Benítez-Burraco *Hereditas* (2018) 155:38
https://doi.org/10.1186/s41065-018-0076-2

Hereditas

LETTER TO THE EDITOR Open Access

Differences in the Neanderthal *BRCA2* gene might be related to their distinctive cognitive profile

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Abstract

The unique divergence of the *BRCA2* gene in Neanderthals compared to modern humans has been hypothesized to account for a differential susceptibility to cancer. However, the role of the gene in brain development and its connection with autism suggest that these differences might be (also) related to the more encapsulated nature of the Neanderthal cognition and their (inferred) autistic-like features.

Keywords: *BRCA2*, Neanderthal, Evolution, Cognition, Autism

Main text

In their paper [1] Michalak and Kang report on three unique non-synonymous nucleotide substitutions in the Neanderthal breast cancer 2 (*BRCA2*) gene. According to the authors, these changes might be involved in a species-specific differential response to cancer, particularly, because one of the variants (position (2)) has been associated to two cancer types in present-day human populations. Although there are some descriptions of tumoral lesions in Neanderthals [2], there is no evidence of a differential susceptibility to cancer among them. Other reasons might account for the selection of these variants in Neanderthals. *BRCA2* is known to be required for normal neurogenesis [3] and mutations in the gene have been associated to intellectual disability and microcephaly [4]. Interestingly enough, two de novo missense mutations in *BRCA2* have been identified in individuals with autism spectrum disorder (ASD) [5]. The parallels between the Neanderthal and the ASD brains/minds are striking (reviewed in [6]). Candidate genes for ASD are overrepresented among the genes that have changed in the human lineage [7, 8]. Additionally, introgression events from archaic hominins have been claimed to account for aspects of the diversity of genes related to neurodevelopmental disorders, including ASD [9]. Finally, experimental and biochemical data suggest that BRCA2 interacts with several proteins involved in brain function and associated to cognitive disease, specifically, TP53 [10], PARP1 [11], and FLNA [12]. TP53 exhibits a human-specific variant not found in Neanderthals [13]. PARP1 regulates the dyslexia-susceptibility gene *DYX1C1* [14]. FLNA is involved in neuronal migration [15] and interacts with ITGB4 [16], a protein showing two fixed changes in humans compared to Neanderthals [17]. Overall, this evidence suggests that the reported changes in the Neanderthal *BRCA2* gene might have been (also) selected because of its impact on cognition, plausibly accounting for some of the differences between Neanderthal and human cognitive abilities.

Abbreviations

ASD: autism spectrum disorder; BRCA2: breast cancer 2

Acknowledgements

Not applicable.

Funding

Preparation of this work was supported by funds from the Spanish Ministry of Economy and Competitiveness (grant number FFI2016–78034-C2–2-P [AEI/FEDER,UE]).

Availability of data and materials

Not applicable.

Author's contributions

ABB conceived and wrote the paper.

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Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The author declare that he/she has no competing interests.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 19 November 2018 Accepted: 28 November 2018
Published online: 13 December 2018

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