



Published in final edited form as:

FEBS Lett. 2014 November 28; 588(23): 4267. doi:10.1016/j.febslet.2014.10.022.

More than an adaptor molecule: The emerging role of tRNA in cell signaling and disease

Lluís Ribas de Pouplana and Peter Dedon

This *FEBS Letters* “FOCUS ON...” series of short reviews on tRNA captures the essence of the *Barcelona BioMed Conference on Gene Translation: Fidelity and Quality Control*, which was held at the Institut d'Estudis Catalans in Barcelona on December 2–4, 2013. This meeting was powered by the dramatic resurgence of interest in tRNA biochemistry following the realization that tRNA is much more than a simple adaptor of the genetic code.

This realization stems in part from the emergence of new convergent technologies, such as deep sequencing, bioinformatics, biological mass spectrometry and ‘omic science, as well as from the growing body of evidence that connects translation biology to the cell cycle, metabolism and disease. Research on translation has long focused on the interactions between the basic players of translation (tRNA, aminoacyl-tRNA synthetases, transcripts and ribosomes), but these interactions were mainly studied in isolation from the rest of the cell. However, tRNAs have now emerged as key players in the many mechanisms of control that tightly couple protein synthesis to the main signaling pathways that modulate cell biology and pathophysiology. Recent discoveries on the connections between tRNAs and signaling pathways and cell function have highlighted the need to establish a fluid dialogue among laboratories that approach the problem from its many different perspectives.

The *Barcelona BioMed Conference* recognized and consolidated these emerging ideas and discoveries, the scientific substance of which is reflected in the five mini-reviews of this “FOCUS ON...” series. A major focus was the growing area of tRNA mistranslation (see also Moghal et al.), from the perspective of pathological errors in protein sequences due to mischarging of tRNAs, to the concept of “adaptive mistranslation” as a stress response and survival mechanism for many organisms. Another emerging topic was the role of anticodon modifications and their effects upon codon usage patterns and codon-biased translation in cell stress responses and pathophysiology (Begley and Dedon). A third area of interest was discoveries of direct mechanistic links between human diseases, such as cancer and neurodegeneration, and facets of tRNA biology including tRNA modification and maturation (Torres et al.), tRNA cleavage (Anderson and Ivanov) and aminoacyl-tRNA synthetases (Laporte et al.).

While the meeting successfully accomplished the objective of bringing together a diverse group of scientists to discuss the present and the future of tRNA research, this FOCUS ON...series reflects its scientific substance, as well as the excitement still resonating among those who attended the conference. As co-organizers of this meeting and editors of the FOCUS ON..., we hope that you might share the excitement about these new developments in tRNA biology.