

## Determining the antiviral activity of leaf extracts of eucalyptus species from southeast Queensland

A collaborative research project between the University of the Sunshine Coast and Gympie Region Council.

### Project Summary

Koala populations are under enormous pressure from several factors including disease, habitat fragmentation, climate change, vehicle strikes and dog attacks. While progress is needed on all these issues to assist koalas, disease is particularly significant in Southeast Queensland. Koalas in this region carry a high burden from the two major diseases that affect the koala population - the bacteria *Chlamydia* and the virus Koala Retrovirus (KoRV). While antibiotics are available to treat chlamydial infections in koalas, we currently have no treatment options available to manage KoRV. This is a deficiency that cannot be left unaddressed.



Eucalyptus leaves are the sole food source for koalas. Studies of various eucalyptus plants from across Australia have found that some eucalypt species possess natural antiviral activity. One study in particular found that buds from a secondary koala food source possessed potent anti-retroviral activity. This created an interesting opportunity, as KoRV belongs to the Retrovirus family of viruses and could be affected by compounds with anti-retroviral activity. Finding a “natural antiviral medicine” in the food source that koalas already eat could be a game-changer in treating this virus naturally in koalas.

To determine if any primary or secondary koala food sources in the Gympie Council Region possessed natural antiviral activity, this project tested leaf extracts from 16 local eucalypt species for two categories of anti-retroviral activity; anti-integrase and anti-reverse transcriptase.

Antiviral testing determined that all of the eucalyptus species studied possessed a measurable level of antiviral activity in their leaves. Specifically, seven local eucalyptus species (primary koala food sources Bancroft’s red gum, Large-fruited grey gum, Grey gum and Swamp mahogany and the secondary koala food sources Rose/flooded gum, Blackbutt and Sydney blue gum) possessed relatively high levels of anti-integrase activity while four local eucalyptus species (primary koala food sources Narrow-leaved red ironbark and Grey/gum-topped box and the secondary koala food sources Queensland peppermint and Scribbly gum) possessed moderate levels of anti-reverse transcriptase activity.

These results show, for the first time, that local eucalyptus species have natural compounds in their leaves that have the potential to inhibit retroviruses like the one affecting koalas. This work also establishes that not all eucalyptus species have the same antiviral potential and that some species may have more promise as natural antiviral medicines than others.

It is important to note that the results are preliminary, but this project represents the critical first step in a journey of natural drug discovery towards finding a food source that could contribute towards a treatment for KoRV in koalas. Therefore, while much work is still needed, the first hurdle has been cleared – local eucalyptus species with potential antiviral activity have been identified. This represents a significant step forward in developing natural and sustainable treatment options for one of Australia’s best loved animals.

The next steps for this exciting project will include following koalas before and after they eat a naturally “antiviral-rich” eucalyptus diet (identified in this study) compared to a naturally “antiviral-poor” diet to see if the levels of Koala Retrovirus change in koalas between diets. As well, more chemistry is needed to identify the specific molecule(s) responsible for the antiviral activity in the leaves tested and to test more eucalyptus trees to ensure the antiviral activity detected is widespread in the plant population.

This project has been a collaborative effort between the USC Koala Chlamydia and KoRV research team of Prof Peter Timms, Dr Bonnie Quigley and Dr Sharon Nyari, the USC Plant Biotechnology team of Assistant Prof Steven Ogbourne, Dr Trong Tran and Dr Ton Stewart, Western Sydney University chemical ecologist Dr Ben Moore and the Gympie Regional Council Environment Office, led by Mr. Paul Sprecher.

Questions about this project can be directed to Dr Bonnie Quigley at the University of the Sunshine Coast.