

Introduction

Climate change is the **warming of the average global temperature**¹. It is naturally caused as well as through human activities, particularly the burning of different fossil fuels¹.

This could wreak **havoc on different ecosystems**. It can also affect **individual and community health**. There is a risk involved with extreme heat, in which populations would suffer periods of **heat waves**¹. There is also the risk of **natural disasters**, like hurricanes, flooding, increased periods of rainfall which could lead to the destruction of homes and crops, leading to issues like **malnutrition**¹.

Many studies have examined the relationship between **the increase in rainfall and infectious diseases**.

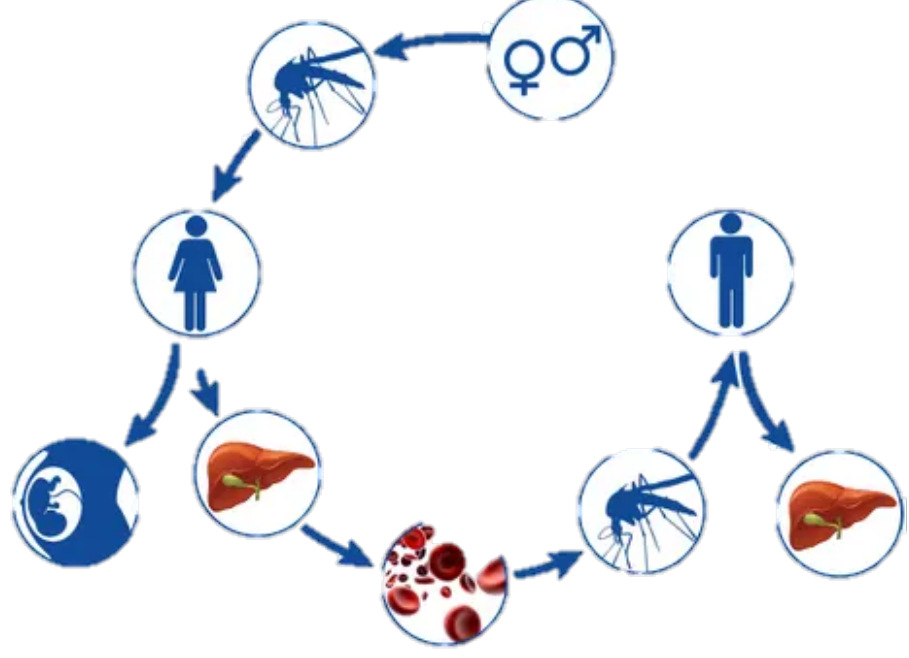
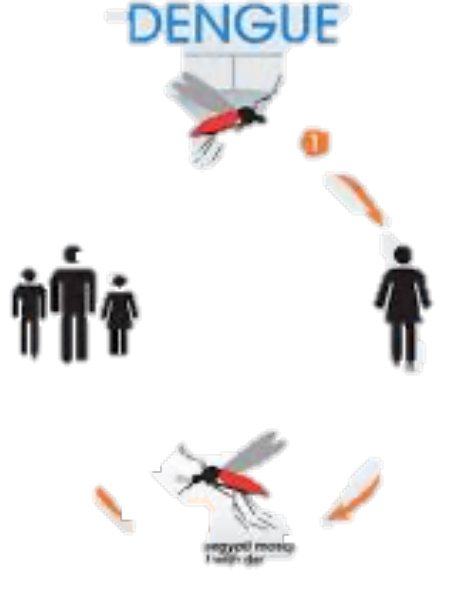
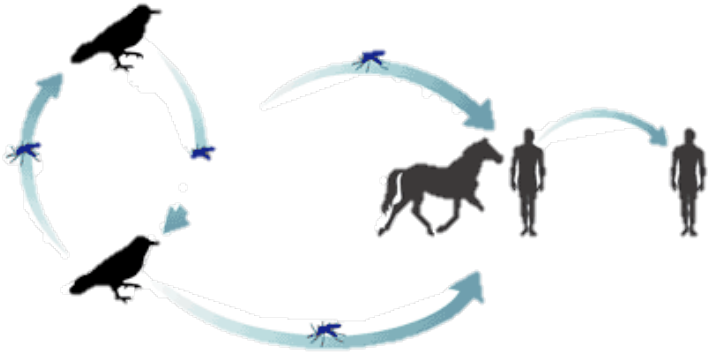
Studies have indicated an **increase in the range of infectious diseases with warming temperatures**². With mosquito-borne diseases, the increasing temperatures have allowed for mosquitoes to spread, specifically the **geographical location and life spans**, resulting in the extension of infectious diseases, like malaria². Global warming has led to changes in the temperature of water. It has been documented that water with increased temperatures has led to environments more suitable for bacterial growth². This in turn has caused increases in water-borne infections².

There has been so much discussion about how precipitation has increased different vector borne diseases and not a lot of discussion on the **effects of decreased precipitation**, aka drought, **on vector borne diseases**.

Methods

| Databases | Final Inclusion |
|--|---|
| <ul style="list-style-type: none">PubMedGoogle ScholarWeb of Science | <ul style="list-style-type: none">800 articles were retrieved350 articles passed the abstract and title screening300 articles were included after final screening (vector borne illnesses vs weather variables) |
| Inclusion Criteria <ul style="list-style-type: none">Key terms “climate change” “drought” “infectious disease, disease specific termsStudies between 1988-2018ENSO, precipitation, drought index vs. vector | |

Results

| Infection/Virus | Findings |
|---|---|
| Malaria  | <ul style="list-style-type: none">Sahara, drought conditions reduced Anopheles mosquitoes and malarial risk³South America, Southeast Asia malaria risk increased as drought severity increased⁴<ul style="list-style-type: none">Increased due to decreased human immune response in stressful periods as well as increase in gametocytogenesis⁴Changes in mosquito behavior - increased in blood meals associated with reproductive success⁵Drought tolerance phenotypes were selected for in Anopheles Gambiae species⁶ |
| Dengue, Zika, Chikungunya  | <ul style="list-style-type: none">Guangdong, China and Venezuela – periods of drought and El Nino were associated with increased dengue outbreaks<ul style="list-style-type: none">Aedes species increased blood feeding frequencyZika and Chikungunya – drought consistently associated with increased breakouts⁷<ul style="list-style-type: none">mosquito feeding behavior - increased blood mealshuman behavior - shifted to have more open water containers |
| Eastern Equine Virus/ St. Louis Encephalitis | <ul style="list-style-type: none">Infections rates were the same during heavy precipitation periods and dry periods⁸ |
| Japanese Encephalitis | <ul style="list-style-type: none">Infections rates were increased during dry periods⁹<ul style="list-style-type: none">Human behavior change - increased open water containers for storage |
| Ross River Virus | <ul style="list-style-type: none">Infections rates increased during dry periods<ul style="list-style-type: none">Female Aedes species were capable of vertical transmission (transmission from parent to child)⁹ |
| West Nile Virus  | <ul style="list-style-type: none">Dry periods associated with increased WNV cases¹⁰<ul style="list-style-type: none">Culex species increases blood feeding mealsPeriods of drought increase stress in primary host, birds, propagating WNVHuman behavior – shifted to have more open water containers |

Limitations

The studies in this paper were limited from 1993-2018. The researchers believed **that using studies that were more recent would be more beneficial to individuals using this paper**. The search criteria being specific to drought and to vector borne disease significantly limits the pool of studies.

The studies included in this review **varied in design and level of quality**.

With the **limited number of studies between drought and vector borne diseases** it is difficult to assess direct causation between the variables.

Conclusions

With a decrease in precipitation, **mosquitoes have adapted in multiple ways**. During periods of drought, their **feeding behaviors have increased**, some species have **adapted to vertical transmission**, and finally **some species have developed drought resistant eggs**.

Change in **human behavior has led to a closer proximity** between mosquitoes and humans.

Findings are important in **driving preventative responses to potential outbreaks** in periods of drought.

The routine **surveillance of mosquito borne diseases will play an important role in preventing future outbreaks** as they become more common due to climate change. With the proper surveillance methods set, the burden of these infectious diseases could potentially be alleviated.

Acknowledgements

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