Regulation of the yeast glycerol-3-phosphate acyltransferase Gpt2p by phosphorylation

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A glycerol-3-phosphate acyltransferase (GPAT) mediates the first and committed reaction of phosphatidic acid (PA) biosynthesis, namely acylation of the precursor glycerol-3-phosphate at the *sn*-1 position yielding 1-acyl glycerol-3-phosphate (lyso-PA). Subsequently, lyso-PA is converted to PA by another acyltransferase. *De novo* synthesis of PA is essential, because this molecule serves as a substrate for the formation of all glycerophospholipids and triacylglycerols (TAG). Additionally, PA functions in cell signaling. Because of these pivotal roles, the formation of PA has to be adjusted to cellular requirements. The major target to regulate biosynthesis of PA appears to be the pace making GPAT reaction. In the model organism yeast *Saccharomyces cerevisiae* the GPAT reaction is catalyzed by two enzymes with overlapping functions, Gpt2p (Gat1p) and Sct1p (Gat2p). Both enzymes are phospho-proteins, and their phosphorylation status depends on various factors such as the genetic background, the expression level or growth conditions [1,2]. These observations indicate that GPATs are regulated by phosphorylation. Currently, we examine this hypothesis for Gpt2p. By a proteomic approach we identified several phosphorylation sites of Gpt2p. Three of the phosphorylated amino acids form a highly conserved motif. To examine the relevance of Gpt2p phosphorylation under physiological conditions we created several mutants expressing phosphorylation deficient Gpt2p variants from the *GPT2* locus. We show that manipulations in the conserved phosphorylation-motif strongly and specifically affect TAG accumulation, but not the glycerophospholipid content or the glycerophospholipid pattern. The mechanistic link between the phosphorylation status of Gpt2p at the conserved motif and TAG accumulation is currently under investigation.

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