What if you share a drink with a bat?

Authors: up to 3 researchers from the original paper usually the ones most involved with the adaptation.

Associate editors: members of our team who worked on the adaptation.

Total text length: 800-1000 words for the main text (excluding glossary, references, assessment questions) so that the entire adaptation will fit on 4 pages

Title:
an open question that is short and catchy (ideally no more than 40 characters), not a yes/no question. It can be the original research question as long as phrased appropriately.

Title cartoon: custom-made for your paper. We discuss it with you before we create it and make whatever modifications are necessary.

Abstract:
maximum 150 words.

Abstract:

We found that eight of them drank fermented palm sap - the local palm wine. We believe that drinking this liquor is a potential way to get infected with Nipah virus. Palm wine producers should probably take measures to prevent contact between bats and the sap.

Introduction:

150-250 words.

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Bats have a really bad reputation - undeserved one. Maybe you have heard some horrifying stories yourself like blood-sucking and hair tangling. They are not true, by the way! Bats are in fact important for our environment (Fig. 1) - they keep insect populations in check and some of them are important pollinators (like bees).

One thing, though, that makes bats look bad is that sometimes, not often, they spread diseases. Unfortunately, pretty deadly ones. These include the scary Ebola and Marburg diseases, SARS (Severe Acute Respiratory Syndrome) and Nipah virus infections which cause encephalitis - an inflammation of the brain. The Nipah virus recently (in 1999) in a village called Nipah (this is how the virus got its name) infected people. It turned out that people built their pig farms near bat-inhabited forests. The virus jumped from the bats, which are its natural reservoir, to the pigs, then from pigs to humans. Many people got sick and more than half of them died. (Read more in How one man saved his country from a nightmare virus called Nipah.)

A few years later, in Bangladesh scientists found that people also could get sick from drinking raw date palm sap.

Figure 1:

New vocabulary is bolded and colored (when encountered for the first time) and listed in the Glossary at the end.

Option: links to online resources related to your research.
**Methods**

Our epidemiological study took place in two districts in Bangladesh from 2011 to 2014. We took a few steps and some detective work to find a possible route of infection.

- **We identified possible cases of Nipah virus infections.** Sometimes, diagnosis is not that easy. So we categorized the possible cases as:
  - Suspected = no lab diagnosis but the symptoms were present (fever, altered mental status, seizures);
  - Probable = the patient had exhibited the described symptoms and had lived near a patient with confirmed virus infection but had died before we could take samples;
  - Confirmed = the symptoms were present and we found antibodies against the virus.

**Results**

We focused on three clusters where the virus source was unknown. Within them, there were 14 cases of sick people described in figure 2.

Eight of the patients had drunk *tari* before their illness began. Another six had close contact with them (for example, they took care of the sick) and then got sick themselves.

We also noted if the patient had had contact with another Nipah-infected patient. In this case we are talking about a secondary infection. When there has been no such contact we talk about primary infection.

- We identified clusters of Nipah virus infection - at least two people with brain inflammation living near each other.
- We identified probable route of infection. We talked to the surviving patients or the friends of the deceased ones. Had they been drinking raw palm sap? Had they had contact with sick pigs or other animals? We limited this study to clusters where these answers were no. It turned out that some of them had drunk wine, called *tari*, prepared from fermented palm sap, so we investigated its production as well.

It seemed quite possible that the *tari* was somehow involved, so we asked around how it was made. The process resembles the process of collecting raw palm sap: the harvesters cut the old leaves at the top of the palm tree and insert a bamboo spigot (tap). (See Fig. 3 and the video.) Then they hang a pot under the spigot and wait. The collected sap ferments for several days in the pot. This is a mistake – the longer the pots stay there exposed, the more opportunities for bats to contaminate them. Indeed, the harvesters had found bat excreta in and on the sap pots.

**Figure 2:**

Nipah virus transmission in 3 clusters in Rangpur and Rajshahi districts, Bangladesh from 2011, 2012 and 2014.

**Figure 3:**

This is how palm sap is harvested to make *tari*.
Conclusion: 100 words. Generally different from the original paper. Instead of summarizing the paper/reiterating the findings, it suggests things that the reader can do. What are the implications for the individual student?

Discussion: 150-200 words.

WHAT IF YOU SHARE A DRINK WITH A BAT?

Discussion

Is drinking tari one more way for Nipah virus to get you? We believe so. All of the primary case-patients had been drinking tari regularly. They hadn’t been drinking raw palm sap and they hadn’t been in contact with any sick pigs. Maybe there had still been some raw palm sap inside the tap? No, we checked that the harvesters collect tari in the morning and all the patients had been drinking it in the evening – enough time for the sap to ferment at least partially.

Unfortunately, raw palm sap is tasty for bats. They often lick it and sometimes pee inside the collection pots. Both bats’ urine and saliva are rich in viruses (when the bat is infected). We also know that alcohol tends to kill some viruses. So is it possible for the Nipah virus to survive inside the tap? If we want to sanitize a surface or an object we use 60-70% alcohol solution. Palm wine contains only 5-8% alcohol, so yes, the virus can survive.

Conclusion

Using an epidemiological approach we were able to link clusters of Nipah virus infection with drinking tari. There is the possibility that other bat viruses can infect people the same way. So what can we do?

First, palm sap harvesters can use bamboo to cover the tree cuts so that bats have less contact.

What about the bats? Shouldn’t we kill them all? No! Don’t hate bats. It’s not their fault. They don’t even know they are sick when they carry the virus passively. Killing bat populations would lead to an ecological disaster as they are really important pollinators. Plus, one single bat can eat 2,000 insects per night, including mosquitoes.

However, you shouldn’t touch bats! If you find a bat on the ground, don’t pick it up! It may be sick. Instead, call a local wildlife rehabilitation center. If you absolutely have to touch it always use thick leather gloves.

Glossary of Key Terms

- Encephalitis – inflammation and swelling in the brain. Most often viruses and bacteria are to blame. It can lead to fever, confusion, changes in behavior, seizures and even death.
- Natural reservoir – the host in which the virus lives and reproduces for a long time. Usually the natural reservoir get sick but it spreads the virus. For example – the natural reservoir for plague bacteria are wild rodents.
- Palm sap vs tari – just as we have a blood stream, plants also have vascular system. The fluid there is also of people (and bats) drink it. Tari, also called palm wine, is fermented palm sap and it’s alcoholic.
- Epidemiology – part of medicine which studies the spread of a disease – how does someone get infected. People are at risk, where people are at risk and so on. For example, there is no risk for you to get Ebola been to Africa or you had contact with someone who had it.
- Antibodies – scientists use the presence of specific antibodies - molecules in the blood - as an indirect proof of presence of an infection. For example, if you had chickenpox as a baby you developed specific anti-chickenpox antibodies. If scientists detect these antibodies they will know you have had chickenpox in the past. They can also check it in the past or if you are having it right now.
- Cluster – a group of people with a disease in a relatively small area in a short period of time. For example, a cluster of Ebola virus is when five people have the disease in a small village in the same week.
- Primary vs. Secondary Infection – In those cases, the illness occurs several other way.

We try to use as little technical terminology as possible. You might not realize that everyday terms that sound simple to you, are not so simple to a kid. (E.g. compound terms such as “plant community flowering patterns” etc).

If a term is essential to your research, we introduce it in the text and define it in the glossary. But we try to limit these to the truly essential ones.

Ultimately, the adaptation will sound very different from the original paper - this is the point! In many cases it may initially sound TOO simple. But we recommend you trust our editors as they have extensive experience communicating with children and can judge when a text or image is too complex for the intended reading level. Our aim is to help students learn about scientific research, so it may not be necessary to present all of the findings from the original paper.
REFERENCES


National Public Radio reports:
• The fascinating story of how Nipah was first discovered: How one man saved his country from a nightmare virus called Nipah
• Disease detectives find a really good reason not to drink date palm wine
  http://www.npr.org/sections/goatsandsoada/2016/03/22/470803523/disease-detectives-find-a-really-good-reason-not-to-drink-date-palm-wine

Check your understanding

1. Nipah virus is related to measles, mumps and parainfluenza viruses. There is something really alarming about that. So alarming that a lot of governments donated a total of 460 million dollars for the fast development of a vaccine against Nipah virus. What is it?

2. Bats are mammals like us. Do you have any ideas why they don’t get the viruses they carry?

3. Are bats and the viruses they carry in a mutualistic relationship?

4. Why are bats an important part of our environment?

5. What should you do if you discover a bat in your house or fallen on the ground?

Assessment questions to help teachers integrate the content into the classroom. We create a teacher’s key which you can also review during the adaptation process.