Spores Galore!
A Look into the World of Fungi & How they Reproduce

VOCABULARY
Vocabulary in article indicated in italics

Asexual reproduction
Act of reproducing without a mate

Agar (aw' gur)
Jelly-like substance made from seaweed; used as a thickener in foods

Basidiospores
(bah sid' ee oh spors) *Spores* associated with spreading plant disease

Chlorophyll (klor' oh fil)
substance which helps produce food (carbohydrates) for plants; this is what gives plants their green color

Direct germination
To germinate (sprout) under favorable conditions

Dormant
An inactive, yet live state

Exudation (ex oo day' shun)
The process of the oozing out of matter

Germination (jer min ay' shun)
To sprout; development

Hydrate
To combine with water

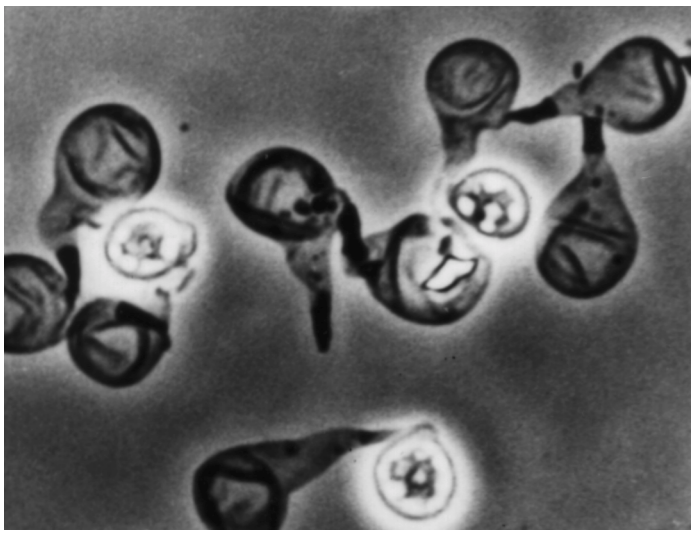
Spores
Microscopic bodies which alter germination and develop into fungi

Adapted from:
Spaine, Paula C., and S. Kaneko. 1993. Spore exudates and other factors affecting germination type of Cronartium quercuum f. sp.fusiform basidiospores. *Mycologia. 85:51-61.*

The scientists in this study conducted **basic research** to understand the reproduction of *spores*. Basic research is research that is not aimed at solving a particular problem. Instead, the scientist designs a study that advances knowledge in a particular area of interest, with the hope that the information can be useful to other scientists in the future.

Discovery

This paper is about fungi. You might be wondering what fungi are. The following paper will describe fungi, but first let's see what a fungus looks like. Bring a fresh, watery fruit such as grapes or strawberries and a plastic bag from home. Put the fruit in the bag with a few drops of water and place in a warm area. Observe the fruit every day, and notice the changes that occur as mold begins to form. Why do you think the mold appeared?



The spore is forming a seconday case where it will remain for a certain period of time to ensure that the spore germinates when the environment is most favorable.

Introduction

Fungi are very distinct among the plant and animal kingdoms. They are neither plant nor animal. Since they do not contain *chlorophyll*, they cannot be considered plants. And because they lack certain animal characteristics, like mobility, they cannot be considered a part of the animal

kingdom. Because fungi are immobile, they cannot hunt or gather food. Therefore, in order for a fungus to survive, it must feed off a host.

Not only are their eating habits different, but they reproduce in a very strange and fascinating way. As you may already know, there are many types of fungi. While some can reproduce sexually, they are all asexual reproducers. In other words, they do not need a partner to produce offspring. *Asexual reproduction* is carried out by cell division. Fungi do this by forming *spores*, a microscopic body which is somewhat like an egg because it contains DNA and nutrients. However, they are unlike eggs because they do not need to be fertilized by sperm. What is inside the spore's protective wall is all it needs to become a fungus!

How many *spores* do you think a fungus can produce? The answer is millions! When the environment is favorable, the fungus releases its *spores*. Since *spores* need a lot of moisture, the most favorable environment would be one that is humid or rainy. After the *spores* are released they are carried either by wind or rain. When they land they do something very curious. You see, the *spores* can only *germinate* under certain conditions. These conditions are: plenty of water, humidity, and food in the environment. Also, the surface onto which they land has to be just right in order for the spore to continue its *germination* process. So, the *spores* "sense" the environment and "make a decision" as to whether or not they should continue to germinate. If they "decide" it is favorable, they begin cell division. This is called *direct germination*.

If the *spores* do not find the conditions favorable, they stop the *germination* process. They do this by going into a *dormant* state. They are considered *dormant* because the *spores* do not need to obtain nutrients externally. The *spores* contain fats and carbohydrates that nourish them while they are *dormant*. If the environment becomes favorable in a short period of time, the spore can begin *germination* again.

Studies have shown that the primary reason for this *dormant* state is that in this way a spore can continue to live while waiting until the time is right to germinate. You might be asking yourself how the spore "knows" when to directly germinate and when to go *dormant*. That is a very good question. In fact, it is a question that scientists Paula Spaine and S. Kaneko asked themselves. This question, in turn, led to a research study on *germination* factors that affect *spores*.

Reflection

1 Some animals, such as bears, are also able to live in a dormant state. This dormant state is called:

2 Why do you think the spores might "decide" to go dormant?

Methods

The spores were put in different conditions to see which conditions are most favorable for *germination.* The experiment conducted involved the following tests:

Agar Concentration

This test used *agar*, a jelly-like substance made from seaweed, to simulate leaf hardness. In other words, Drs. Spaine and Kaneko wanted to find out what level of leaf hardness is more favorable for spore *germination*.

Agar pH

This test determined which pH level, or acidity level, is ideal for both *direct* and indirect *germination*. Drs. Spaine and Kaneko used agar with different concentrations of acidity to see which concentration is most favorable for *germination*.

Washing Time

In this test, *spores* were washed with water for different amounts of time. The purpose of this test was to find how much washing had to occur before the *spores* lost their ability to germinate after being *dormant*.

Results

Agar hardness did not affect the *spores* significantly. As for pH level, Drs. Spaine and Kaneko found that higher acidity produced higher *direct germination* rates. The washing time test concluded that all washing treatments resulted in more *direct germination*. Almost all (99%) of the *spores* that had been washed germinated directly. But, only 4-11% of unwashed *spores* germinated directly.

Reflection

1 On the basis of the three tests, which factor is least important for spore reproduction?

2 What do you think is the most important factor? Why?

Further Discovery

For fun: Imagine you are a spore... After being released from a fungus you are swept away by the wind. It carries you about a mile away. You land on a dead leaf. This leaf hardly has any moisture in it. The air around you is dry and cold. What will you do?