

Date _____

Name _____

Teacher _____

Introduction

Science is about understanding changes in the natural world and developing solutions to challenges. In this learning experience you will do both. The topic is about how head lice are becoming pesticide resistant.

Task

1. Read the texts on the following pages. Make notes in the margins about your reading, thinking and problem solving processes.
2. Construct a scientific model that explains how head lice have, over time, become commonly pesticide resistant. Use the information in the texts. Use both visuals and words in the model.
3. Explain why the scientific model you constructed is a good model.

Space is provided after the texts for you to complete your responses.

Head Lice: Treating Parasites That Go to Your Head

If simply the thought of head lice makes you feel a little itchy, imagine how those affected by a head lice infestation feel when they learn what has been creeping around them and causing symptoms such as intense itching or irritated scalps. Even less comforting is the fact that lice parasitic infestations are on the rise.

According to the Centers for Disease Control and Prevention (CDC), 6 million to 12 million people a year suffer from head lice infestation, and it is estimated that more than \$100 million is spent annually to combat this problem. Head lice tend to affect younger, school-aged children, but teens also can get them; and girls tend to get head lice more than boys due to their longer hairstyles.

Upon close examination, the most common signs of head lice include: an itchy scalp, red bumps, small skin tears and evidence of the egg casings (or nits) attached to the hair shafts, as well as live lice. The nits hatch within seven to 10 days and live about 30 days, during which they reproduce to spread the infestation.

Common, over-the-counter, topical treatments for head lice include chemical pesticides, such as permethrin and synthetic pyrethroids. However, resistance to standard pyrethroid treatments has become widespread and is well documented in the United States, the United Kingdom, Israel and the Czech Republic. In one study, patients using both permethrin and synthetic pyrethroids for 10 minutes and then washing it out (the standard treatment), only killed 5 to 7 percent of the head lice.

To help children avoid head lice, they should not share combs, brushes, hats, barrettes or any other personal care items with anyone else, regardless of whether they have lice or not. Also, it's important to examine everyone in the household when there is a case of head lice, just to be sure that the bugs have not been transmitted.

Sources: Adapted from: American Academy of Dermatology (Academy)
<http://www.news-medical.net/news/20100305/Dermatologist-addresses-common-parasitic-infestations-and-latest-treatment-options-at-Academy-Annual-Meeting.asp>

Excerpts from: <http://www.news-medical.net/health/What-is-head-lice.aspx>.

Text 2

Head Lice Resistance to Pesticides

Pharmacists and doctors have relied on chemical pesticides to kill head lice. Some of the chemical pesticides are over the counter products, and others are prescriptions. Their purpose is to affect the nervous system of the lice, to disrupt their ability to move and eat, or to kill bacteria that lives in their gut, which provides nutrients to them. If the bacteria die, the lice die. However, these may now be unwise choices for treatment, in light of potential lice resistance to these chemicals.

Resistance is the development of mechanisms to survive potentially deadly onslaughts. Many organisms that can cause disease have become resistant to many antibiotics. It should be no surprise that rapidly reproducing insects, such as head lice are developing resistance to the pesticides used to kill them.

Resistance has become a 'growing problem' since the 1970's, as patients resort to using multiple treatments of chemical pesticides, which can also potentially and needlessly expose children to toxic chemicals. By 1999, several of the chemical pesticides were reported as virtually useless in England, while, in the U.S. 81% of patients using pyrethrin against head lice could not get rid of the lice. Also, more than 58% of people in the U.S. who treat against lice without success the first time have treated themselves with higher doses of chemical pesticides and have done it more frequently. Resistance seems to be affected by:

- how large is the spread of infestation,
- the type of chemical pesticides used,
- the variety of mechanisms by which lice resist chemical pesticides, and
- the pattern of use of chemical pesticides in different countries.

Scientists hypothesize that there are various resistance mechanisms that head lice develop, such as changes that take place in the amino acids of cells in the nervous system of the lice, so the chemical pesticides' purpose is no longer effective; or by slowing down the absorption and metabolism of the pesticides into their bodies, allowing lice to live longer and to lay eggs; and by successful mutations in their DNA being passed on to succeeding generations for survival.

Sources:

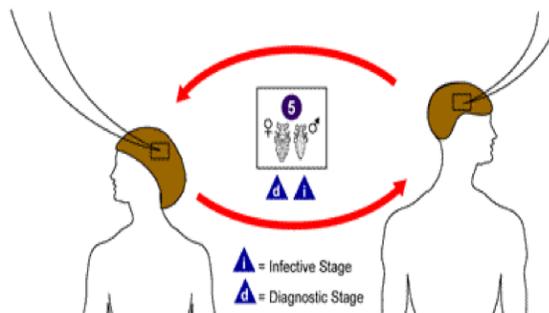
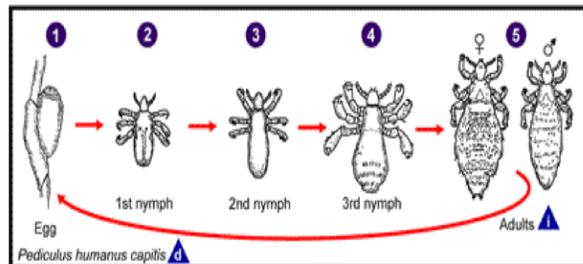
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<http://www.ncbi.nlm.nih.gov/pubmed/14651472>

Head Lice Life Cycle

Pediculus humanus capitis, the head louse, is an insect parasite that lives only on the outside of human hosts, particularly on hair close to the scalp (1 mm).

The adult female lice lay around 7 to 10 eggs a day and attach them to the hair using a glue-like, water-insoluble substance. Most eggs are laid at night and can survive for more than 2 weeks. The common site for these eggs or nits is the back of the head or back of the ears. The heat and the moisture of the human head help to incubate the eggs. Because people have a constant body temperature, female lice reproduce continuously throughout the year.

Each adult louse lives for around 30 days. Within 7 to 10 days the nymph emerges from the eggs and feeds on blood from the scalp. Another 7 to 10 days and three moulting stages makes the nymphs adult lice. New adult females start laying eggs soon after day 10. Consequently, the total life span of a head louse from egg through adult averages about 25 days.



To survive, a newly hatched head louse must have a blood meal within minutes of birth. Each louse takes several meals of blood each day and die if they are removed from the head for more than 2 days.

At any given time a person with an infestation has no more than 10 to 12 live head lice but over a 100 eggs or nits.

Source adapted from: from URL: <http://www.news-medical.net/health/What-is-head-lice.aspx>

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