# To see how blowfly larvae (calliphora) react to light essay

The Blowfly is any member of the insect family Calliphoridae (order Diptera). They are metallic blue, green, or black in colour and are noisy in flight, producing a distinctive buzzing sound. The blowflies are on average 8-10 mm in length, slightly larger than the more common housefly larvae. Among the blowfly family, the more important members are the screwworm, bluebottle fly (Calliphora), green bottle fly, and cluster fly.

Adult blowflies feed on a variety of materials, but the larvae of most species are scavengers that live on carrion or dung. The adults lay their eggs on the carcasses of dead animals, the eggs hatching in less than a day and the larvae burrow straight down into the food source, and feeding on the decaying flesh. The larvae of some species also sometimes infest open wounds of living animals. Several days before going into the pupal state, the blowfly larvae tend to move away from light source, often ending up under carpets or behind panelling.

After 8-10 days the pupae wriggle their way into the light and the adult flies emerge. They are immediately able to fly off, mate and start laying eggs. Stereotyped responses are the unlearned behavioural reactions of an organism to some environmental stimulus. It is an adaptive mechanism and may be expressed in a variety of ways. All living organisms exhibit one or more types of stereotyped response.

In general stereotyped response in organisms may be divided into four main categories: unorganised or poorly organized response, reflex movements of a particular part of an organism, reflex-like activity of an entire organism, and instinct. In the blowfly larvae, the main response that it encounters when faced with a light stimulus is a reflex-like activity of the entire organism. Behaviour in an animal’s movement that are not orientated with respect to the direction of a stimulus source are called kinesis. For instance if an animal is used to living in a humid environment then it’s activity will increase in a non-humid environment, thus helping them to find a more humid environment as quickly as possible. The term klinokinesis has been used to describe the orientation of animals that were said to increase their rate of turning in high light intensity and then to move down a light gradient, finishing up in the dark. In klinokinesis, animals do not maintain a fixed direction of movement, but in other kinds of orientation, the taxes, their paths are always at a fixed angle to the stimulus source, or may lead directly towards or away from the source.

I think that when the Calliphora larvae are subjected to the light, they will move away from the source to a region of the paper circle where the intensity of the light is not as strong, generally moving into the negative region, with a few in the neutral zones. The reason for this is that the larvae needs to avoid the possibility of becoming prey to a predator, just before it is due to go into the pupal state. When the larvae are found in brighter areas, it becomes more visible to other animals, therefore putting itself in harms ways. If the larvae remain in darker areas, it increases it chance of survival (as larvae), also increasing the possibility of it becoming a bluebottle fly once it has come out of the pupal state.

Furthermore, I predict that the speed of the larvae will be dependant on where they are situated. If they are nearer to the light source, they will move away from it faster, slowing down as the intensity of the light decreases. The reason for this is due to the larvae needing to get out of the light as quickly as they can, reducing the amount of time that they exposed to potentially threatening situations. Due to information that I have seen about the way in which woodlice behave in a choice chamber, my null hypothesis would be that there would be an equal number of maggots in each section. That is to say the maggots will show no preference in which sector they finally finish. Note: Only use Calliphora larvae that are ready to pupate within a few days because this is the period in which they are most sensitive to light.

Also, keep them in the fridge as this decreases their activity, so remain longer as larvae. Making the marked sheets of paper: Take a sheet of A2 size paper. Using the compass, draw a circle 20cm in radius (40cm in diameter). At the centre of the circle, draw another circle of radius 2cm (diameter 4cm).

Then with the protractor, divide the circle into four sectors: two of 120 and two of 60 as shown below: Label the circle as above. Cut out, and repeat to produce as many as required. Before investigating the effect of light on Calliphora larvae, I had to ensure that the size of the circle that I would be using would be sufficient to allow the light source to decrease in intensity as it spread along the surface. At fist I began with circle of diameter 15cm. On a circle of this size, I found the light intensity had not decreased enough from one end to the other.

I then moved up in size, using a circle of diameter 30cm. Unlike the 15cm circle, this did allow the light source to decrease in its strength. However the difference between centre and the ends was not large enough. Finally I tried a circle of diameter 40cm.

This size circle allowed the light to lessen in strength sufficiently and was also easily reproducible by using a compass and not any other drawing methods. Whilst investigating the size of the circle, the height at which to have the light source above the table was also explored. Simply by just moving the lamp up and down, I found that a suitable height for the front end to be above the table was 1. 5cm.

The next factor that I had to consider was the time intervals between marking the progress of the larvae. To ensure that the following method can easily be followed, make sure all apparatus that needs to be used is within in easy reach as the experiments are carried out in the dark. Firstly set up the apparatus whilst the lights in the room are still on. Make sure that the circle of paper placed beneath the lamp is put in the correct way; the positive sector nearest the lamp with the negative furthest away.

After the apparatus is set up, remove the larvae from the fridge and allow them to sit for 10 minutes so they reach room temperature. Once everything is ready, turn off all the light in the room, close all the blinds; as a result the room is lit only by the lamp being used in the experiment. When ready, spin the pencil to provide a random direction in which to place the maggot. Place the maggot in the inner circle. As soon as the tail of the maggot leaves the circle, start the stopwatch.

Make a mark on the inner circle to show the spot from where the maggot left. Here on, until the maggot reaches the outer circle, mark the movement every five seconds. Do not make marks by the maggots head as this will affect the direction in which they travel, instead mark near the end of the tail. When the maggot has left the circle, place it in petri dish so that it is not used again.

Repeat this process at least fifteen more times, using a new sheet of paper each time so that the new maggot cannot follow any trails of previous ones. Within this investigation, a few safety issues arouse. The main issue was the handling of sharp instruments such as the compass and scissors. Care had to be taken when drawing and cutting out the circle so as to avoid cutting myself.

Another issue in this investigation is the ethical implications of using living organisms. The Calliphora larvae were used so that no harm came to them from being subjected to the light source. The lamp being used was not too powerful and so this did not have any long-term effects on them as they were seen to be reacting in the way suggested even when not being tested. Also the larvae did not encounter any chemical stimuli that could cause imbalances in their bodies.

See the following tables and graphs. My hypothesis stating that the larvae will move away from the light source has been shown to be correct. Fifteen out of the seventeen maggots tested moved into the negative region of the circle. The two that did not enter the negative sector settled in the neutral zone. As you can see from the table and graph showing the angle at which the maggots finally leave the circle, the majority are found within the angles 160ï¿½ and 200ï¿½. The larvae found between these angles can be seen on the circles to be the furthest away from the light source.

This is further proved by the standard deviation of the angles. The value of 32. 52 places the majority of the angles within this range. My hypothesis stating that as the larvae move away from the light stimuli, their speed will decrease, has been shown to be partially correct. As you can see from the table and graph showing the speed of the maggot (until they reach the edge of the circle), the majority do show an overall decrease in their speed, but a few do speed up the further they have travelled.

One of the better examples of this is maggot 15. This maggot ended up in the neutral sector of the circle, this possibly being a possible cause in its speeding up. My null hypothesis stated that the maggots would show no preference in which sector they finish. To prove that there is a relationship between the site of a light stimulus and the direction in which they travel, I will use a Chi Squared statistical analysis.