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EFFECT OF POLYAMINES AND SYNTHETIC POLYAMINE-ANALOGUES ON THE EXPRESSION OF THE E. coli ato OPERON AND ITS REGULATORY GENES

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In bacteria, the biosynthesis of polyamines is modulated both at the level of transcription as well as post-translationally. In E. coli, a non-competitive protein inhibitor was identified, named Antizyme (Az), which is the gene product of atoC. The cloning and sequencing of the E. coli antizyme gene revealed that Az also have a second function as a transcriptional regulator AtoC, belonging to the two-component system family and Az was identical as the gene product of atoC. AtoC, is a positive transcriptional regulator of the atoDAEB operon genes, encoding enzymes involved in short chain fatty acid metabolism. The antizyme is referred to as AtoC/Az, to indicate its dual function as both a transcriptional and post-translational regulator. The role of polyamines at the transcriptional level of atoS and atoC genes as well as that of atoDAEB(ato) operon is studied. Polyamine-mediated induction was measured in atoSC positive or negative E. coli backgrounds by using β-galactosidase reporter constructs carrying the appropriate promoters (i.e patoDAEB, patoS, patoC). In addition, a selection of synthetic polyamine analogues have been tested for their effectiveness in inducing the expression of atoC/Az, whose product is a key protein in feedback inhibition of putrescine biosynthesis as well as the transcriptional regulator of the ato operon. The effects of these compounds were also measured on the ato operon expression. The polyamine analogues were tested for their effect on the growth of E. coli strain MA255 (ODC-, ADC-) which lack polyamines and grow only when exogenous polyamines are present. Polyamines, which have been reported to induce AtoC in E. coli, act at the transcriptional level, since activation of the transcription of AtoC/Az in three isogenic E. coli strains was observed. In addition, some of the polyamine analogues tested to activate the transcription of the atoC gene and the atoDAEB operon promoter.