

Rearing Monarch Butterflies

Egg to Adult



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Directions

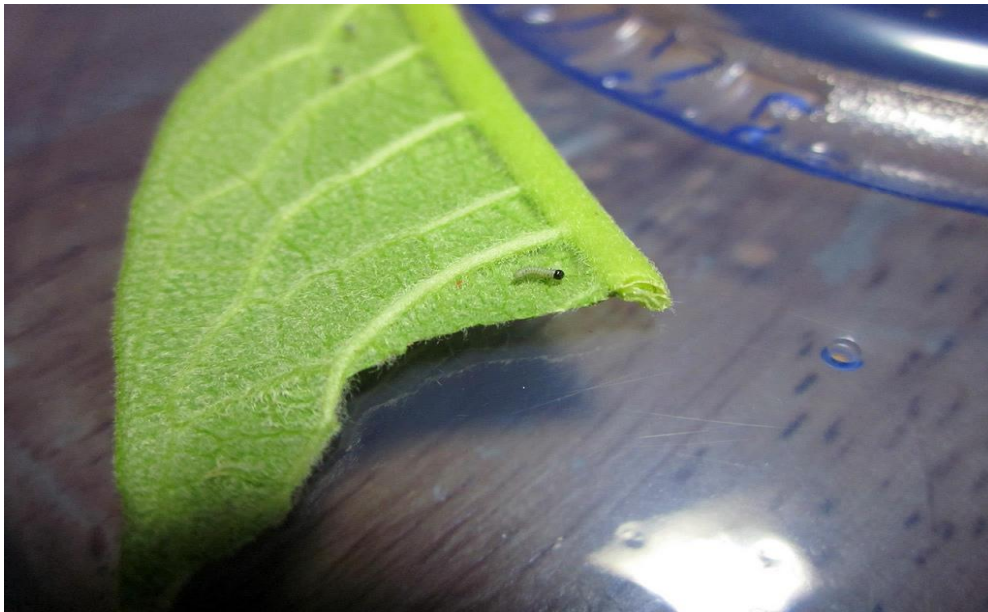
- If the links do not work, try copying and pasting them into your internet browser.
- Read the whole document and then follow along as you raise your caterpillars especially if this is your first time rearing.
- Please send input on suggestions or errors to Mona Miller at runmede@gmail.com so that this document can be edited and made better for people to use.

How to Hatch Eggs

- Collect the egg on a piece of the milkweed leaf. Leaves should be placed into a closed plastic container to hatch. The lid of this container should have very small holes. The holes can be made by using a corn holder, bend one prong down, punch from the inside out to create a smooth surface on the inside of the lid.
- Put a moist (not wet) paper towel into the bottom of the container. Viva paper towel is recommended for its absorbency and mold resistance. Next, place a plastic lid with the eggs on top of the paper towel. Photo album “How to Hatch Eggs”: <https://flic.kr/s/aHsjYSbHM1>
The leaves will keep longer, if you place them on a plastic lid inside of the closed container.
- Place a dinner sized napkin or paper towel on the top of the container and put on the lid. Close the lid to keep the eggs moist. The caterpillar will emerge in 3 – 5 days and will be extremely small.

How to Hatch Eggs Continued

- Open your container at least once a day to check for newly hatched caterpillars. The paper towel on the top under the lid will make it easier to see caterpillars that come to the top of the container. Take a leaf and carefully move these tiny caterpillars into another container (that has small holes in the top) with fresh milkweed leaves. Be careful because tiny caterpillars also make silk and may go swinging away. Keep a count of the caterpillars in a container so that you can verify that number when feeding them. Tiny caterpillars are very good at hiding.
- The first thing the tiny caterpillar will do is eat its egg. They are so small during the first 1-3 days that they can drown in a drop of water. Photo of first instar:



Cautions on Hatching Eggs and Taking Care of Tiny Caterpillars

- If the leaf they are on is getting dry, put a new leaf in beside of the dry leaf and the caterpillar will find it. If it has a difficult time transferring to the new leaf, cut the small section of the leaf that it is on and place that on top of the new leaf (this is the best way to move young caterpillars that may be molting). Make sure to check both sides of the leaf before cutting because another caterpillar may be on the other side. Always use clean scissors. Always wash hands before handling caterpillars to avoid transferring germs to them.
- Second to third instar caterpillars can be moved to another container such as a butterfly rearing cage. Photo of parasite proof rearing cage:



Cautions on Hatching Eggs and Taking Care of Caterpillars Continued

- Parasite proof containers can be purchased from eNasco (see references below for details on purchasing). Do not overcrowd (put too many caterpillars into a container) this can cause disease.
- Use parasite proof containers outside, the Assassin bugs (pierce the fabric) and Tachinid flies (lay through the fabric) will attack caterpillars outside, if the container is not parasite proof. You can also use plastic containers inside. Here is one setup that uses 13 cup Glad containers: <https://flic.kr/s/aHsjZh7MpW> (see description on each photo) Six caterpillars are enough to place in a 13 cup Glad container. You will need to transfer the chrysalis to a net container to emerge. They cannot emerge in the plastic containers. Video “How to Move and Pin Chrysalises”: <https://www.youtube.com/watch?v=TimY3aTGfNw>
- Do not add newly found wild caterpillars to those that you are currently raising. These new caterpillars could transfer disease. Fix a separate container for them. Matter of fact, keep caterpillars from different locations in separate containers, this will help to avoid transferring disease between different populations of caterpillars.
- Caterpillars go through 5 stages or instars each lasting 2-3 days. First instar caterpillars may eat other eggs, if left in the container with the eggs. Monarch butterfly life cycle stages: <http://www.monarchwatch.org/biology/cycle1.htm>

Care During the Larva (Caterpillar) Stage

- Keep smaller and larger caterpillars in separate containers. The larger caterpillars can eat the smaller one. Use this range for containers: eggs, first instars, second and third together, fourth and fifth together, but watch fourth instars they can bother hanging “Js” and chrysalises.
- First instar caterpillars are very small and will hide in the folds of leaves. Check old leaves and folds of leaves before disposing of them. Do not mist caterpillars with water, they get enough moisture from their food.
- When **molting** the caterpillar will stop eating and become very still. Don’t be alarmed. This is important because they need to shed their skin in order to grow. When this is happening, **DO NOT** move your caterpillar! It will resume eating when molting is complete. Usually after 24 hours or more. They may molt at the top of the container or on the side. Clean around them. If latched, do not detach. Molting video: <https://www.youtube.com/watch?v=5TQY5J9m9XI>
- A Monarch caterpillar will need fresh milkweed from the time it hatches from its egg until it becomes a chrysalis in 10 to 14 days.

Common Milkweed (*Asclepias syriaca*) Photos

Young plants. During the spring the upper leaves close at night. Often you will find eggs on these leaves. It is like nature is using those leaves to protect the eggs and early instars.



Common Milkweed (*Asclepias syriaca*) Photos



Flower buds



Field in full bloom the
colors vary from white to
pink to purple



Seed pods

Care During the Larva (Caterpillar) Stage Continued

- Caterpillars will eat more in the 4th-5th instar than at any other stage (pick some extra milkweed, wash, wrap in paper towel, and place into a plastic bag. Place the bag of milkweed into your refrigerator vegetable bin for later use (these leaves will last several days in the vegetable bin). Make sure to check leaves for eggs and small caterpillars before placing them into the refrigerator and before washing.
- Leaves may be picked, washed, and put into rearing containers or cut stalks of milkweed with leaves and place those into containers that have water in the bottom; for example, gallon jugs for large rearing containers (wrap wet paper towel around the opening to keep caterpillars from drowning) .



Care During the Larva (Caterpillar) Stage Continued

- Pint or quart bottles can also be used or deli containers with holes in the top of the lid and water in the bottom. Trim the stem prior to placing them into the containers this will help them take up water better. Keep the water replenished in these containers.



Care During the Larva (Caterpillar) Stage Continued

- You can also trim back the leaf near the stem (where leaf attached to the plant), then trim the stem a little, and wrap wet paper towel around the cut stem to offer young caterpillars leaves. This will help keep the leaf fresh longer. Some people use floral picks (available from florist or online) to keep leaves fresh, but you have to make sure to keep water replenished in these, too. These can be placed in cups to keep them upright.



Care During the Larva (Caterpillar) Stage Continued

- If using containers with water, make sure there are no gaps in the top of the containers or in the holes in deli lids because the caterpillars may fall in and drown. You can wrap a piece of wet paper towel through the plants and over the top of the bottle. If you cut the end of the stem just before putting the milkweed stems in water, it will last longer. Plants cut in the morning or late evening will also last longer.
- Your caterpillars will leave droppings while they are eating. These droppings are called **frass** (butterfly poop) and are the waste product of the caterpillar. A paper towel can be placed in the bottom of the rearing cage to catch frass.

Care During the Larva (Caterpillar) Stage Continued

- It is important to change the paper towel on the bottom of your rearing cage every day or every couple of days depending on the amount of frass present, to prevent the spread of parasites and bacteria that can occur in frass. Too much frass can also cause bacterial infections. Clean black print newspaper can also be used.



Care During the Pupa (Chrysalis) Stage

- On or about the 10th day (the cycle is temperature dependent – heat makes it go faster, cold slows it down) or when the caterpillar is the size of your pinky finger and 10-14 days old the caterpillar will find a firm place and begin to web. Usually they will climb to the top of the cage and web (make their silk button) or they will web on the bottom of a leaf. If you have other caterpillars eating in a container, it is recommended that you remove the leaf with the “J” and pin it into another container or paper cup (pin both sides of the leaf). The other caterpillars may eat the leaf and the pupating caterpillar/chrysalis. They have very poor eyesight. Video of moving and pinning chrysalises: <https://www.youtube.com/watch?v=TimY3aTGfNw>



Care During the Pupa (Chrysalis) Stage Continued

- When the 5th instar caterpillar is ready to pupate, it will stop eating and roam (walk-a-about) the cage. It is important to allow the caterpillar to roam and not to move the caterpillar while it is webbing. Once it has climbed to the top of the container, leave it alone. A rearing cage should be tall enough (at least 4"x4") for the butterfly to emerge. If using a net container, line the bottom with paper towel. It gives the butterfly a rougher surface to pick itself up and get to the wall if it falls. Turn zippered side away from the light, this will help insure that they form their button in another area.
- A short time after the small cone shaped web is completed; the caterpillar will back on to it and attach at its rear (prolegs). In a few hours the caterpillar will drop all its legs, 2 at a time until it is hanging in a 'J' position. The caterpillar will hang in this position for 12 hours (most often overnight). In the morning you will notice the caterpillar moving slightly. It is getting ready to pupate (chrysalize). Watch it very closely when the tentacles are limp, pupation (or becoming a chrysalis) will happen very soon. The process of pupating takes only 1-2 minutes and it is easy to miss. Video of pupation: <https://www.youtube.com/watch?v=-fte9JKmLSk>

Care During the Pupa (Chrysalis) Stage Continued

- Inside rearing -- once the monarch has pupated it should not be touched for 24 to 48 hours. Outside rearing – If the chrysalis is in imminent danger then move it very carefully. Outside only 3-10% of Monarchs make it to adulthood. Inside rearing gives them a better than 80% chance of making it if you follow guidelines for healthy rearing (start with clean containers between broods (after a butterfly has completed its cycle), clean out frass, wash leaves, and provide fresh leaves). After 24 hours the chrysalis is hard and gold color will start to appear on it. Remove any leaves and frass (butterfly poop) left in the container and put a fresh, dry paper towel on the bottom.



Care During the Pupa (Chrysalis) Stage Continued

- If you are rearing indoors (where caterpillars are not exposed to moisture), it is recommended to lightly spray the chrysalis after 2 days. Filtered or spring water is best because tap water usually contains low levels of bleach. In nature, the chrysalis will be exposed to morning dew and rain. Inside air conditioning dries out the air. If it is too dry, it may cause your butterfly to have trouble getting out of the chrysalis. Spraying the chrysalis lightly with water once a day will help to avoid this problem. Caterpillars do not need to be sprayed with water. Caterpillars get all the water they need from their food. It is important to provide caterpillars with fresh food.

Care During the Adult Stage

- In 10 to 14 days the chrysalis will become very dark and the color of the wings will be clearly visible. Photo of dark chrysalis ready to emerge (eclose):



- On that day the butterfly will emerge. This usually happens early morning, but again it only takes a minute or two and it is easy to miss it.

Care During the Adult Stage

Continued

- The butterfly will emerge head first and immediately climb to the top of its chrysalis shell and hang for 2 to 3 hours before dropping to the bottom of the container. When the butterfly emerges the abdomen will be extremely fat and the wings small. The butterfly will pump the liquid from its abdomen into the wings and it will gain a normal appearance. Video of Monarch after it emerged, but before it inflated its wings: <https://www.youtube.com/watch?v=tAmP0HMS24U>
- During this process a small drop of liquid that looks like blood will drop from the butterfly. This liquid is called **meconium** and it is a part of the normal process. Let your butterfly dry for a few hours before handling it. It is very important that the wings hang straight down so they dry without any curled edges.

Care During the Adult Stage

Continued

- Always pick up the butterfly when the wings are closed. Never pick it up by one wing. Hold both wings together at the top center edge of the forewing (first set of wings). This will prevent damage to the wings. If it is **NOT** cold or raining (butterflies cannot fly if the temperature is below 50 degrees), go outside, remove the butterfly from its container, place it on the back of your hand and release it. If it does not immediately fly away, give it a few minutes. Photo of how to hold a butterfly:



Care During the Adult Stage

Continued

- If the weather is not favorable (no sun and too cold, the optimum temperature is above 60-70 degrees with sun), wait to release it until the second day.
- Butterflies do not have to eat the first day. I do recommend that after the wings are thoroughly dry, that you spray the cage lightly with water. Do not spray the butterfly. They do need water. They need to be fed on the second day. Video on hand feeding with nectar recipe in the description:
<https://www.youtube.com/watch?v=kua2aHTG0jc>
- You can also offer Juicy Juice, Gatorade (not low calorie), watermelon and slices of orange, or flowers, but check for any predators on the flowers. If you have to keep it for more than one day because of future severe storms, then I recommend hand feeding twice a day (morning and night). They do not seem to get enough nutrition from the fruit or flowers. Check their abdomens to see if they are plump, that will show you that the butterfly is getting enough to eat. If the butterfly is too upset that it is not being released, then cover with a black trash bag that you have cut open or put into a dark room.

Hand Feeding Butterflies

Make sure that their abdomens are not shrinking. Hand feed them in the morning and evening—twice a day. Video on hand feeding with nectar recipe in the description: <https://www.youtube.com/watch?v=kua2aHTG0jc>



Care During the Adult Stage

Hand Feeding

- Small square cube for hand feeding, set up several caps of nectar. Start them feeding, zip closed and allow them to finish. They will fly up when finished. Wash their feet and face after feeding. Video: <https://youtu.be/Uld9sh27apU>



Possible Problems and Fixes

- Problem: The caterpillar has crystalized (pupated) on the bottom of a leaf and the leaf is drying out
- Fix: Remove the leaf from the plant and tape it to the top of the rearing cage with a strong tape (masking tape). Or pin the leaf into a net container, sharp side of the stick pin on the outside—cover the sharp end with masking tape so no one gets stuck. Small paper cups can also be used to pin the leaf, make sure to pin both sides so the caterpillar does not fall down into the cup. Video of moving and pinning chrysalises:
<https://www.youtube.com/watch?v=TimY3aTGfNw>
- Problem: The chrysalis has fallen from the top of the cage
- Fix: Gently tie a piece of thread around the black stem at the top (the cremaster) of the chrysalis and then tape it to the top of the cage or pin it with a stick pin through a loop in the thread. Do this very gently, tying too tightly may break the black stem (cremaster) Monarch Watch has a diagram of how to tie the chrysalis:
<http://www.monarchwatch.org/rear/index.htm>

Possible Problems and Fixes

Continued

- Problem: The milkweed is drying out or is almost gone
- Fix: Place another bottle with a fresh stalk(s) of milkweed into the container right next to the old milkweed, or if your milkweed is lying at the bottom of a cage, place the new milkweed on top of the old leaves, the caterpillar will find them. Remember to remove old milkweed later and check the leaves for small caterpillars before you throw them away. It is a good idea to keep a sticky note with how many caterpillars you have in each container. This way you will know to search if your count is off.
- Problem: The butterfly has fallen and the wings are wrinkled and have dried. It is unable to fly.
- Fix: If the wings are too deformed, it will not be able to fly. You can hand feed it until it dies naturally. Video on hand feeding with a nectar recipe in the description: <https://www.youtube.com/watch?v=kua2aHTG0jc> You can also offer watermelon and slices of orange, or flowers, but check for any predators on the flowers. I use a squirt bottle and spray the side of container with water. They do need water. Don't spray the butterfly.

Possible Problems and Fixes

Continued

- Problem: The butterfly has laid an egg on the milkweed pod and I want to collect the pod for seeds.
- Fix: If the eggs are dry you can, with a container underneath, push the egg off the pods making sure to stay as close to the bottom of the egg as possible. Then take the egg, place on a wet milkweed leaf to hatch. You can put more than one egg on a leaf, just give them at least a inch or two apart. Monitor for hatching and then transfer new instars to a separate container so they do not crawl over and eat another egg. As far as transferring the lose eggs to the wet leaf, try a toothpick or damp q-tip, let us know how it goes. I used to do this, but now I just let them eat the pods, they love milkweed pods.
- Problem: The caterpillar has pupated on the side of the container and it is making one side flat.
- Fix: If possible tilt the container so that the caterpillar is hanging down instead of against the container. If that is not possible, then move the chrysalis by wetting the silk button with water (use a moist q-tip), lift the button with a pin and pin into a net container or tape up in a plastic container. It is important for the chrysalis to not dry with a flat side, it can cause deformities. Moving “Js” or wet chrysalises is very hard and can result in death. If you decide to do this, do it very carefully. Frankly it depends on how flat it has made its button on the side of the container.

Cautions

- Do not place your Monarch rearing container with any stage of Monarch in direct sunlight because they will over heat. Always use indirect light for rearing Monarchs.
- All newly found caterpillars should be given separate containers. You could introduce disease to the caterpillars you are presently raising by combining them.
- Separate larger caterpillars from smaller ones. The larger ones can eat the smaller ones.
- Wash your hands thoroughly before taking care of your caterpillars and afterwards; milkweed sap can hurt your eyes.
- Use only parasite proof containers outside. Assassin bugs and Tachinid flies will attack (they can lay through and pierce the fabric) caterpillars outside, if their cages are not parasite proof.

References and Information

Monarch Watch, “Rearing Monarchs” for more details:

<http://www.monarchwatch.org/rear/index.htm>

Bug Dorm 2 container, item 1462W, Bioquip.

<https://www.bioquip.com/search/DispProduct.asp?pid=1452>

Parasite Proof Cages:

eNasco:

<http://www.enasco.com/product/SB46624M>

Butterfly Farm™ Square Pop-Up Cage - 16-1/2" x 16-1/2" x 30" (2' 6" tall)

<http://www.enasco.com/product/SB46623M>

Butterfly Farm™ Square Pop-Up Cage - 27" x 27" x 48" (4 foot tall).
Tall enough to put in two small students.

References and Information Continued

Learn About Monarchs, OE Spores

<http://www.learnaboutmonarchs.com/learnaboutoespore.html>

Project Monarch Health, Click on “Monarch
Parasites”

<http://www.monarchparasites.org/>

Monarch Diseases and Parasites

Learn About Monarchs, What is Black Death

<http://www.learnaboutmonarchs.com/whatisblackdeath.html>

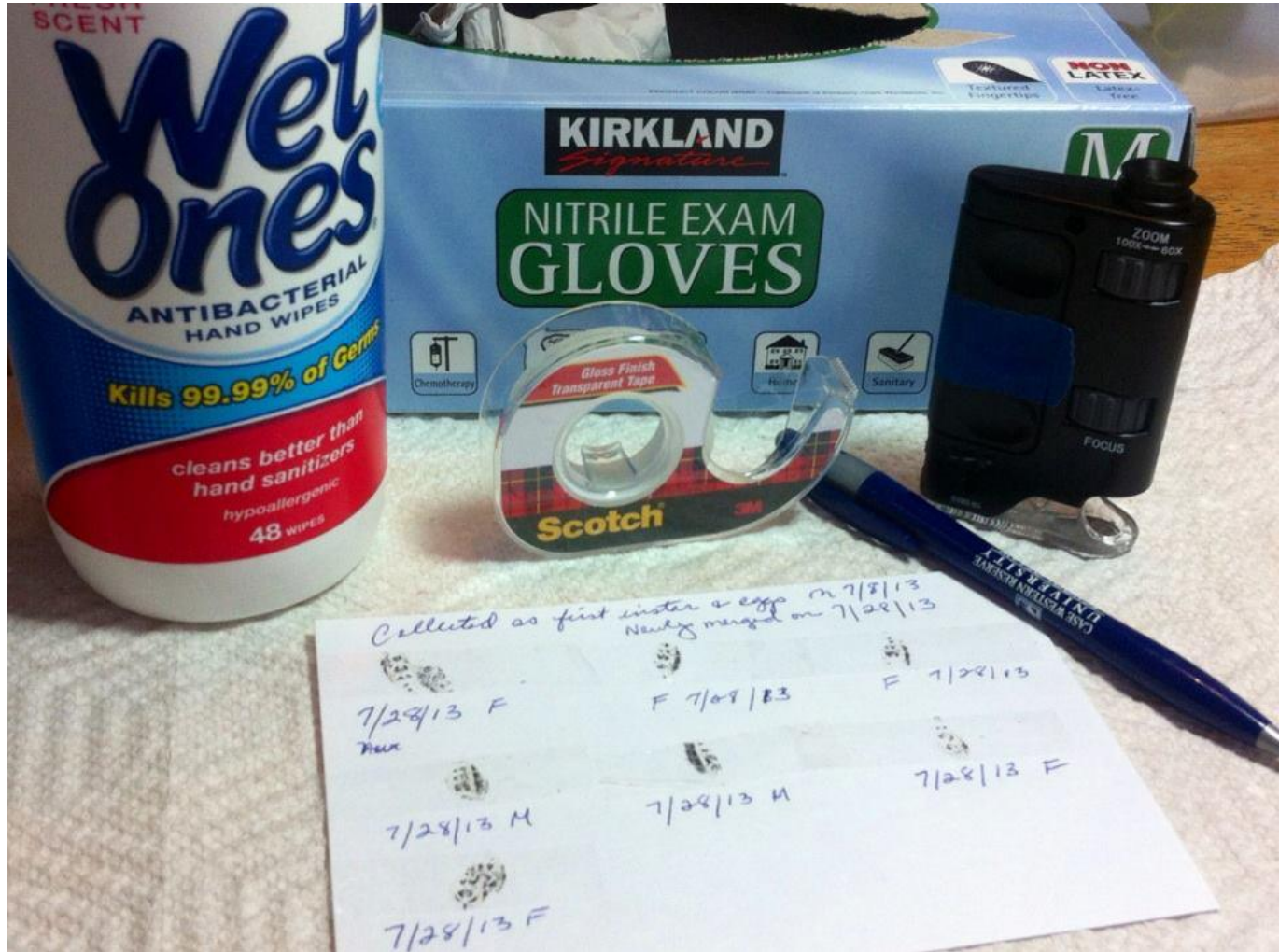
Learn About Monarchs, Tachinid Fly

<http://www.learnaboutmonarchs.com/learnabouthtachinidfly.html>

Valerie Evanson's Garden on facebook, **Monarch Butterfly Diseases & Parasites:**

<https://www.facebook.com/media/set/?set=a.10150356327304949.1073741827.57837984948&type=3>

Testing for *Ophryocystis elektroscirrha* (OE)



Testing for *Ophryocystis elektroscirrha* (OE)

Equipment Needed

- White index cards
- Pen for writing down information (date, sex, condition of butterfly)
- Clear invisible tape
- Rubber disposable gloves
- Wet Ones
- Small microscope -- \$10.99 from Amazon (<http://tinyurl.com/onjqlx5>)

What is *Ophryocystis elektroscirrha*, (OE)

- Project Monarch Health, University of Georgia. What is OE? For more details, visit this website:
<http://monarchparasites.uga.edu/whatisOE/>
- How to test? Directions from Project Monarch Health at the University of Georgia:
<http://monarchparasites.uga.edu/testing/taping.html>
- **Are you interested in sampling monarchs in your area for a protozoan parasite?** Please e-mail Project Monarch Health at monarchhealth@gmail.com and they will send you a free research kit
- Testing monarchs for the protozoan parasite OE. OE does harm monarchs. Sampling involves capturing or raising adult monarchs and pressing clear tape against the butterfly's abdomen to collect parasite spores. All wild monarchs should be released after testing even if they have OE because it is a natural infection. All wild collected eggs and caterpillars should be released if you did not introduce the infection. Sanitizing containers between broods will kill OE spores and prevent introducing OE to uninfected butterflies.