



**Endocrine & Cell Communication Part I:  
Introduction to Communication**



**Why do cells need to communicate?**

- There are many reasons, so name a few.



**Signal Transduction Animation**

- Click on this link to access the animation:  
[http://www.wiley.com/college/boyer/0470003790/animations/signal\\_transduction/signal\\_transduction.htm](http://www.wiley.com/college/boyer/0470003790/animations/signal_transduction/signal_transduction.htm)



**How does a cell communicate?**

He uses a cell phone.  
HA HA HA

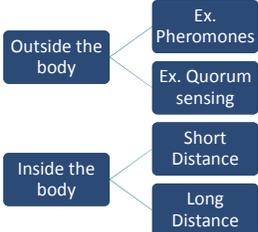



**Why do cells need to communicate?**

- Here are a few reasons:
  - Coordinate activities in multicellular organisms
  - Hormone actions
  - Cell recognition
  - To find mates (yeast cells)
  - Turn pathways on/off
  - apoptosis



**Chemical Communication**




**AP Biology Curriculum Framework**

- Enduring Understanding 3.D Cells communicate by generating, transmitting and receiving chemical signals.
- EK 3D1: Cell communication processes share common features that reflect a shared evolutionary history.
  - C. In single-celled organisms, signal transduction pathways influence how the cell responds to its environment.
  - D. In multicellular organisms, signal transduction pathways coordinate the activities within individual cells that support the function of the organism as a whole.



**Evolutionary ties of cell communication**

- Cell-to-cell communication is everywhere in biological systems from Archaea and bacteria to multicellular organisms.
- The basic chemical processes of communication are shared across evolutionary lines of descent.
- Signal transduction is an excellent example



**Pheromones**

- Members of the same animal species sometimes communicate with **pheromones**, chemicals that are released into the environment.
- Pheromones serve many functions, including marking trails leading to food, defining territories, warning of predators, and attracting potential mates.
- Here's an example of a termite following a "manmade" trail: <http://edutube.org/en/video/termites-and-pheromones-ink-trails>



### Quorum sensing

- Quorum sensing in bacteria – single celled bacteria monitor their environment by producing, releasing and detecting hormone-like molecules called autoinducers.

### Direct Contact Communication

Ex. Plant cells communicate directly through openings called plasmodesmata.

### Autocrine signals

- These chemicals affect the same cells that release them.
  - Ex. Interleukin-1 produced by monocytes and can bind to receptors on the same monocyte.
  - Tumor cells reproduce uncontrollably because they self-stimulate cell division by making their own division signals.

**Autocrine signaling**

### Chemical Communication

### Short Distance Communication

- Paracrine signals diffuse to and affect nearby cells
  - Ex. Neurotransmitters
  - Ex. Prostaglandins

**Paracrine signaling**

### Long Distance Communication

- Endocrine hormones via signal transduction pathway:
  - Reception
  - Transduction
  - Response

Copyright © Pearson Education, Inc. All Rights Reserved. No portion of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without prior written permission from Pearson Education, Inc.

### AP Biology Curriculum Framework

EK 3.D.2 Cells communicate with each other through direct contact with other cells or from a distance via chemical signaling.

- Cells communicate by cell-to-cell contact.
- Cells communicate over short distances by local regulators that target cells in the vicinity of the emitting cell.
- Signals released by one cell type can travel long distances to target cells of another type.

### Neurotransmitters and Neurohormones

### Long Distance Communication

- Endocrine hormones via signal transduction pathway:

### Hormones

- Endocrine glands produce hormones which are
  - Chemical signals
  - Transported in tissue fluids
  - Detected only by target cells

**(a) Endocrine signaling**

### Communication Features

- Secreting cell** - releases the signal
- Signal** = chemical = ligand
- Receptor** - accepts and temporarily joins with the ligand forming receptor/ligand complex
- Target cell** - contains the receptor

**NATIONAL  
MATH + SCIENCE  
INITIATIVE**

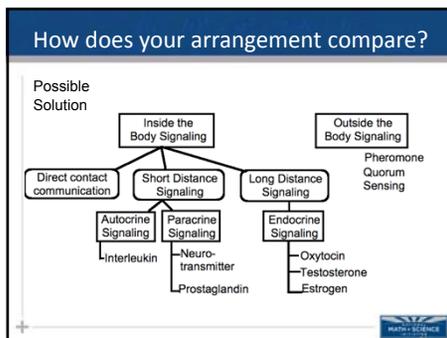
Created by:  
Debra Richards  
Coordinator of Secondary Science Programs  
Bryan ISD  
Bryan, TX

Practice: Use the labels provided to create a cell communication graphic organizer.

Long Distance Signaling	Pheromone	Autocrine Signaling	Oxytocin
Short Distance Signaling	Quorum Sensing	Interleukin	Neuro-transmitter
Outside the Body Signaling	Paracrine Signaling	Prostaglandin	Direct contact communication
Inside the Body Signaling	Endocrine Signaling	Testosterone	Estrogen

### Apply the features

- Insulin is secreted by beta cells of the pancreas. Once secreted, insulin travels around the body. When insulin docks with an integral protein on the membrane of a muscle cell, glucose can enter the cell.
- What is the secreting cell, the target cell, ligand, and the receptor?



### Next time: Endocrine System