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Staufen: from embryo polarity to cellular stress and neurodegeneration

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1. ABSTRACT

Staufen is a double-stranded RNA-binding protein that forms RNA granules by RNA-dependent and -independent interactions. Staufen was initially described in *Drosophila* as a key molecule for targeting maternal mRNAs. In vertebrates, two highly similar paralogs with several splicing variants mediate mRNA transport, thus affecting neuron plasticity, learning and memory. Staufen also regulates translation and mRNA decay. In recent years, Staufen was shown to be an important regulatory component of stress granules (SGs), which are large aggregates of silenced mRNPs specifically induced upon acute cellular stress. SGs contribute to cell survival by reprogramming translation and inhibiting pro-apoptotic pathways, and Staufen appears to negatively modulate SG formation by several mechanisms. More recently, mammalian Staufen was found in RNA granules and pathological cytoplasmic aggregates related to SGs containing huntingtin, TDP43, FUS/TLS or FMRP. In addition, Staufen binds CUG repeats present in mutant RNAs causative of degenerative conditions, thus ameliorating disease. Finally, Staufen affects HIV and influenza infection at several levels. Collectively, these observations unveil important roles for Staufen-mediated post-transcriptional regulation in a growing number of human diseases.