Week 14
BIO-1306 - Biology 2 – ICB textbook

Hello and Welcome to the weekly resources for BIO-1306 - Biology 2 – ICB textbook!

This week is Week 14 of class, and typically in this week of the semester. your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout of the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester**.

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

Keywords: *Pollutant, Parts Per Million (ppm), Biomagnification*

TOPIC OF THE WEEK: Pollutants in the Environment

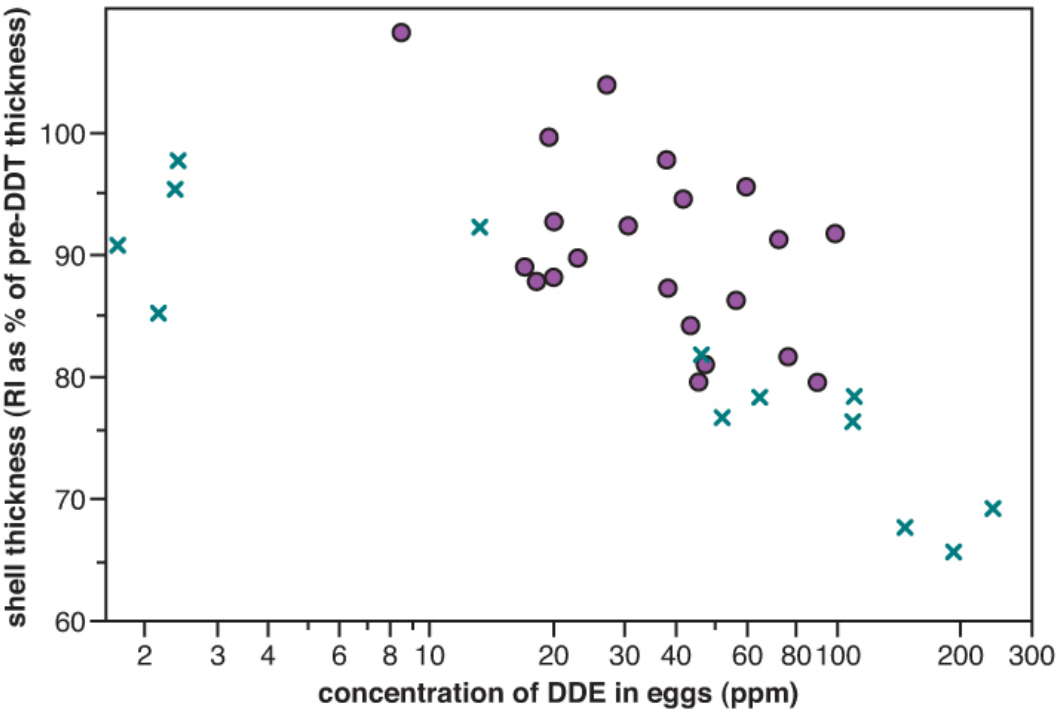
This week we will be looking at how predators at the top of the food web suffer from biomagnification

- Pollutant → Chemical found in ecosystem due to human activities
- Parts Per Million (ppm)→ Concentration of substance in media -- either mg/L or mg/kg.
- Biomagnification → Increase in concentration of pollutants that occurs in the food chain.

HIGHLIGHT #1: Insecticide's Effect on Eggshell Thinning

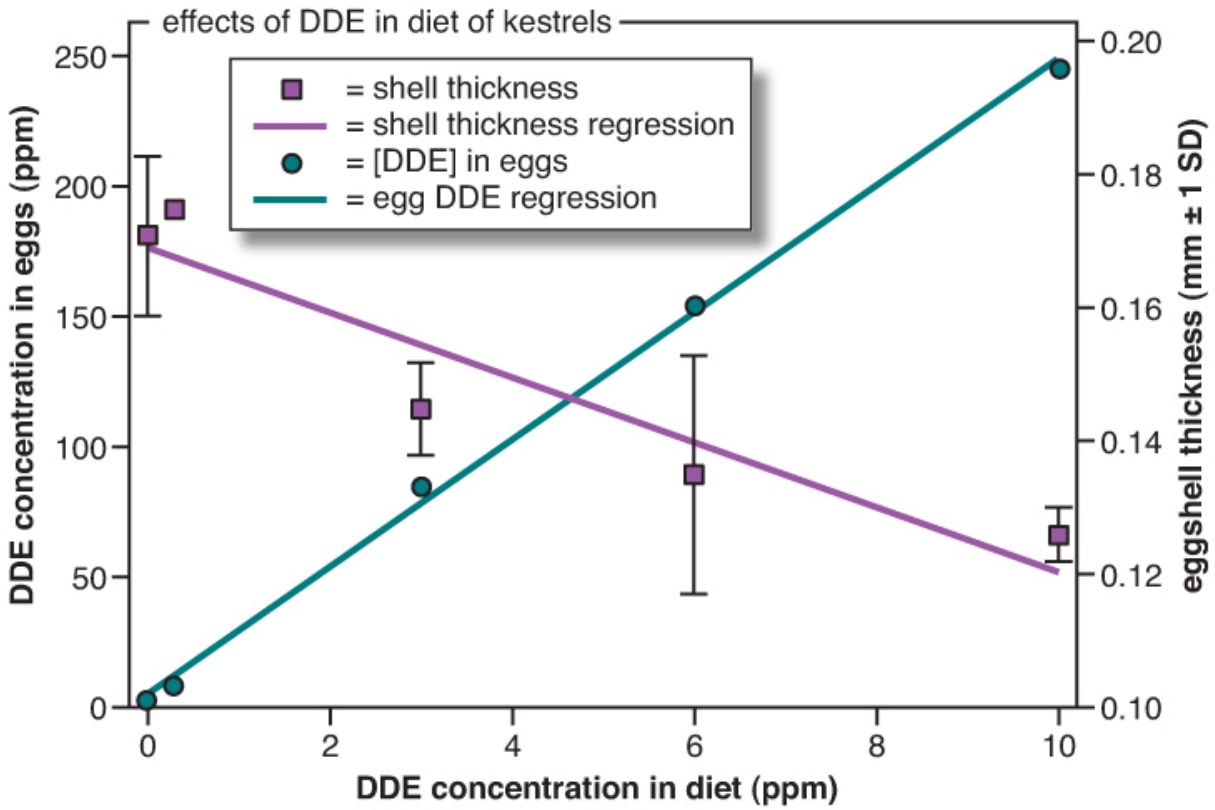
Dichloro-diphenyl-trichloroethane (DDT) is an insecticide that was developed around World War II when it was seen that humans were not harmed by it. Even though this seemed like the perfect solution to fighting insects, DDT has been found in Arctic animals where DDT has never even been sprayed. The contamination and pollution of DDT has exceeded acceptable levels in the environment, affecting the animals in the ecosystem a well.

Researchers saw a correlation between the presence of DDT in the environment and the thinning of bald-eagle eggs. Jeffrey Lincer combined a controlled study with captive raptors and field study with natural raptors to declare a causative relationship. Nest boxes in New York which were established areas for laying eggs were checked two to three times a week. Some of the eggs were taken back to the lab to measure the breadth/weight, and also check for cracks. The scientists took four measurements of each shell and threw out the highest and lowest measure before analyzing the data. Lincer also calculated **Ratcliffe's Index (RI) which is the weight of the dried eggshell (in milligrams) / length x breadth (in millimeters).** The egg content was analyzed for DDT, DDE, and other hydrocarbons, and was then compared to the thickness of the shell.



This graph shows both the birds that were observed under laboratory conditions (shown by x's) and then birds that were observed in nature (shown by circles). **What did we see?** Generally, as the concentration of DDE administered decreased, the shell thickness decreased. This trend was even more evident for birds observed in the lab that got DDE administered to them.

Following this, researchers fed each kestrel 30 grams of meat and varied the concentrations of DDE fed to each kestrel. They also had a kestrel that got no DDE and instead of was just fed sesame oil. Eggs were collected 5 days after they were laid to allow development to occur.



The x-axis shows what researchers manipulated which was the DDE concentration in the birds' diets. The y-axis shows what was measured and recorded; DDE concentration in the eggs laid is shown in blue and the shell thickness is shown in purple. **What do we see?** As the birds consumed more DDE, the amount of DDE found in the eggs increased as well, however, the eggshell thickness decreased.

Although these experiments themselves were not enough to assert that DDE/DDT was **causing** egg-shell thinning, many other field studies were done to eliminate

other confounding variables that could've affected the results. Combined, these studies provide strong evidence that DDT is a causative factor in eggshell thinning. Due to the fact that DDT lasts a long time in the environment, biomagnification (increasing DDT concentration in the food web) is an issue with insecticide use. With the knowledge of eggshell thinning and the fact that insects are gaining resistance to DDT, many countries have banned its use.

CHECK YOUR LEARNING:

1. Who would be more affected by biomagnification? A carnivore (top of the food web) or a plant (bottom of food web)?
2. How would you describe the relationship between DDE concentration in diet and eggshell thickness? What about the relationship between DDE concentration in diet and DDE concentration in eggs? The relationship between DDE concentration in eggs and eggshell thickness?

THINGS YOU MIGHT STRUGGLE WITH:

1. For this, reading the figures and really trying to understand how the research connects to the big pictures is tough. Please try to remember that the key component of this section is biomagnification and how pollution from one area can still affect environments you may feel are disconnected.

Thanks for checking out these weekly resources!
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring ! Answers to check your learning questions are below

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Answers:

1. Predator at top of food web would be more affected
2. DDE in diet and eggshell thickness: Indirect; DDE concentration in diet and DDE concentration in eggs: Direct; DDE concentration in eggs and eggshell thickness: Indirect