BED BUGS KEEPING YOU AWAKE?

(1) They don't like the sunlight and they wait until the Sun sets to come out and feed on human blood. Is this a story about vampires? Instead of vampires, you will learn about the equally fascinating common bed bug, also scientifically known as *Cimex lectularius.*

(2) Bed bugs are 4-5 mm in length. They have flattened oval-shaped bodies and horizontal bands across their abdomens. Like all insects, they have six legs. They are hematophagous, meaning that they feed on blood. *Hema* refers to blood and *phage* means to feed. They need this blood to grow, moult and nourish their eggs. They are also classified as ectoparasites. *Ecto* means that they are found on the outside of the host's body instead of inside of it. This is opposed to an endoparasite, like a tapeworm, that lives on the inside of a host's body.

(3) Bed bugs find their sleeping hosts through detecting the carbon dioxide emitted as they breathe. They are also attracted to the heat generated by their victims. They prefer to bite exposed areas of the sleeper like the neck, face and arms. Sometimes they leave three marks on their victims that some people call "breakfast, lunch and dinner."

(4) If bed bugs are biting you in your sleep, why don't you just wake up? Bed bugs have a variety of methods of avoiding detection as they go about obtaining their nocturnal meals. Bed bugs puncture human flesh by inserting a small beak-like structure called a rostrum into the skin. The rostrum contains a set of tiny teeth that act as miniature saws that cut through flesh until a blood vessel is found. Inside the rostrum are two tubes. The large one is the blood canal which transports blood from the host to the bed bug and the smaller tube is for injecting saliva into the host. When a blood vessel is pierced, the blood pressure forces the blood into the blood canal and into the bed bug's abdomen making it turn red. This take 3-5 minutes.

Cimex lectularius, Photo Credit: Piotr Naskrecki

(5) While a bed bug is feeding, two things can go wrong for the bed bug: the victim can wake up due to the pain of the bite and the blood can start to clot as the victim's healing mechanisms begin to respond to the injury. Blood clotting starts to thicken the blood and prevents it from flowing into the blood canal. To combat these issues, the beg bug injects saliva into the victim as it drinks. The saliva contains painkillers to prevent the sleeper from waking. It also contains an anticoagulant that prevents the blood from clotting so that it stays a liquid. Many other hematophagous organisms use anticoagulants for the same reason.

(6) Some humans have an allergic reaction to these chemicals in the saliva. This can cause small swellings or red marks at the sites of the bite wounds. Around 20% of victims have no reaction and never know they've been bitten.

(7) Bed bugs have a very interesting way of reproducing. The male bed bug fertilizes the female in a process called traumatic insemination. This means that the male bed bug uses its hypodermic (needle-like) genitalia to puncture the female bed bug's abdomen and deposits his sperm into her body cavity. The sperm travels in her hemolymph (blood) until it finds her seminal conceptacles which store the sperm until she's ready to use it to fertilize her eggs. Male bed bugs sometimes accidentally try to inject other males with their sperm. This mix-up occurs because the way bed bugs tell the difference between males and females is by body size. The females are typically larger than the males, but a larger male might be mistaken for a female and get accidentally injected.

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Female bed bugs have developed a way to protect themselves from the injury or infection that could occur after traumatic insemination. Males have not developed this protection so an accidental mating can lead to serious injury.

(8) In developed countries, bed bugs were almost wiped out in the 1940s but began to increase in numbers again in the 1990s. This rise occurred as they became more pesticide resistant. They also benefitted from increased international travel which carried them from country to country. They like to live in bed linens, mattresses and headboards, but can be found in many other places like suitcases, picture frames and wall sockets.

(9) Once a home is infested with bed bugs, they can be difficult to get rid off. They can live up to 1 year without a blood meal. Eradicating them often involves non-pesticide methods. One common method is to use extreme temperatures against them. They can be killed if they are exposed to a temperature of 45°C/113°F for over one hour or -17°C/1°F for two hours. Bed linens and clothes you suspect of having bed bugs can be put into the drier for an hour to kill the insects. Bed bugs live for around 9 months and during that time a single female can potentially produce up to 500 offspring in a few weeks. This is more than enough to cause an infestation if even one healthy female bed bug is in your home.

Article Questions

1) Besides the bed bug, can you name two other organisms that are also hematophagous?

2) What is the difference between the term ecto and endo?

3) How do bed bugs prevent humans from waking up from the bed bug bite?

4) Why do some people react to the bite of a bed bug?

5) Describe the process of traumatic insemination. What does the female do with the sperm she receives?

6) Why are male bed bugs sometimes accidentally injected with sperm by other male bed bugs?

7) What has caused cases of bed bug infestations in developed countries to increase over the past few decades?

8) How can you get rid of bed bugs?