Changes in Endosymbiont Complexity Drive Host-Level Compensatory Adaptations in Cicadas

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 For insects that depend on one or more bacterial endosymbionts for survival, it is critical that these bacteria are faithfully transmitted between insect generations. Cicadas harbor two essential bacterial endosymbionts, "Candidatus Sulcia muelleri" and "Candidatus Hodgkinia cicadicola." In some cicada species, Hodgkinia has fragmented into multiple distinct but interdependent cellular and genomic lineages that can differ in abundance by more than two orders of magnitude. This complexity presents a potential problem for the host cicada, because low-abundance but essential Hodgkinia lineages risk being lost during the symbiont transmission bottleneck from mother to egg. Here we show that all cicada eggs seem to receive the full complement of Hodgkinia lineages, and that in cicadas with more complex Hodgkinia this outcome is achieved by increasing the number of Hodgkinia cells transmitted by up to 6-fold. We further show that cicada species with varying H