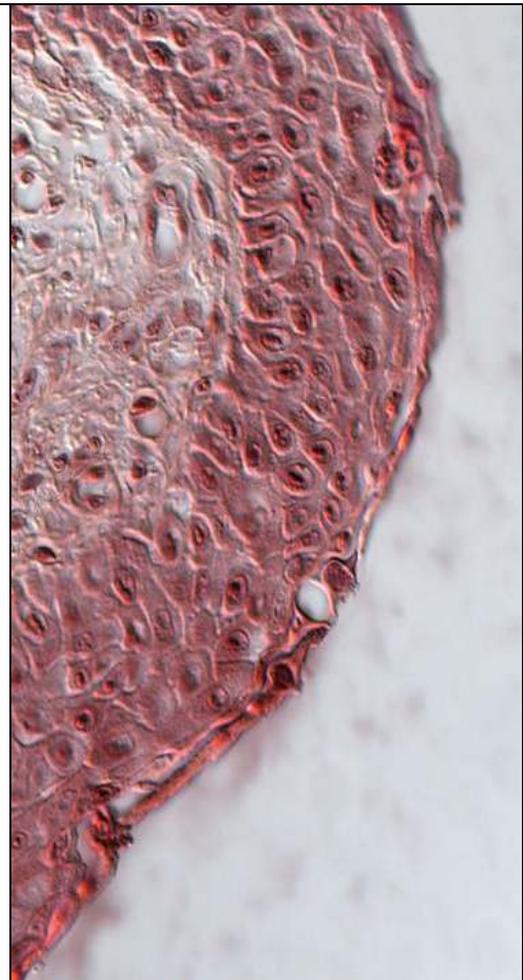
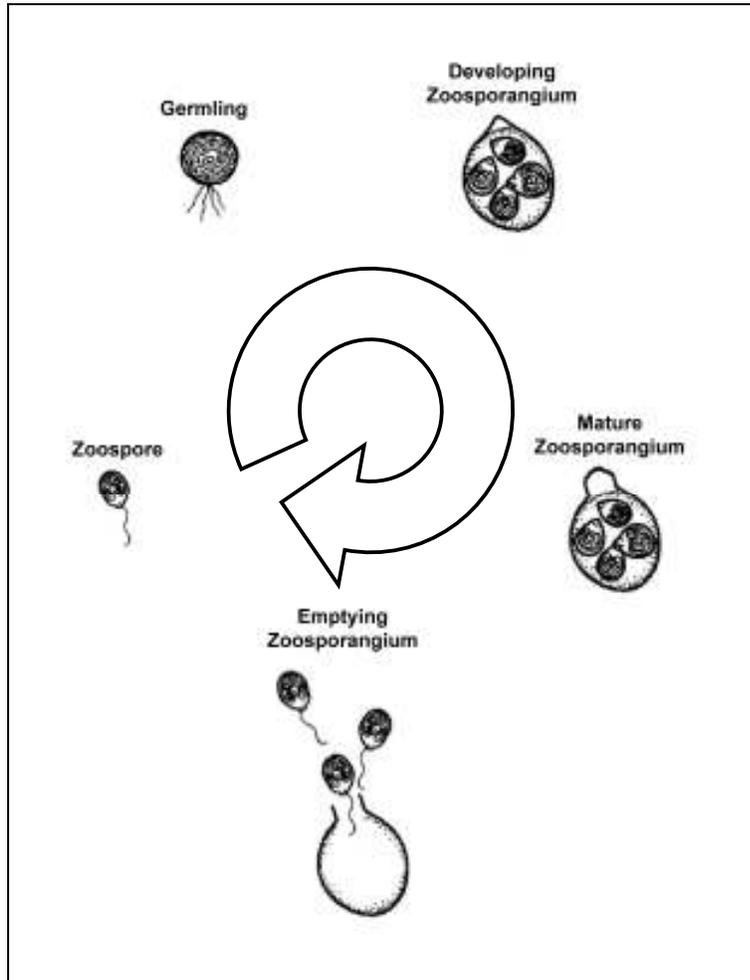


## MICROORGANISMS AND AMPHIBIANS

The life cycle of the chytrid fungus *Batrachochytrium dendrobatidis* begins with a motile zoospore, which is the infective stage of this pathogen. During the course of infection, chytrid zoospores enter skin cells on the amphibian and the fungus grows and develops as it feeds on keratin within the skin cells. Eventually discharge tubes form, which extend to the surface of the cells and release mature zoospores to begin the life cycle again.

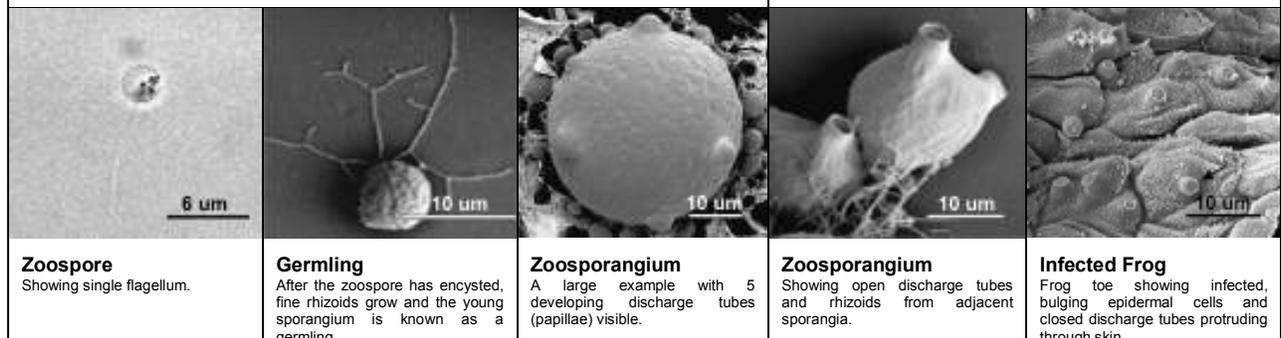


### Chytrid Fungus Life Cycle

*Batrachochytrium dendrobatidis* has two life stages; a motile, uniflagellated zoospore that is dispersed through water until it finds an amphibian host, and a sessile, reproductive zoosporangium that develops within the hosts epidermis to release further zoospores.

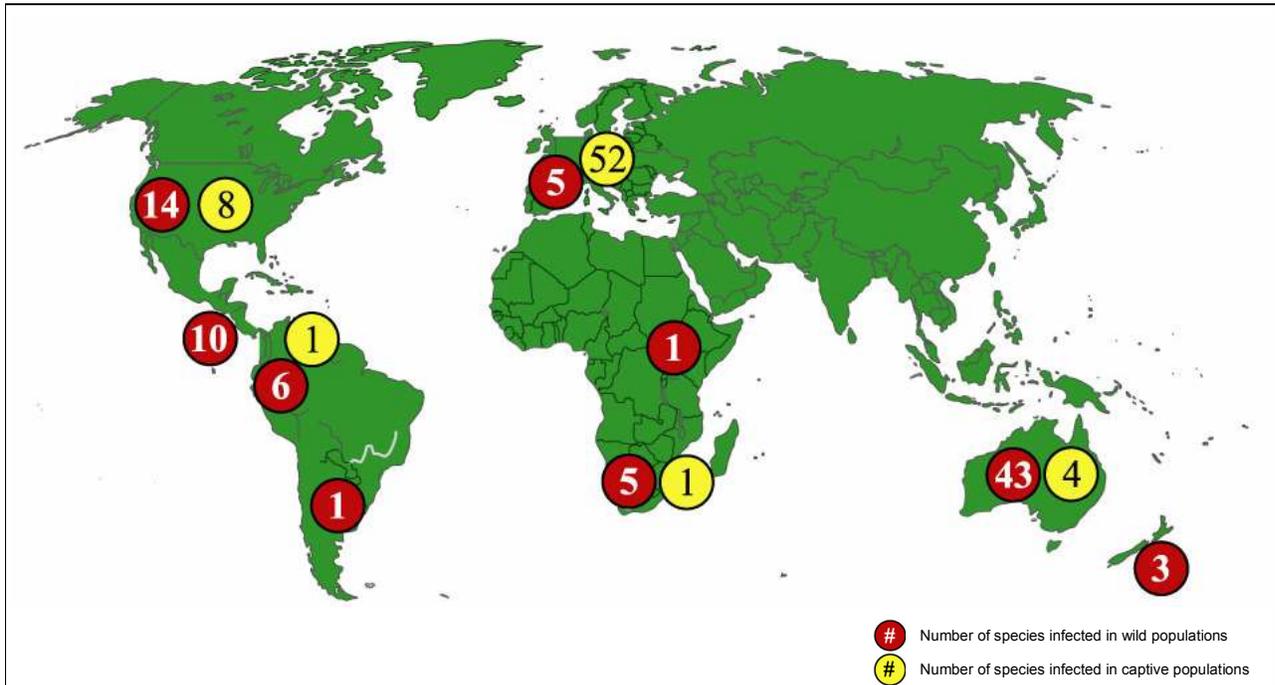
### Infected Frog

Frog skin showing extensive degeneration and peeling of epidermis, empty zoosporangium and mature zoosporangium ready to release zoospores through discharge tube.



## MICROORGANISMS AND AMPHIBIANS

*Batrachochytrium dendrobatidis* is the Chytrid fungus that infects and kills amphibian species. It is believed to be responsible for the deaths of innumerable frogs and the extinction of several species. The fungus grows and feeds on the epidermis of frogs before releasing zoospores into the water to begin the cycle again. One droplet of water can contain many thousands of zoospores, each able to infect a new waterway and a new population of frogs.



### Global Distribution of Chytrid

By 2004 the Chytrid fungus was widely distributed around the world and had been identified in three separate wild populations in New Zealand including two species of introduced frog and, more importantly, the native, and nationally critical Archey's Frog (*Leiopelma archeyi*). In many countries this spread has been traced to the pet trade.

Introduced Species				
	<b>Green and Golden Bell Frog</b> Coastal South-Eastern Australia, and Northern North Island of New Zealand.	<b>Whistling Tree Frog</b> Coastal Southern Australia and the South Island of New Zealand.	<b>Southern Bell Frog</b> Southern Australia and throughout New Zealand.	
Native Species				
	<b>Archey's Frog</b> Found in Coromandel and in one site west of Te Kuiti.	<b>Hochstetter's Frog</b> Occurs in several locations around the upper half of the North Island.	<b>Hamilton's Frog</b> Only found on Stephens Island in Cook Strait	
				<b>Maud Island Frog</b> Located on Maud Island and Motuara Island in the Marlborough Sounds.

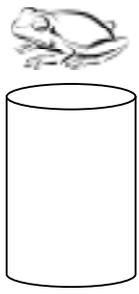
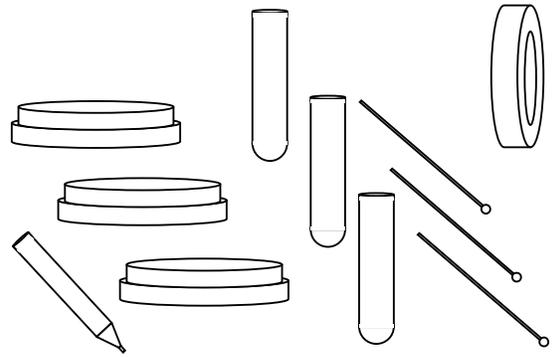
### Amphibians of New Zealand

There are now just four of the original eight species of native frogs, and three species of introduced frogs in New Zealand. All of New Zealand's unique native species (in the genus *Leiopelma*), as well as the Green and Golden Bell Frog and Southern Bell Frog (genus *Litoria*), are listed as threatened or endangered in the recent IUCN Global Amphibian Assessment.

## MICROORGANISMS AND AMPHIBIANS

Microorganisms are controlled by means of physical agents and chemical agents. Physical agents include such methods of control as high or low temperature, desiccation, osmotic pressure, radiation, and filtration. Control by chemical agents refers to the use of disinfectants, antiseptics and antibiotics.

Describe how to conduct a fair test to identify the best of two physical agents that could be used to stop the spread of Chytrid fungus.

 <p><b>Reagents:</b> Distilled water, Fungal sample: 25mL of water containing <i>B.dendrobatidis</i> from an infected frog, Physical agents: eg heat, cold, visible light, UV light.</p>	 <p><b>Equipment:</b> Permanent marker, sterile petri dish (3) containing agar with keratin nutrient, test tubes, inoculating needles, scotch tape.</p>
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1. Identify two physical agents that you believe will be effective in killing *B.dendrobatidis*.

\_\_\_\_\_

2. State your hypothesis (your best educated guess that will answer the investigation):

\_\_\_\_\_  
\_\_\_\_\_

3. Reasons for supporting your hypothesis:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Why does the sterile agar solution contain keratin?

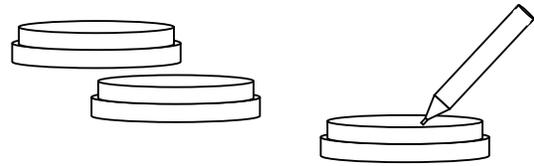
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5. Where would this be found naturally?

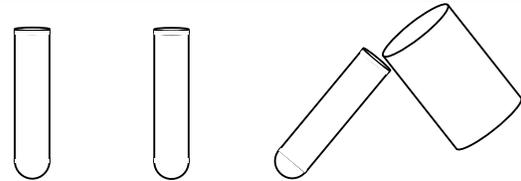
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## MICROORGANISMS AND AMPHIBIANS

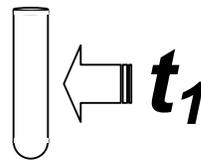
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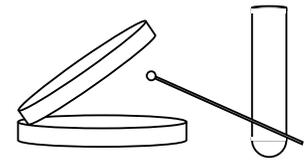
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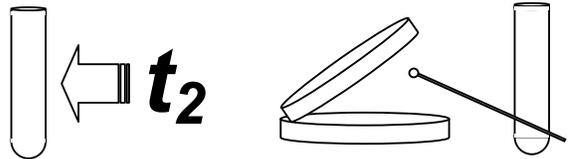
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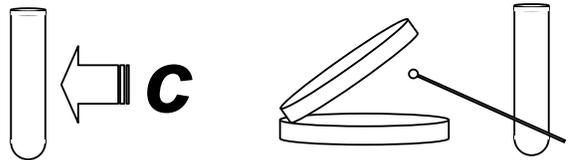
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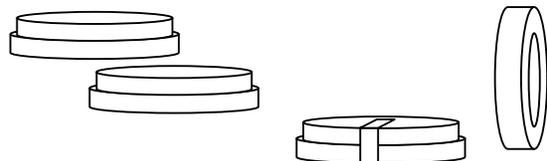
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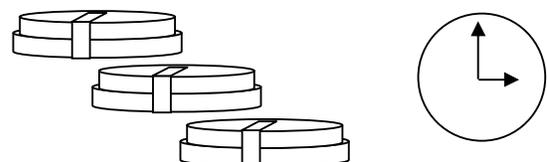
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13. \_\_\_\_\_  
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## MICROORGANISMS AND AMPHIBIANS

Biosecurity New Zealand are currently researching suitable methods to ensure that Chytrid fungus is not spread further throughout New Zealand. One possible 'protocol' is based on the "Check, Clean, Dry" message already in use to combat the spread of Didymo (rock snot), as shown below. Before such a protocol can be released it needs to be thoroughly tested to ensure that it is easy to perform, it will reliably kill *B.dendrobatidis*, and has no harmful effects on the environment.

14. What is the chemical agent suggested to clean away the Chytrid fungus?

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15. Which two factors need to be controlled to make sure this agent will work?

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16. Which two physical agents are recommended to clean away the Chytrid fungus?

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17. Which two factors need to be controlled to make sure each of these agents will work?

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18. If cleaning is not possible what method should be used?

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19. How long must this be done for to be effective?

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### PROTECT OUR WATERS FROM CHYTRID AND OTHER AQUATIC PESTS



When you are moving items between waterways you must:

**CHECK** Remove all obvious matter from items that have been in the water.

**CLEAN** Soak and scrub all items that have been in the water for at least one minute with:

- 2 percent solution of bleach;

**OR**

Soak and scrub all items that have been in the water for at least five minutes with any of the following:

- 5 percent solution of salt;
- hot (60°C) water;

A 2 percent solution is 200ml, a 5 percent solution is 500ml (two large cups), with water added to make 10 litres.

**DRY** If cleaning is not practical, dry items completely and then leave for at least 48 hours before using in another waterway.

For more information visit:

[www.biosecurity.govt.nz](http://www.biosecurity.govt.nz)

