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Regulation of mitochondrial biosynthesis and function by dietary carbohydrate levels and lipid sources in juvenile blunt snout bream *Megalobrama amblycephala*

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Abstract

This study aimed to investigate the effects of dietary non-protein energy adjustments on the mitochondrial biosynthesis and function of juvenile *Megalobrama amblycephala*. Fish (average weight: 37.98 ± 0.07 g) were fed eight diets containing two dietary carbohydrate levels (30% and 43%) and four lipid sources (fish oil, soybean oil, palm oil and the mixed oil) for 11 weeks. Liver mitochondrial respiratory chain complex V activity and ATP (adenosine triphosphate) content both increased significantly with increasing dietary carbohydrate levels, whereas the opposite was true for the AMP (adenosine 5'-monophosphate)/ATP ratio, hepatic transcripts of AMP-activated protein kinase α1 (AMPKα1), AMPKα2, peroxisome proliferators γ-activated receptor coativator-1α (PGC-1α), NADH dehydrogenase 1 and cytochrome c oxidase 1 (COX1) as well as the activities of Na^+-K^+-ATPase, succinate dehydrogenase (SDH), citrate synthase (CS) and mitochondrial respiratory chain complex I, III and IV. Additionally, hepatic ATP content, the transcripts of AMPKα, COX1 and ATP6 and the activities of Na^+-K^+-ATPase, SDH, CS and mitochondrial respiratory chain complex III were all significantly affected by lipid sources. Furthermore, an interaction between dietary carbohydrate levels and lipid sources was also observed in the activities of liver mitochondrial Na^+-K^+-ATPase and respiratory chain complex III as well as the transcripts of ATP6 and PGC-1α. Overall, these findings suggested that dietary carbohydrate levels and lipid sources remarkably affected the mitochondrial biosynthesis and function of *M. amblycephala*. A diet containing 30% carbohydrate and FO could boost its