Intake of Salmon Fillets Elevates Plasma Astaxanthin Levels in Human Subjects

Peiran Lu,[1] Kevin Quinn,[2] Michael Armstrong,[2] Lauren E. O'Connor,[3] Lillian M. Berman,[2] Nichole Reisdorph,[2] Wayne W. Campbell,[3] Nancy F. Krebs,[2] Dingbo Lin,[1] and Minghua Tang[2]

[1]Oklahoma State University; [2]University of Colorado Anschutz Medical Campus; and [3]Purdue University

Objectives: Salmon is a commonly consumed fish rich in astaxanthin carotenoids and polyunsaturated fatty acids with inflammatory and metabolic benefits. This study investigated concentrations of astaxanthin and fatty acids from salmon type (wild vs. farmed) and temperature changes (raw vs. cooked), and the effect of salmon consumption on human plasma astaxanthin concentration as part of a Mediterranean-style eating pattern (MED).

Methods: For the salmon analysis, three wild-caught and three farmed salmon fillets were randomly selected from local vendors. Methanol extracts of salmon fillets were subject to fatty acids and astaxanthin analyses by GC-MS and LC-MS QTOF, respectively. We then analyzed lipophilic plasma compounds via LC-QTOF MS from 41 overweight and obese adults who participated in a randomized crossover feeding trial. Participants consumed MED for five weeks, consumed their self-chosen diets for 4 weeks (washout), then consumed another MED for an additional five weeks; MED interventions differed by the amount of red meat consumed. Both MED contained 2 servings of salmon/week. ANOVA with a Tukey posthoc test was used.

Results: In the salmon analysis, astaxanthin (fold change 4.00, $P = 0.0002$), EPA ($P = 0.005$), and DHA ($P = 0.01$) concentrations were higher in wild-caught compared to farmed salmon, while ALA ($P < 0.0001$) and AA ($P = 0.002$) were higher in farmed salmon. Cooking (baking) did not cause significant changes in astaxanthin concentrations. In the human plasma samples, astaxanthin was higher ($P = 0.001$) after the MED, in which farmed salmon was consumed for five weeks. Astaxanthin concentrations decreased ($P = 0.02$) back to baseline amounts after the 4-week washout and increased again ($P = 0.001$) after the second dietary intervention. LC-QTOF MS analysis of all MED foods consumed showed that astaxanthin was discovered in salmon only.

Conclusions: Wild salmon tend to have higher amounts of health-promoting compounds which were unaffected by cooking. Concentrations of astaxanthin in human plasma were responsive to changes in salmon intake.

Funding Sources: USDA NIFA 2020–67,017-30,842, NIH 5R01DK113957, and Beef Checkoff (MED feeding study).