**Can bed bugs adapt to the heat treatments?**

Heat treatment for bed bugs involves heating a room to about 130°F over the course of 24 hours. This length of time ensures that every bit of the room comes up to this high temperature for at least an hour. This treatment works by basically cooking bed bugs, but what exactly does this mean?

As the bed bugs get hotter, the structure of their proteins starts to change. Proteins are big complicated molecules. As the temperature increases, these molecules tend to move more, just like when an egg white is cooked. This extra motion can cause parts of the protein to shift around as bonds break and rearrange. These shifts change the structure of the protein. As the protein structure changes it often causes the protein to stop functioning the way it should.

As more and more proteins stop functioning, processes like moving, digesting, and respiring start to fail. Eventually, so many processes are interrupted that the bed bug dies.

This shifting structure does not happen to just one or two proteins, but nearly every protein in the bed bug. This means that in order to adapt, there needs to be a heat tolerant trait for not just a single protein, but thousands. This makes the probability of a bed bug having all the mutations needed to survive very, very small.

To test how hot the heat treatment needs to be in order to be effective, scientists exposed bed bugs to various temperatures for 1 hour. They then measured how many bed bugs survived. The graph below shows the relationship between temperature and percentage of bed bug surviving.

Percentage of Bed Bugs Surviving versus Temperature

