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## Mosquito core viromes: do they exist?

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1 **Mosquito core viromes: The importance of context**

2

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11 metagenomics

12

13 In response to our Opinion article on mosquito viromes and the paths towards implementable  
14 measures to counter the transmission of mosquito-borne viruses, De Coninck and Matthijnsens  
15 raise an important point on the definition of the increasingly used term ‘core virome’. Across  
16 published mosquito virome studies, this term appears to have two usages with very different  
17 biological implications: to refer to the entire set of mosquito-infecting viruses, or to refer to a  
18 subset of common viruses found above a certain abundance or occurrence (i.e., prevalence)  
19 threshold. Here, we take advantage of this opportunity to add a little more to the discussion.

20

21 De Coninck<sup>i</sup> had previously presented how the microbiome research community view the term  
22 ‘core virome’ and that the methodologies employed to assign ‘core’ status are varied and currently  
23 the subject of active debate [1,2]. It is generally agreed that core taxa must fulfil some criteria in  
24 terms of abundance or occurrence and therefore cannot comprise the entire virus community  
25 within a host given the high variability of virome composition across individuals and populations.

26 We concur with this since viral taxa that occur with particularly high abundance or occurrence are  
27 more likely to have biological and ecological relevance. As such, defining core viromes is useful for  
28 refining future investigations and their analysis across populations permits insights into host-virus  
29 infection and transmission dynamics.

30  
31 In their letter, De Coninck and Matthijnsens posited that the concept of a core virome requires a  
32 more nuanced understanding. In their very recent metagenomics study on single *Culex*  
33 mosquitoes, no single virus species was shared among all individuals of the same mosquito species  
34 from different sampling locations [3]. This new data, alongside previous studies in *Aedes aegypti*,  
35 *Ae. albopictus*, *Cx. quinquefasciatus*, and *Cx. pipiens*, shows that the presence, in addition to the  
36 composition, of core viromes are species-specific and may even be population-specific [3–6]. They  
37 argued for caution and called for clear definitions in using the term ‘core virome’, which we  
38 unreservedly echo. More precisely, the inclusion criteria or methodological details of assigning  
39 core status should be well presented, and abundance or occurrence measures in single mosquitoes  
40 should be aimed for.

41  
42 But not all core taxa are equally stable. A previous study from their group [5] made the distinction  
43 between a vertically transmitted core virome and an environmentally derived core virome, which  
44 emerges from comparisons between the viromes of lab-reared versus wild mosquito populations.  
45 The viromes of wild populations often proved to be richer, due to a greater proportion of  
46 environmentally derived viral taxa, and more diverse, as environmentally derived members may be  
47 habitat-specific and may naturally fluctuate with time, climate, and other ecological factors [5,7]. It  
48 follows that an environmentally derived core virome would be less stable than a vertically  
49 transmitted one and must be interpreted within defined spatial and temporal scales. Hence, it  
50 could be argued that ‘core’ status should be reserved for vertically transmitted viral taxa, which are

51 more likely to have long-term coevolutionary relationships with their host. That said, the current  
52 body of virus metagenomics studies in the same mosquito species across wide geographical scales  
53 supports the alternative definition of “mosquito core virome” put forward in their letter, given that  
54 single mosquito-specific virus species globally present in all tested populations, let alone  
55 individuals, are seemingly rare [5,6,8,9].

56

57 To summarise, we agree that viruses should not be granted ‘core’ status lightly and we encourage  
58 researchers to consider the biological ecological implications of assigning candidate viral taxa into  
59 core viromes. Research works from the group of De Coninck and Matthijnsens have significantly  
60 shaped the mosquito virome zeitgeist and we look forward to following the data-informed  
61 evolution of the ‘core virome’ concept.

62

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68

### 69 **Declaration of interests**

70 The authors declare no competing interests.

71

### 72 **Resources**

73 <http://disq.us/p/2vydkvk>

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