Control of Ribosome Synthesis in *Escherichia coli*

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Introduction

We have recently published a comprehensive review on the regulation of the synthesis of ribosomes and their components (Nomura et al., 1984). We will not attempt to repeat that effort here. Rather, we will simply discuss recent work from this laboratory that is pertinent to questions concerning the regulation of ribosomal protein and ribosomal RNA synthesis.

In *Escherichia coli*, ribosome synthesis is regulated to meet the needs for protein synthesis. The appropriate amounts of ribosomal components (r-proteins and rRNAs) are made to provide the ribosome capacity for protein synthesis required by the cell under different growth conditions. The genes for the components of the protein synthetic system are spread all over the *E. coli* chromosome (see Fig. 45.1 A, B), and yet the synthesis rates of all their gene products are regulated in a coordinated and balanced manner so as not to use up energy that is required for other biosynthetic purposes. Only very small amounts of free, unassembled components or even monosomes are ever present under normal, exponential growth conditions (except during conditions of very slow growth). Thus, almost all ribosomal components occur within the polysome fraction.

Figure 45.1. A. Genetic map of *E. coli* showing the locations of r-protein genes. The gene order of S19, L22 is from G. Zurawski (personal communication). The location of the L20 gene is from Fayat et al. (1983). References for the positions of other genes are given in Nomura et al. (1984). B. Genetic map of *E. coli* showing the locations of stable RNA genes. Transfer RNAs encoded within rRNA operons.

B. Hardesty et al. (eds.), *Structure, Function, and Genetics of Ribosomes* © Springer-Verlag New York Inc. 1986
are shown in parentheses. In some cases, tRNA genes are cotranscribed with genes coding for proteins (tuB, Hudson et al., 1981; Lee et al., 1981; Miyajima et al., 1981; nusA, Ishii et al., 1984). The direction of transcription of the rRNA operons is indicated by arrows. Other references are given in Nomura et al. (1984) and Jinks-Robertson and Nomura (in press).