

# The effects of light and dark areas on a pill bug's behavior over time



A two-part study was recently done to show what natural habitat a Pill bug, *Armadillidium vulgare*, naturally prefers: wet or dry environments along with a light or dark environment. It was hypothesized that a Pill bug would prefer and wet and dark environment based on its natural habitat of soil. For the wet and dry experiment, a coffee filter and soil were placed in each chamber of a double petri dish with one being dampened before being placed in. For the light and dry experiment a light was hung above one chamber of another double-chambered petri dish while the other chamber was covered with aluminum foil, after placing soil in both chambers. An equal number of Pill bugs was placed in each chamber and a study was taken for ten minutes where every thirty seconds the number of Pill bugs in each dish was counted. The results showed that Pill bugs, unlike its natural habitats, preferred light and dry environments.

## Introduction

Pill bugs, or their scientific name of *Armadillidium vulgare* are small, very segmented insects beneficial to breaking down naturally decaying wood and leaves which is among them in moist beds of soil (The Dirt Doctor, [www.dirtdoctor.com](http://www.dirtdoctor.com)). They do not actually have eyes (only eyespots) so they rely on their antennae and help with the sensing of their surroundings. Since Pill bugs don't have eyes light is not a necessity for survival or everyday living. They have seven pairs of legs, a pair for each body segment, which makes for quicker transportation. Pill bugs also rely on a constant form of moisture because they dehydrate and dry out very easily, but have adapted the ability to absorb water vapor from their surrounding environment (PILLBUGS, [www.northern.edu](http://www.northern.edu)).

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Therefore, based on their lack of eyes and need for water, pill bugs generally tend to favor a darker, moist environment for an “ optimal functioning” rate, however it is not completely “ accepted” because pill bugs have been seen out in dry areas during periods of a brighter light. A high school study was recently done over a period of time in two different tests to see whether a pill bug actually does favor a dark or light area as well as a wet or dry area. The hypotheses made for each experiment were as follows: “ If one area of a double-chambered petri dish is dry and one area is wet, then the Pill bugs will favor the wet side.” “ If one area of a double-chambered petri dish is dark (being covered by Aluminum foil) and one area has a light on it, then the Pill bugs will favor the dark side.”

#### Methods & Materials

During experimentation, groups found that an even number of Pill bugs should be used for even distribution in the beginning of the experiment so there would be no bias toward one area of the double-chambered petri dish, to which it was decided ten (10) Pill bugs would be acceptable. Both sides of the double chambers had a small amount of dirt added to them for a more realistic environment, and a table was made to keep a survey of how many bugs were in each chamber every thirty (30) seconds for ten (10) minutes (the time being tracked by a simple stop watch or timer).

One column of the table was labeled “ Number in Dark” with the other obviously being “ Number in White,” and each row went according to time; 0 minutes, 0. 5 minutes, etc. until reaching ten minutes. Space was made for additional notes incase a bug was possibly in-between chambers in the

tunnel. If a bug was in the transgression tunnel, they were determined to be in a dish by which way their head was facing or the direction they were travelling.

### Dark or Light Environments

For the main experiment, one side of the double chamber was covered in aluminum foil (after five of the bugs were placed inside) and the other side had a larger standard light bulb hung approximately 12" above. The timer was started as soon as the light bulb was turned on from it's hanging position and a survey was taken of how many bugs were in each chamber during each marked time. Once the experiment was finished, a graph was created to show the variation throughout the time on how many bugs were in the hypothesized chamber. Once the experiment concluded, a graph was made to show the changes over time of the number of Pill bugs found in each chamber.

Wet and Dry Environments to find whether Pill bugs gravitate toward a wet or a dry experiment, two coffee filters were cut to the size of the petri dish and placed inside, however one was dampened before being placed on the bottom. Dirt was then added on top to promote a more realistic environment and five Pill bugs were placed in each side before starting to prevent bias on an environment. A log was taken every thirty (30) seconds for ten (10) minutes on how many bugs were in each chamber and a graph was then made to show the changes of the bugs' positions over time. Again, if a Pill bug was in the transgression tunnel he was determined to be in a dish by the direction he was moving or the way it's head was facing.

**Results Dark and Light Environment** After experimentation occurred it was found that Pill bugs in the double-chamber preferred the light area over dark. The first three minutes followed hypothesized beliefs of the Pill bugs favoring darker environments; it soon showed a predominant change in habitual residence when through minutes five and nine the number of Pill bugs in the chamber with a light bulb above it never came below seven at a time. For fifty percent of the time, there were two Pill bugs in the light chamber for every one Pill bug in the dark (as the table below shows). The statistics strongly favored Pill bugs liking light areas for the majority of the experiment (60% of the time).

**Wet and Dry Environments** During the wet and dry environment stage there was a gradual increase for the first six minutes of the experiment where Pill bugs slowly gravitated toward the dry chamber. At minute six there were nine Pill bugs in the dry chamber at a time. There was one bug which remained in the wet chamber for the entirety of the experiment. A large drop occurred between minutes six and eight because three Pill bugs became stuck in the transgression tunnel from crowded travel through the small space. For the first minute it was determined that two were in the dry chamber and one was in the wet chamber because of the direction their heads were facing. This same challenge also occurred in minutes eight and a half (8.5) to nine and a half (9.5) where two Pill bugs were stuck alongside of each other in the tunnel, one was in mid-travel toward the wet area, and one toward the dry. Overall, the change seemed to be gradually developing toward the dry area.

## Discussion

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**Dark and Light Environment** There was one error in the experiment where a Pill bug was stuck on it's back under the aluminum foil of the dark chamber during the dark/light testing from minute one to the end of the experiment. The error could not be corrected because it would require removing the aluminum which would corrupt the whole experiment. The bug wasn't expected to make a drastic change, but it may have ended up also favoring the light, possibly completely proving our hypothesis false.

**Wet and Dry Environment** During the Wet and Dry tests, we feel that the test failed because a wet coffee filter is a lot different than moist soil, therefore the consistency and excessive moisture may have caused the Pill bugs to move to a drier chamber.

Throughout the experiment that seemed to be the correct conclusion with the (mostly) gradual change of Pill bugs from the wet chamber to the dry. Next time the experiment may have to be done with actual dry and moist soil to provide a more accurate analysis of what the bugs prefer. The experiment proved both of the hypotheses on the wet/dry environment as well as the light/dark environment to be false. However, our hypotheses were based off of factual evidence about their natural habitat as well as their necessities for living. Pill bugs, as the scientific world knows, do, in fact, live ideally in damp, dark environments (under garbage, in garden soil, etc.) and need the moisture to survive (Pill Bugs, [www. pestworldforkids. org](http://www.pestworldforkids.org)).

One possible error in both experiments could have been the amount of soil in each chamber. Pill bugs do gravitate toward patches of soil, so if one chamber did happen to have more that could possibly explain why the Pill bugs went against their natural inclinations.

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