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Title: α -Lipoic acid-enrichment partially reverses tissue ascorbic acid depletion in pacu (*Piaractus mesopotamicus*) fed vitamin C-devoid diets

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Abstract: Effects of dietary α -lipoic acid (LA) and ascorbic acid (AA) on the growth, tissue vitamin C and tocopherol (vitamin E) levels, and malondialdehyde levels were examined in the tropical fish pacu, *Piaractus mesopotamicus*. Pacu juveniles were fed one of four casein-gelatin-based diets for 8 weeks: with 0.05% AA and 0.1% LA (+AA+LA), with AA and without LA (+AA-LA), without AA and with LA (-AA+LA), and without AA and LA (-AA-LA). When the fish received quantities of feed equal to 1.9–2.5% of its body weight, growth was not influenced, regardless of the presence of AA or LA throughout most of the experimental period. Growth was, however, slightly but significantly lower at week 8 in the AA deficient/LA-supplemented group. An AA-deficient diet caused a highly significant reduction in both total AA and dehydroascorbic acid content in the liver and gill tissues. This reduction of tissue AA concentrations was reversed in a significant manner by LA (antioxidant-sparing effect). The 8-week-long vitamin C deprivation was sufficient to initiate the reduction in tissue ascorbic acid; however, total ascorbate in the liver of fish in the (-)AA/(+)LA group was 127.7 ± 54.3 nmol g⁻¹ tissue, whereas it was 28.6 ± 26.3 nmol g⁻¹ in the (-)AA/(-)LA group, a 4.4-fold difference. This mitigating effect of the addition of the endogenous antioxidant LA to the diet indicates that LA exerts a vitamin C-sparing effect in teleost fish that by far exceeds

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the phenomena demonstrated in nonscurvy-prone mammals. There was no difference among the different diet groups for vitamin E and malondialdehyde levels in the liver. These results suggest that LA is a potent substance for the prevention of AA deficiency in cultured fishes. The optimal dietary level of LA needs to be determined in the light of the slight reduction in body weight gain after 8 weeks of feeding in the absence of AA.

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