The central dogma and its implications for gene-centrism revisited: from DNA-centrism to NA-centrism

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Abstract

Both the 'Weismann barrier' and Francis Crick's 'central dogma' of molecular biology nourished the gene-centric paradigm of life, i.e. the conception of the gene/genome as a 'central source' from which hereditary information unidirectionally 'flows' or 'radiates' into cellular biochemistry and development and not the other way around. Today, due to advances in molecular genetics and epigenetics such as the discovery of complex post-genomic and epigenetic processes in which genes are causally integrated, many theorists argue that gene-centrism is getting falsified. Here, we explore the causal implications of the following four, to the central dogma related issues: (i) widespread reverse transcription (arguing for a shift from DNA-genome to 'NA-genome'); (ii) the absence of a mechanism of reverse translation (arguing in favour of the 'structural primacy' of NA over protein in cellular biochemistry); (iii) pervasive transcription (arguing in favour of the 'behavioural-functional primacy' of NA over protein in cellular biochemistry); and (iv) the fact that functional (post-genomic and epigenetic) biochemistry can only edit and not integrally recode structural genetic sequence (arguing for a 'sequence-centric' perspective on cellular biochemistry). We conclude – in spite of the embeddedness of genes/genomes into the complex biochemical (post-genomic and epigenetic) dynamics of the cell – in favour of a gene-centric conception of cellular biochemistry, i.e. biochemistry at the sub-cellular level, although a shift from traditional narrow 'DNA-centrism' to the broader 'NA-centrism' seems mandatory. We will also ask whether this conclusion can be extended to the cell as a whole, and further to the organismal and ecological level.

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