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What makes bats special so that they are reservoirs for so many different pathogens?

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What makes bats special so that they are reservoirs for so many different pathogens?

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Introduction

- Our focus will be studying bats as hosts to zoonotic pathogens
- We will find different review articles on different diseases associated with bats and pathogens to formulate a meta-review.
- We aim to study how the pathogen causing the disease is transmitted to other animals with a focal point on humans.
- We will attempt to answer the question on whether bats have something special that allows them to be reservoirs for so many different pathogens and how that directly affects their exposure to humans.
- We will be centered on three particular diseases that seem to have been transmitted to humans: SARS-CoV, Marburg Virus, and Nipah virus.
- The purpose of the paper is to educate individuals on how bats can serve as special hosts for many pathogens focusing mostly on the above pathogens and their mode of transmission to humans.

Keywords: Infectious disease, Meta-review, Bats as reservoirs, host, Literature review, Zoonotic pathogens, SARS-CoV, Marburg Virus, Nipah virus

Inclusion and Exclusion Criteria

Eligibility criteria will be based on relativity to bats as reservoirs of disease, study design, and date. Exclusion criteria mostly are unrelated, duplicated, unavailable free texts, or abstract-only papers.

- The inclusion criteria would be articles that help answer our research question. Our most important goal for the research conducted is that our information is clear and sufficient evidence that either agrees or disagrees with our hypothesis.
- For the inclusion criteria: (1) any review papers that identify why bats are good reservoirs for disease and (2) articles relating to SARS-CoV, Marburg Virus, Nipah virus
- For the exclusion criteria: We will exclude focusing on only a specific bat species or geographical area. We will also stay away from non primary sources such as Wikipedia and other sources that can add low credibility to our paper. Finally, we will exclude any articles that requires payment for access.

Objective

- The objective of our research is to identify the characteristics of what makes bats be reservoirs for so many different pathogens and how these pathogens play a role in infecting humans or propagating the survival of a pathogen.
- Identifying special characteristics, as well as their respective mechanisms
- Analyze different review articles
- Follow inclusion and exclusion criteria to aid in writing final paper answering main question of study

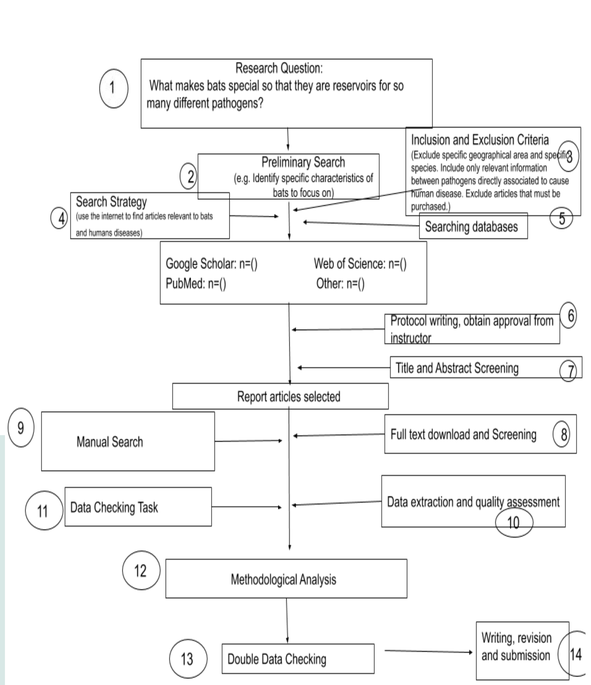

Figure 1: Meta-review flowchart [8]

Methods

1. Came up with a question to study and proposed ideas as to what areas to focus on the most.
2. Reviewed articles related to bats and how they serve as reservoirs for different pathogens.
3. Began our preliminary search.
4. Information from articles was analyzed and dissected most important information

Methods Cont.

5. Individual searching and reading and dissecting each review article and then sharing the ideas of the information found in each one of them.
6. Non relevant articles were left out
7. We need to further look at articles and attempt to really answer, if there is an answer, to what makes bats so special to serve as reservoirs for so many pathogens.
8. Obtain more information from other studies
9. Discuss final project ideas
10. Follow Figure 1 to aid in writing the meta-review paper.

- We hypothesize that what makes bats so special to so many reservoirs is that they have a long life (greater than 30 years):
  - their ability to migrate
  - their daily movement patterns
  - their ability to have access to so many food choice
  - their virus susceptibility

Discussion

- Bats that live in temperate regions have to deal with winters by either hibernating or migrating.
- They cluster in groups as a way to conserve energy. These groups can range from a couple hundred to hundreds of thousands of individual bats [2].
- "Bats may play a key role in the maintenance of some cave ecosystems by bringing in an outside energy source (their guano, or droppings) to energy-poor, lightless caves. Cave biologists think some cave creatures may be highly dependent on bat guano as a source of food" [2].

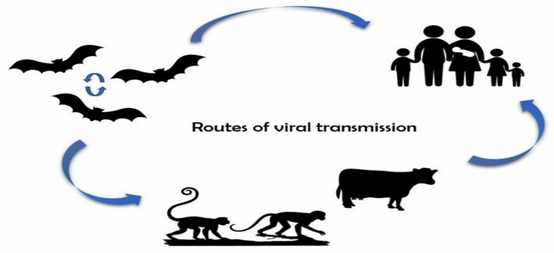

Figure 2: Better understanding of animal biology and behaviour can facilitate identification of the source of these outbreaks and their viral transmission routes, allowing better control and more effective preventative measures (FEMS, 2018).

- Bats clustering causes hotspots for diseases to transfer between the bats. Bats can be a threat to humans for they do not necessarily have only one mode to transmit their pathogen.
- Bats have the potential to come in close contact with both humans and domestic animals.

Discussion Cont.

- Bats can contaminate houses and places with their urine and guano. Intermediate hosts are often a great method to transmit the pathogen to humans.
  - Among the ways in which the intermediate hosts can become infected are:
    - ingestion of food that was partially digested by bats
    - directly ingesting bat meat
    - or a bat bite
  - The partially ingested food of the bat ends up being eaten by another animal making their potential to infect humans higher. [3]
  - Bats have immune systems that are primed and ready to combat infection by walling the virus out of cells.
  - Their flight patterns and their lightweight bodies make viruses hard to stay contained with individual bats for a long period of time.
  - Such a high immune response helps the bats but also encourages a swift spread; it's highly transmissible yet not destructive to them individually. Animals with more sluggish immune systems are more likely to be overwhelmed by the virus. [4]

Conclusion

Our project is ongoing and results are forthcoming in the upcoming weeks.

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