

A Nuclear Export Signal In hnRNP A1: a signal-mediated, Temperature- Dependent Nuclear Protein Export Pathway

W. M. Michael , M. Choi , and G. Dreyfuss 1

1 Howard Hughes Medical Institute, University of Pennsylvania School of Medicine, Philadelphia 19104-6148, USA

Pre-mRNAs are associated with hnRNPs, and these proteins play important roles in the biogenesis of mRNAs. The hnRNP A1 is one of the most abundant hnRNPs, and although localized primarily in the nucleoplasm, shuttles continuously between the nucleus and the cytoplasm. A 38 amino acid domain within A1, termed M9, which bears no resemblance to classical nuclear localization signal (NLS) sequences, localizes A1 to the nucleus. Here we show that M9 is also a nuclear export signal; placing M9 on a protein that is otherwise restricted to the nucleus, the nucleoplasm core domain (NPC), efficiently exports it to the cytoplasm in a temperature-dependent manner. In contrast, classical NLSs cannot promote the export of NPC. These findings demonstrate that there is a signal-dependent, temperature-sensitive nuclear export pathway and strengthen the suggestion that A1 and other shuttling hnRNPs function as carriers for RNA during export to the cytoplasm.