stimulated phagocytosing cells. The pattern of serum protein synthesis was markedly different from that in normal rats and appeared to be related to an increased synthesis of rRNA moieties. In addition, very early in infection, there appeared to be a de-repression of the chromatin templates of hepatic nuclei, and this may explain the increased rates of RNA synthesis. The changes in chromatin template activity appeared to correlate with the increased flux of amino acids into the liver. Thus it may be postulated that the presence of an excess of free amino acids somehow stimulated increased synthesis of rRNA and perhaps mRNA and the subsequent production and release of specific serum proteins.

From these various experiments it may be concluded that the intracellular availability of certain amino acids can markedly influence the regulatory mechanisms for rRNA synthesis, release and subsequent template activity. With a decrease in amino acid supply, a significant correlation was observed between decreased ribosomal synthesis and activity and the lowered concentration of certain intracellular amino acids; this direct relationship was not as apparent when the amino acid supply was increased.

The Influence of Diet on Ribonucleic Acid Polymerase Activity

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The response of the rat liver cytoplasm to changes in the protein content of the diet has been well documented (see other papers in this Colloquium). The equally profound changes that occur in the nucleus are less well known.

Lagerstedt (1949) was probably first to investigate the histological changes occurring in the rat liver nucleus after changes in the protein content of the diet. He showed that starvation for 24h produced a 50% decrease in the size of the nucleolus and that starvation prolonged beyond this period did not cause further size changes. Feeding of a high-protein diet to these animals led to a very rapid increase (+100%) in nucleolar size within 3h.

Stenram (1956) observed the changes in rat liver nucleolar size for several weeks after feeding with a high-protein diet. Nucleolar size increased for at least 3 days but remained relatively large for a further 7 weeks. A low-protein diet produced very large increases in nucleolar size that took longer to develop than with the high-protein diet.

As the rat liver nucleolus is known to be both the site of synthesis of ribosomal precursor RNA and the location of the Mg^{2+} -activated DNA-dependent RNA polymerase (reviewed by Busch & Smetana, 1970), several investigators have studied the association between this RNA polymerase activity and the diet.

Shaw & Fillios (1968) observed an increase in activity of rat liver RNA polymerase after feeding with a low-protein diet. Rickwood & Klemperer (1970) showed a decrease in activity of the RNA polymerase over 4 days of starvation, and Henderson (1970) obtained an increase in activity of the polymerase within 5–10min of feeding a complete mixture of amino acids to young rats. This increased activity was shown to be short-lived and to be abolished by pretreatment with puromycin or cycloheximide, and it was therefore suggested that a new enzyme was formed after feeding. The omission of tryptophan from the feeding mixture decreased the response of the Mg^{2+} -activated DNA-dependent RNA polymerase to feeding. The activity of the polymerase could be correlated with the liver tryptophan concentrations for both types of feeding mixtures.

With the discovery of multiple forms of RNA polymerase (Roeder & Rutter, 1969) and the extension of these findings by many groups of workers it is expected that a clearer understanding of the influence of diet on nucleolar and extranucleolar RNA polymerases may be gained.

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