SWIMMING PERFORMANCE AND MUSCLE FUNCTION RESPOND TO ELEVATED T_3 HORMONE IN SMOLTING COHO SALMON

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Introduction

During the parr-smolt transformation, 3,3'-5'-tri-iodo-L-thyronine (T_3) plays a major role in the onset of many physiological, morphological and behavioral smolt-like characteristics. T_3 has been implicated in muscle contractile and molecular modification in many taxa, but T_3-modification of muscle contraction and locomotion in juvenile salmonids has not been addressed. We used isometric and tetanic contractility as measurements of muscle function and critical swimming velocity as a measure of maximum aerobic swimming performance to test the hypothesis that juvenile coho salmon (*Oncorhynchus kisutch*) locomotion is modified by a hyperthyroidal status

Methods

Treatment groups included T_3 pellet-implanted, sham pellet-implanted, or control (no implant) juvenile coho salmon. All fish were anesthetized (MS-222), weighed to the nearest 0.1 g, measured (SL, FL, and TL) to the nearest mm, and held in (outdoor) round holding tanks, incorporating continuous flows of well water and aeration. After the 3-wk treatment period, critical swimming speeds (swimming flume) were

determined, blood samples were drawn for hematocrit measurements, gill tissue was sampled for Na+-K+ ATPase activity, and muscle bundles were dissected from the hypaxial musculature for *in vitro* twitch and tetany contraction measurements.

Results and Discussion

The surgically implanted (intraperitoneally) T_3 pellets produced some significant changes in the juvenile coho salmon. Critical swimming speeds were significantly decreased in T_3-treated fish, compared with the sham and control fish. In contrast, hematocrit, body weight, body lengths, and gill Na+-K+ ATPase activity were not different among any of the treatment groups. Tetanic contraction and twitch contraction rates as well as relaxation rates were significantly increased in T_3-treated fish compared with the control and sham fish. T_3 also induced morphological changes such as modified head morphology and increased body silvering, typically associated with the parr-smolt transformation. We conclude that surges in T_3 during the parr stage of the salmonid life cycle, and potentially during the parr-smolt transformation, modify locomotion. T_3-induced modification of muscle contractile kinetics may significantly contribute to decreased maximum aerobic swimming performance.

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