- **PROJECT-1 : Transcriptional regulation of the *proU* operon:**

Following our group's discovery *(1)*, cloning *(2)*, genetic characterization *(3)* and nucleotide sequence determination *(4)* of the *E.coli proU* operon, our interest has been in understanding its transcriptional regulation. *proU* transcription is induced 400-fold during growth at high osmolarity, which is the highest known for an osmoresponsive gene in any organism. Three *cis* elements for *proU* regulation have been identified *(5)*, namely two promoters P1 and P2 and a negative regulatory element (NRE) of approximately 500 bp that is situated downstream of the promoters (overlapping the first structural gene). The P1 and P2 promoters are transcribed by RNA polymerase bearing the σ^s- and σ^{70}- subunits respectively *(6,7)*. The nucleoid protein H-NS is involved in repressing proU expression at low osmolarity at least in part by interacting with the NRE *(5,7)*, but this does not appear to be through a 'silencing' mechanism *(8)*. Our current interests are in understanding (i) the contribution of the P1 promoter to *proU* regulation, particularly in light of the finding *(9)* that this promoter is cryptic in the closely related bacterium *Salmonella typhimurium* because of a novel phenomenon of transcription attenuation; and (ii) the mechanism by which the NRE mediates the repressive action of H-NS, and in particular the topological changes occurring at the NRE during growth at high osmolarity *(5)*. We have recently shown that P1 promoter transcription is modulated by the transcription termination factor *Rho* as well as by H-NS, and that the promoter may be involved in *proU* expression during growth at low temperatures (10).

We have also developed and patented a *proU* promoter-based generic system for salt-induced overproduction of recombinant proteins in *E.coli (11,12)* and the strain developed for the purpose is sold by Life Technologies Inc., USA as BL21-SI *(13)*. Studies are ongoing in our group to generate improvements to this process.

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