



V 12 BpuR, a novel protein of *Borrelia burgdorferi* that binds *erp* Operator 1 DNA

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Borrelia burgdorferi, the etiological agent of Lyme disease, persists in nature by adapting to its environment. During mammalian infection, the pathogen produces a family of outer membrane lipoproteins collectively referred to as Erps; encoded by a variable *erp* locus found on circular plasmid 32 (cp32). Production of these proteins is repressed during tick colonization. Known functions of Erp proteins include binding to host laminin, plasminogen, and the complement regulators factor H/factor H-related proteins. Erp expression is regulated at the level of transcription. We previously identified 2 novel proteins, EbfC and BpaB, which bind *erp* Operator DNA, a region immediately 5' of *erp* transcriptional start sites. We now report identification and preliminary characterization of a third borrelial protein that also binds specifically to *erp* Operator DNA. This protein is a member of the PUR superfamily of proteins, which are widely found in eukaryotes and some bacteria. Thus, we have named the *B. burgdorferi* protein BpuR, or *Borrelia* PUR protein. *bpuR* is a highly conserved chromosomal gene found in all Lyme disease and relapsing fever spirochetes. We are currently evaluating BpuR's role in the transcriptional regulation of Erp proteins. In vitro, we have demonstrated that BpuR is capable of binding single-stranded and double-stranded DNA, as well as RNA. Overexpressing BpuR results in a decrease in ErpA expression suggesting that BpuR acts as a repressor of transcription. However, in vitro-coupled transcription/translation assays indicate that BpuR may also increase Erp expression under specific conditions. Thus, BpuR appears to be a modulator and its role in Erp expression may depend on BpuR levels in vivo. Preliminary data indicate that BpuR targets multiple loci, in addition to the *erp* operons. Our data indicate that this novel, chromosomally encoded DNA-binding protein may be a global regulator of borrelial gene expression.