

**Week 11**  
**BIO-1306 - Biology 2 – ICB textbook**

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

**This week is Week 11 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](http://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:** *Hormones, Exoskeleton, Epidermis, Hemolymph, Metamorphosis, Ganglia, Neurosecretory Cells*

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**TOPIC OF THE WEEK: Endocrine System**

This week we will be looking at the complexities of the endocrine system by going over signaling and the hormones associated with the system

- Hormones → Chemical messengers in the body that travel through our bloodstream to tissues and organs.
- Exoskeleton → External skeleton that supports and protects an animal's body
- Epidermis → An outer layer of cells in multicellular organisms
- Hemolymph → Bodily fluids of insects
- Metamorphosis → Abrupt developmental/structural change in an animal
- Ganglia → Masses of nerve tissue containing cell bodies of neurons

All diagrams, tables, and external information included in this document are property of Integrating Concepts in Biology by Campbell, Heyer and Paradise, unless otherwise specific.

- Neurosecretory cells → Specialized neurons that secrete specific hormones in response to stimulation

### HIGHLIGHT #1: Molting Moth Experiment

Researcher **Wigglesworth** performed an experiment to see how *R. proxilus* molts. He decapitated certain insects on a variable number of days after feeding and he would record the percent of insects molting after the decapitation event.

number of days after feeding at which decapitation occurred	percent of 1st stage molting	percent of 2nd stage molting	percent of 3rd stage molting	percent of 4th stage molting	percent of 5th stage molting
2	0	0	0	0	0
3	50	60	83	50	0
4	100	80	87	60	0
5	—	100	83	100	0
6	—	100	100	85	20
7	—	—	100	100	50
8	—	—	—	100	85
9	—	—	—	—	100

Wigglesworth then took some insects in the fourth stage of molting, fed them on the same day, and decapitated half of them 24 hours later. The other half were left untouched as the control group. Each day after the decapitation, he removed the exoskeleton and epidermis from an insect in the control and decapitated group. **What did he see?** Wigglesworth saw that normal insects had epidermal cells with a dense cytoplasm, and they would start to divide in about 5 days. In decapitated insects, the changes were not there.

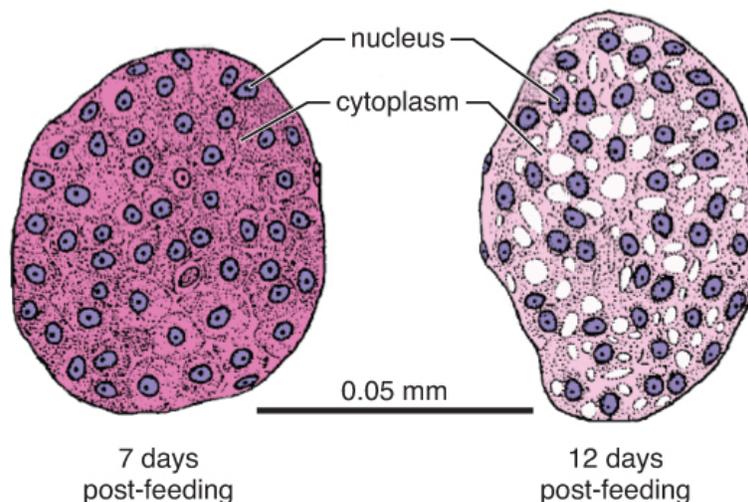
Each stage had a **critical period** → The period of time during which the head is necessary for molting. After the critical period has passed, the head isn't needed for the molting anymore. The critical period for each stage varies. For example, the first stage of molting had the shortest critical period than other stages.

Wigglesworth also saw that the epidermis changes right after blood feeding. The epidermis secretes new exoskeleton that replaces the new one. These changes were not shown in insects with decapitated heads, so he inferred that **the head is**

**necessary for growth** and hypothesized that it probably secretes a molting hormone. After there is a high concentration of the molting hormone in the insect, the head is no longer needed for molting.

Wigglesworth thought that if molting is induced by the hormone produced, then he could induce molting in an insect that hadn't passed the critical period by using the hemolymph from an insect that had passed the critical period. This way the hemolymph past the critical period would contain the molting hormones necessary for the insect to develop. He would decapitate insects that were not in the critical stage and then attach heads past the critical period to these decapitated insects. **What did he see?** Fourth stage individuals did not have the ability to induce molting in fourth stage individuals decapitated after 24 hours so he inferred that the molting hormone is either secreted from the head OR the nervous system stimulates another gland posterior to the head to secrete the hormone.

Wigglesworth cut cross sections of different organs in the insect, and found that only the **corpus allatum** showed the change in cell cycle that coincided with the critical period. He therefore suggested that the source of the molting hormone is the corpus allatum.



Soon, other experiments showed that corpus allatum is not the source of the molting hormone BUT that there may be a small portion in one half of the brain that controls molting. This portion contains neurosecretory cells that mediate the secretion of the molting hormone from the **prothoracic gland**.

The main takeaway is that different populations of endocrine cells perform different tasks; each hormone is specialized.

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**CHECK YOUR LEARNING:**

1. What's the name of the chemicals that help in cell to cell communication?
  2. What is the main system involved in the molting of insects, and how is this controlled?
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**THINGS YOU MIGHT STRUGGLE WITH:**

1. A lot of this section is memorization, so take the time to memorize the glands, the types of cells, and secretions.
  2. There are a lot of details about the experiment in this section but try to concentrate on the main takeaways so you understand the big picture.
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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](http://www.baylor.edu/tutoring) ! Answers to check your learning questions are below

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Answers:

1. Hormones
2. Endocrine system and by the secretion of molting hormones