

# STANDARD DEVIATIONS: The Koala Conundrum

Greetings,

Bothered by bacteria?

Vexed by viral villainy?

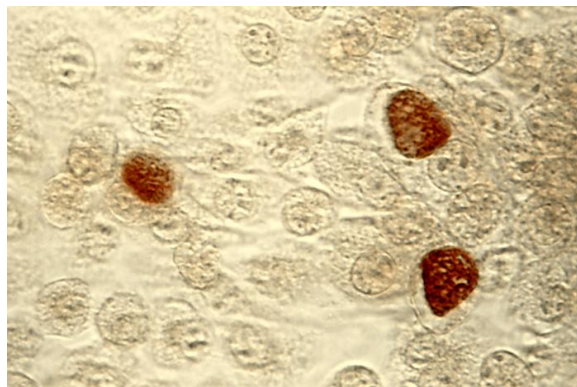
Concerned about climate change?

Consider the cute and cuddly koala.



The bacterial bad-ass is chlamydia, a class of bacteria far better known for causing venereal disease in humans than for devastating koala populations. Queensland studies find chlamydia has caused symptoms in up to 50 percent of wild koalas and suggest more koalas infected but not showing symptoms.

Chlamydia causes a slew of symptoms in koalas, including eye infections, which can lead to blindness, making it difficult for them to find eucalyptus leaves, their primary food source. The bacteria can also lead to respiratory infections, along with cysts and urinary tract infections that can make female koalas infertile.



{Chlamydia trachomatis inclusion bodies (brown) in a cell culture}



A curious viral infection is complicating the picture. This viral epidemic has been particularly severe in Queensland, where nearly all koalas are infected with **koala retrovirus (KoRV)**. This retrovirus is an HIV-like infection that suppresses the koala's immune system and interferes with its ability to fight off chlamydia.

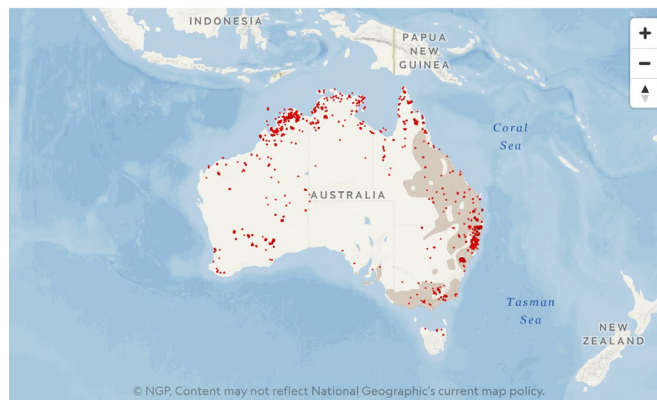
KoRV is important in understanding retroviral disease. Looking at the koala genome, it's been shown that the KoRV has become incorporated into the DNA. The genetics are evolution happening in real time. Over just the last 40,000 years (a blink of the evolutionary eye), pieces of KoRV genome have been incorporated into the koala's DNA. This incorporated insertion provides some sense of immunity against wild KoRV and understanding how may lead to our management of human retrovirus (HIV).

It's not just chlamydia and KoRV; they are also plagued by cancers like leukemia and lymphoma, dogs, loss of habitat, rapid urbanization and deaths from vehicles. In some parts of Queensland, between 1994 and 2016, the koala population declined 80 percent.

And then it got worse.

As catastrophic fires have burned millions of acres in Australia, thousands of koalas are feared to have died. Diminishing Australia's iconic marsupial, the fire danger has only increased in the country as temperatures continue to soar. The Australian Koala Foundation announced this year that koala numbers in many places are in steep decline with no more than 80,000 koalas left in the country.

Red dots show **locations of fires** detected in Australia the week ending Nov. 25, 2019.  
The brown area shows the **range of the koala** (*Phascolarctos cinereus*).



Sources: NASA; IUCN

Chlamydia in koalas is the focus of intense vaccine investigation. The plight has drawn a lot of attention in Australia but has world-wide implications. This research suggests break-through discoveries that could bring relief to millions of people with chlamydial infection.

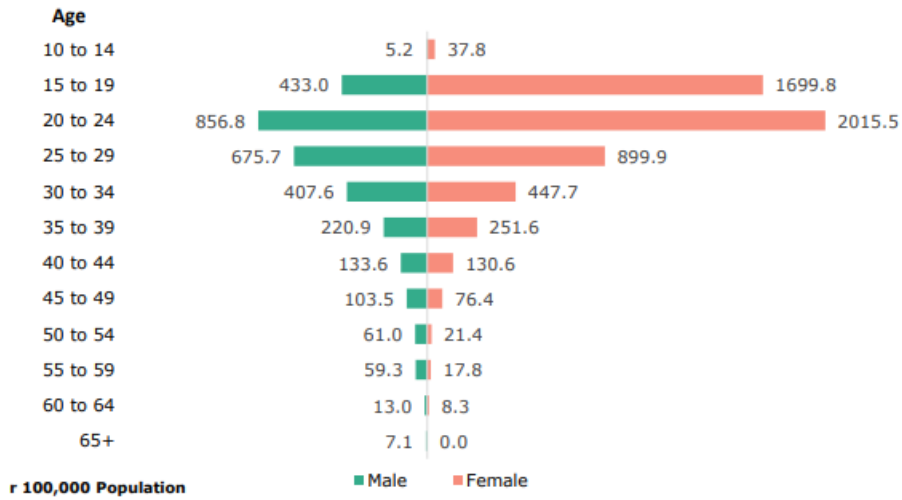
Chlamydia has a unique lifecycle, in which it alternates between a non-replicating, infectious **elementary body**, and a replicating, non-infectious **reticulate body**. The elementary body is the dispersal (spore) form dividing every 2-3 hours and has an incubation period of about 7-21 days in its host. After division, the pathogen reverts to its elementary form and is released by the cell through exocytosis.



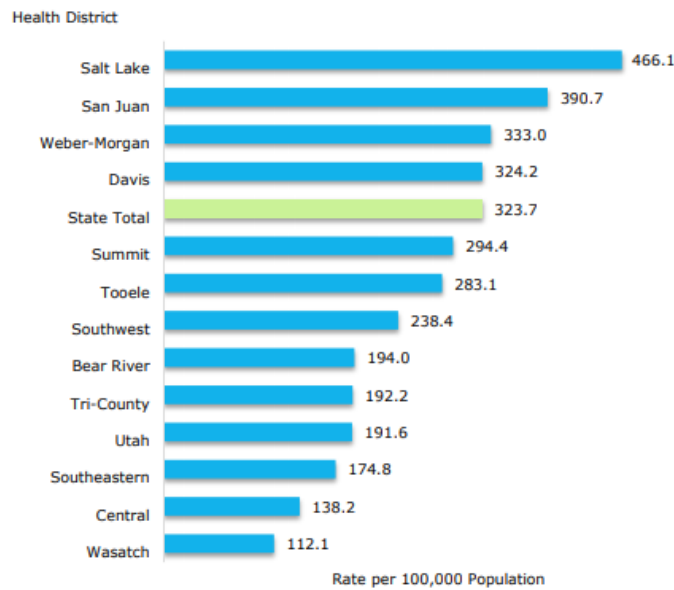


Here are some graphics for Utah Chlamydia rates (2017):

**Figure 3. Chlamydia Rates by Age Group and Sex Among Persons Aged >= 10 Years, Utah, 2017**



**Figure 4. Chlamydia Rates by Local Health District, Utah, 2017**



Welcome the New Year, have a great week, be safe, and Go Utes!

Bryan



p.s. Over two days in November, record-breaking heat in Australia's north wiped out almost one-third of the nation's **spectacled flying foxes**. Researchers from Western Sydney University concluded that about 23,000 spectacled flying foxes died in an aberrant event November 26-27, when air temperature rose above their physiological threshold of 42°C.



{Flying fox. They literally fell out of the hot summer sky.}

