THE SCIENCE BEHIND KAURI DIEBACK

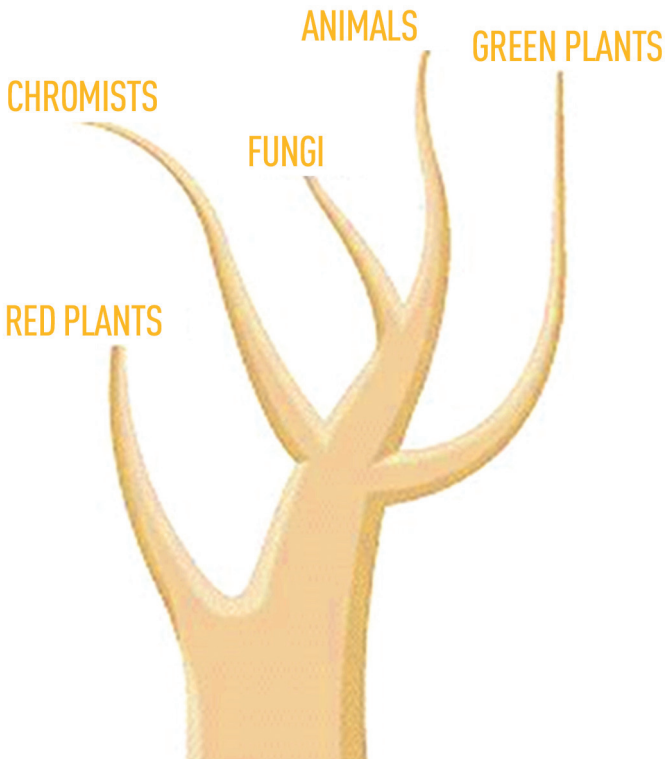
THE FOLLOWING ARE A LIST OF COMMONLY ASKED SCIENTIFIC QUESTIONS AND ANSWERS ABOUT KAURI DIEBACK

The Kauri Dieback Management Programme currently has a research programme underway, there is still a lot to learn about this disease and its impact on kauri. There are many questions that could take years of detailed study to answer. However, regular updates will be made to the kauri dieback website as information becomes available.

1. Is kauri dieback a fungus, virus, or the same thing that kills cabbage trees?

Superficially kauri dieback (and all phytophthora species) can resemble a fungus under the microscope, however it actually belongs to a distinct group of organisms commonly known as water moulds (or oomycetes).

Water moulds belong to a separate kingdom from the fungi, called "Chromists". This kingdom has the same taxonomic rank as the Plant, Animal, Fungus, Bacteria, and Viral kingdoms.
Kingdom Chromista: **Phylum** Heterokont: **Class** Oomycete: **Order** Peronosporale: **Family** Pythiaceae: **Genus** Phytophthora: **Species** taxon Agathis.



Kauri dieback is not responsible for other diseases commonly seen on native plants in New Zealand. The cabbage tree disease which is caused by a phytoplasma (a specialised type of plant bacterium) is spread by sap sucking insects that feed on the tree. Kauri dieback is potentially a much greater threat than the cabbage tree decline due to the long period required for kauri growth and the fact that the soil is contaminated for years.

2. Is kauri dieback really a 'new disease to science"?

Spores of kauri dieback were first discovered from the soil underneath sick kauri and in soil near seemingly "healthy" kauri on Great Barrier Island in the 1970s.
Identification methods at the time led to these samples being misclassified as a morphologically similar species: *Phytopthora heveae* which was considered to pose a low risk to kauri.

Kauri dieback was formally identified during a study undertaken at Landcare Research from 2006 – 2008. This followed reports of kauri tree death in the Waitakere Ranges. Laboratory investigations found kauri can be very susceptible to this disease, with seedlings dying within weeks of infection.

So although kauri dieback has been in New Zealand for at least 40 years, it was not correctly identified as a 'new species to science' or understood to threaten kauri ecosystems until 2008.

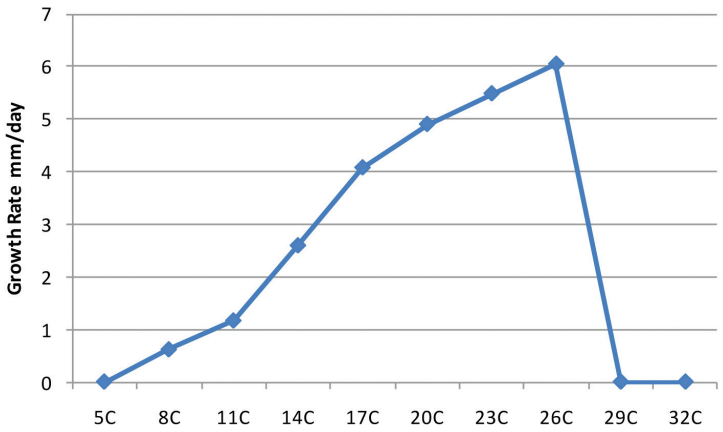
Disease spores recovered from soil around healthy trees does not necessarily indicate that those trees are not or will not be affected by the disease. This lack of symptoms may indicate a lag phase (period of time between the introduction to an area of soil and the infection of the tree) or early infection at root level. There is also the unproven possibility that a degree of tolerance or resistance to the disease may explain such findings.

3. Is this disease native? Could it be a mutation that has arisen through mating between other Phytophthora species already here or could it breed to produce an even worse disease?

The origin of kauri dieback is currently unknown. Kauri dieback is a valid and taxonomically distinct species of Phytophthora. There is no evidence to suggest kauri dieback is a mutation or a mated form of other known Phytophthora species. More research is needed to fully answer these questions.

4. Where did it come from?

Its origin and time of arrival in New Zealand is still unknown, but evidence suggests it may have been introduced from overseas. This assumption is based on the narrow genetic variation found within the disease population (indicating a relatively recent introduction that hasn't had time to evolve variation) and the preference for high soil temperatures.



The graph shows the optimal soil temperature for growth is approximately 20 to 25°C. This is much higher than average soil temperatures within New Zealand and therefore, much higher than would be expected if the disease was native to New Zealand. Research is underway to formally name this species and find out more about its origin. The closest known relative is a chestnut pathogen from Taiwan (Phytophthora katsurae).

5. Are the spores airborne or able to survive in things like soil or the sea?

Kauri dieback does not have airborne spores so is unlikely to travel by wind and airflows.

Motile waterborne spores (zoospores) are produced in wet conditions. Zoospores can move through water films in soil, freshwater streams and ponds but these spores do not survive in seawater. Waterborne spores have a short life span once released.

Resting soil-borne spores (oospores) can survive for at least three years and possibly much longer periods but more research is needed to determine the life span of these spores.

6. Can kauri dieback be killed by UV light or temperature extremes?

Some Phytophthora species are sensitive to low and high temperatures, but we do not yet know what exact temperatures and other treatments (such as UV light) will kill kauri dieback. Our research programme is investigating practical treatments to control kauri dieback disease.

7. Should sick trees be cut out to save the living healthy ones nearby?

The removal of dying kauri trees to protect healthy ones is not recommended unless there is a health and safety risk to landowners or park users (for example, falling branches and trees could damage property and people). Removal of infected trees does not change the threat to any seemingly 'healthy' kauri nearby.

Please refer to the detailed "Kauri tree removal and pruning Standard Operating Procedure" on the kauri dieback website if you need to remove a tree from your land for safety reasons.

8. Can you breed from seed lines to get resistant trees?

Potentially this could be possible. As well as immediate control tools to treat kauri dieback, more research is needed to find longer term management solutions for this disease. Resistance and genetic variation within kauri populations is a priority area of research for the programme.

Methods such as resistance breeding have been successfully used overseas against other related Phytophthora tree diseases. An example is the protection of the Port Orford Cedar against *Phytophthora lateralis*.

9. Should we be saving seed now and thinking about seedbanks?

Seedbanks can be used to retain genetic diversity of a plant population and are often used for the selection of disease resistance varieties in (horticultural) crop breeding programmes. Kauri seedbanks could also be used for this purpose in the future, especially if other control options are unsuccessful or not feasible.

10. Why can't fungicides/products already developed against other Phytophthora species be used?

Phytophthora diseases are a common enemy to many other plants including crops and native species.
Many fungicides and tools have already been developed for farmers, orchardists and home gardeners but before we use any of the available products against kauri dieback we need to ensure their effectiveness on this particular phytophthora species and the effect on kauri themselves.

Plant and Food Research are currently trialling a treatment method for the control of kauri dieback.

11. How easily does kauri dieback spread? If a seed with infected soil attached to it is planted elsewhere, could this spread the disease?

The spores of kauri dieback can be spread through the movement of any amount of contaminated soil – obviously the greater the amount of soil moved, the greater the risk that spores are also transported.

The introduction of spores to an area of kauri can lead to a new area of infection. We do not yet know what "inoculum load" (number of spores) are required for an infection to occur. However, as the spores can multiply once introduced to an area of kauri, a minute amount of soil with a tiny amount of spores can result in an area of disease.

To minimise this risk, vegetation (including seeds) should not be moved from infected areas.

12. What is Trigene?

Trigene is a broad spectrum disinfectant which is non-toxic, non-corrosive, biodegradable and environmentally friendly.

The properties of this disinfectant prevent it penetrating skin so its use is safe for all mammals, amphibians, reptiles, fish and humans. To effectively kill any kauri dieback spores on footwear, try to remove as much soil as possible first, spray footwear with disinfectant then wait for one minute before entering kauri areas.

13. When should disinfectant be used and where is more information available on hygiene procedures?

People visiting and working in kauri areas need to clean their shoes, and equipment with soapy water and a scrubbing brush before and after entering each area. Machinery should be steam cleaned or water blasted to remove all soil before and after entering kauri areas.

The Kauri Dieback Management Programme recommends the use of disinfectants (such as Trigene) as an extra precaution especially for people who cannot clean their shoes between visiting different kauri areas. You can find more information within "General hygiene procedures for kauri dieback" on the kauri dieback website.

CONTACT US
For more information, or to report any suspect sightings of diseased kauri on public or private land, phone the Kauri Dieback Hotline on 0800 NZ KAURI (695 2874) or visit www.kauridieback.co.nz

KAURI DIEBACK PROGRAMME PARTNERS: TĀNGATA WHENUA | MINISTRY FOR PRIMARY INDUSTRIES | DEPARTMENT OF CONSERVATION | NORTHLAND REGIONAL COUNCIL | AUCKLAND COUNCIL | WAIKATO REGIONAL COUNCIL | BAY OF PLENTY REGIONAL COUNCIL

KEEP KAURI STANDING
STOP KAURI DIEBACK DISEASE SPREADING KIA TOITU HE KAURI