

Lesson 3: Scales and Spores!

Teacher Resources:

- Overview (Introduction, Key Concepts, Student Level, Skills, Objectives)
- *Scales and Spores – Monarch Tape Samples* (set of 10)
 - **Note:** Photos of the samples are online through the *MonarchHealth* website Classroom Resources page in the section for Scales and Spores. Teachers can either 1) have groups of students assigned to different computer workstations and instruct them to click on each link for individual photos, 2) print handouts for individuals, or 3) create master color transparencies for group classroom viewing at once
- *Scales and Spores – Data Table Key*
- *Scales and Spores – Discussion/Analysis Answer Key*
- Georgia Life Science (Grade 7) Standards Correlations
- Georgia Biology (Grades 9-12) Standards Correlations
- Georgia Environmental Science (Grades 9-12) Standards Correlations

Student Worksheets:

- *Scales and Spores – Data Table*
- *Scales and Spores – Discussion/Analysis*
- *Monarch Physical Rating Scales* (page 2)
 - *OE Infection Rating Scale*(From *Lesson 1: Checkup Time – Give Your Monarch a Physical!*)

Lesson 3: Scales and Spores!

Overview

Introduction:

This is a great activity to use with students of all ages after participating in Project *MonarchHealth*! With minimal supplies students can essentially replicate the procedures that scientists in Dr. Altizer's lab at the University of Georgia use when analyzing *MonarchHealth* samples. Like practicing scientists, your students will get the opportunity to look for OE parasites in actual samples taken from monarch butterflies, but without the hassle. Students will learn how to identify and count OE spores. Then they will use a standard conversion table to score and describe OE parasite infections.

This activity uses basic supplies found in all classrooms. Instead of using microscopes, students will use magnified images taken through a microscope. The procedures are so easy that even elementary students can complete the activity. Advanced students can benefit by practicing and refining their spore identification and counting skills before moving on to analyzing their own tape samples.

Teachers have several options when it comes to viewing monarch tape samples. Students can work as a class examining images projected from a computer or an overhead projector transparency. Students can work individually or in small groups counting spores from transparencies or photographs.

Scales and Spores! is a simple activity that lets students go beyond participating in Project *MonarchHealth*. For more detailed information on monarchs, OE parasites, and the *MonarchHealth* project, there are additional details online at <http://www.monarchparasites.org/>

Key Concepts:

- Tiny OE parasites infect monarch butterflies.
- Scientists use OE spore counts to determine the severity of parasite infections.
- Students can participate in science.

Student Level:

- Upper elementary
- Middle school
- High school

Skills:

- Identification of spores
- Counting
- Data collection
- Data analysis

Objectives:

Students will determine the extent of OE infections using actual monarch tape samples in a manner similar to that used by practicing scientists. Students will identify and count OE spores found on monarch tape samples. They will convert spore counts to infection scores and qualitative descriptions using standard conversion scales. Students will also make inferences about the health and physical condition of monarch butterflies.

**Scales and Spores!
Data Table Key**

Name _____ Class _____ Date _____

Sample Number	Number of OE Spores	OE Infection Score	Infection Description
1	~25	2	Minimal infection
2	1	1	Minimal infection
3	75-100	2/3	Mild infection
4	0	0	Not infected, disease-free
5	200+	4	Moderate infection
6	1	1	Minimal infection
7	~300	4	Moderate infection
8	1000+	5	Severe infection
9	~90-100	2	Mild infection
10	200-400	4	Moderate infection

Scales and Spores!
Discussion/Analysis Answer Key

1. Scientists at Altizer's lab make tape samples when checking a monarch butterfly for OE parasites. A monarch tape sample is made by pressing a small piece of clear adhesive tape against the abdomen of an adult monarch. Why is the abdomen the best place to make a tape sample?

Although OE spores can be found anywhere on the outside of an adult monarch, the greatest concentration of spores is usually on the butterfly's abdomen.

2. Making a tape sample does not harm a butterfly, but part of its body sticks to the tape. What part of the butterfly's body sticks to the adhesive tape?

Abdominal scales.

3. What do the monarch scales in these samples look like? Describe and draw a monarch scale.

The size and shape of monarch scales can vary. Some scales look like leaves. The place where a scale attaches to the monarch's body is usually pointed. The scale may be light or dark in color.

4. What do OE spores look like? Describe the size, color, and shape of an OE spore.

OE spores are very tiny, brown or black lemon-shaped structures.

5. How do you tell the difference between OE spores and monarch scales?

OE spores are substantially smaller than monarch scales. An average spore is about 1/100 the size of a scale.

6. Which of the ten monarch butterflies tested were not infected with OE parasites?

#4

7. Which of the ten monarchs were mildly to severely infected with parasites?

#8

8. Which of the butterflies in this activity were the mostly likely to have short lives and/or deformed wings?

Monarchs with moderate (#5, 7, 10) or severe infections (#8) could possibly have shorter lives and/or deformed wings.

9. Is it difficult to find and count OE spores in a tape sample? Explain your answer.

It can be difficult to find and count OE spores in a tape sample. OE spores are much smaller than monarch scales. Spores may clump together or be hidden under scales. It takes concentration and a good eye to accurately count OE spores.