



A comparison of low temperature biology of *Pieris rapae* from Ontario, Canada, and Yakutia, Far Eastern Russia.

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Abstract: Low temperatures limit the distribution and abundance of ectotherms. However, many insects can survive low temperatures by employing one of two cold tolerance strategies: freeze avoidance or freeze tolerance. Very few species can employ both strategies, but those that do provide a rare opportunity to study the mechanisms that differentiate freeze tolerance and freeze avoidance. We showed that overwintering pupae of the cabbage white butterfly *Pieris rapae* can be freeze tolerant or freeze avoidant. Pupae from a population of *P. rapae* in northeastern Russia (Yakutsk) froze at c. -9.3 °C and were freeze-tolerant in 2002-2003 when overwintered outside. However, *P. rapae* from both Yakutsk and southern Canada (London) acclimated to milder laboratory conditions in 2014 and 2017 froze at lower temperatures (

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