a soreness ranking using a visual analog scale and a pressure-sensing algometer at three different points along the treated bicep.

Increased pressure sensitivity indicated by decreased algometer pressure occurred at 24 hours (see Figure 1A; $p < 0.05$) and maximal soreness indicated by an increase in Visual Analog Scale measure was experienced at 24 and 48 hours ($p < 0.05$), suggesting that participants developed DOMS in the treated bicep. Plasma DPP-IV in the DOMS-treated arm significantly increased $9.9 \pm 5.7\%$ at 24 hours and $9.3 \pm 9.6\%$ at 48 hours (see Figure 1B) with no change in the non-treated arm. Plasma IL-6 significantly increased $166.1 \pm 124.3\%$ immediately post protocol and $164.9 \pm 91.26\%$ at three hours (see Figure 1C) before returning to baseline by 24 hours. There was no significant change measured in CD26+ activated T cells over time.

The results suggest that IL-6 peaks early after muscle injury, but plasma DPP-IV increases later in the DOMS process. This may imply that the increase in DPP-IV is for modulating the time course of IL-6. Overall, the increase in DPP-IV is localized to the site of injured muscle fibers because an increase in plasma DPP-IV was not observed in the control arm. We also did not see an increase in activation of CD26+ T-cells. This may be due to the small muscle mass utilized in this study or possibly the severity of the DOMS induced was not great enough to cause measurable activated T-cells. The relationship between DPP-IV and IL-6 is important for understanding the inflammatory response and recovery process after exercise-induced muscle damage. In the future, this lab plans to analyze the time course of blood flow in response to DOMS.

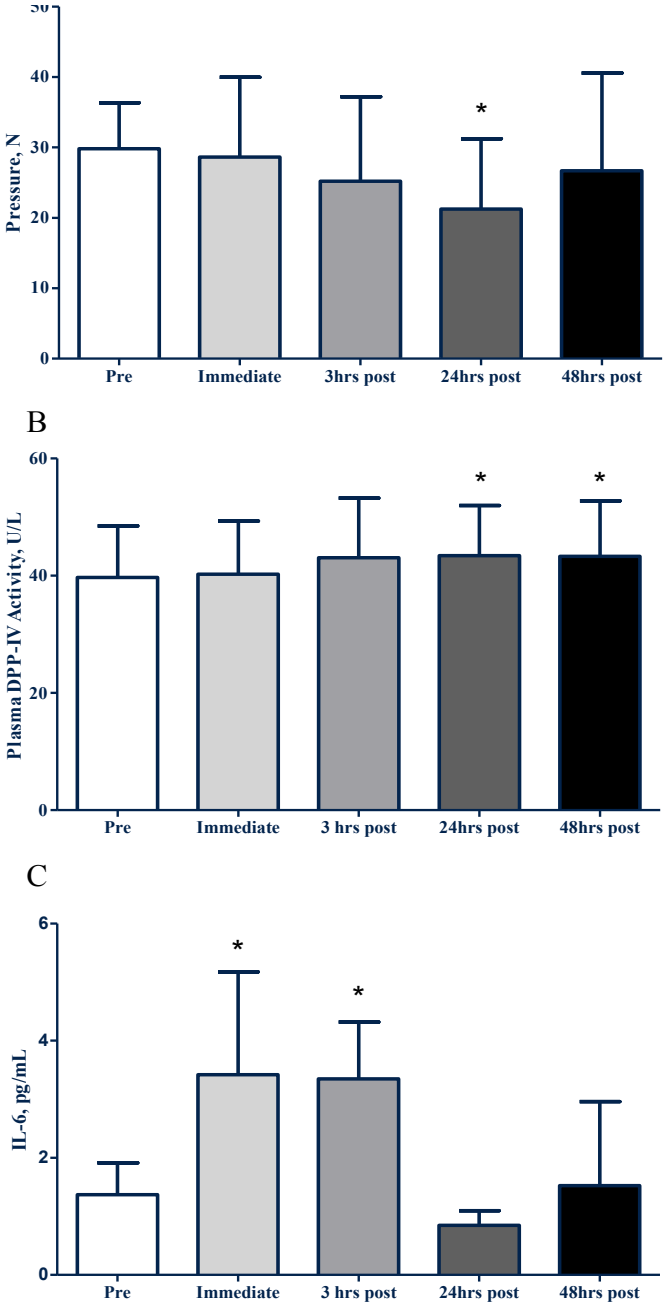

Figure 1: Mean and standard deviation for each time point for the algometer (A), plasma DPP-IV (B) and plasma IL-6 (C). * P<0.05 different from pre.

Statement of Research Advisor:

This project was a continuation of our lab's interest in the function and location of DPP-IV release. Elise was integrally involved in planning and executing this study. She obtained training to take blood samples and managed the entire project including recruitment, data collection and analysis. Leslie Neidert and Anna LaMantia assisted Elise in this project — Heidi Kluess, Kinesiology