Effects of gut-associated microbes on the growth of the eastern spruce budworm *Choristoneura fumiferana*

Melbert SCHWARZ, Steven KEMBEL, and Daniel KNEEWSHAW

Department of biological sciences, University of Quebec in Montréal. 141, av. du Président– Kennedy, Montréal, H2X 1Y4

### Introduction
- Spruce budworm (SBW) is an important forest pest in eastern Canada
- 52 million ha defoliated during last outbreak between 1975 and 1992 (Burton et al., 2015)
- Microbes are often important to host health by aiding in nutrient availability and providing protection against pathogens (Engel and Moran, 2013)


### Objectives
- Test if gut-associated microbes influence growth of SBW
- Investigate how the interaction between diet type and antibiotics influences SBW growth
- Investigate how antibiotics affect the SBW gut microbiome
- Quantify changes in microbial diversity among treatments
- Quantify changes in microbial community composition

### Methods
- Insects reared under controlled conditions until sixth instar
- Two treatment levels and their interactions:
  - Diet: Balsam fir vs black spruce
  - Antibiotics (AB): AB vs no AB
- Measured growth every 2 days

### Results

**Figure 1.** Schematic representation of experimental design. Each box represents one experimental unit (n=40) for each group.

**Figure 2.** Least square means ± SE of spruce budworm larval weights among treatments derived from a linear mixed-effects model. Lowercase letters above the bars represent statistical significance based on ANOVA ($\alpha<0.05$).

- Diet type had the largest effect on SBW growth ($p<0.001$)
- Antibiotics had no overall effect on SBW growth
- SBW larvae feeding on Balsam fir with antibiotics grew significantly less than on untreated diet ($p= 0.0356$)

### Conclusions
- Diet is the most important factor influencing SBW growth
- Interaction between AB and diet suggests that there are microbes beneficial to SBW which live on fir but not on spruce

### Future work
- Quantify microbial diversity and the relative percent contribution of each microbial taxa to the community among treatments
- Test if any microbial taxa are over or under represented in a given treatment
- Test the significance of diet, antibiotics, and their interaction on the growth of SBW larvae

References: