Course Learning Outcomes for Unit V

Upon completion of this unit, students should be able to:

1. Relate the structure of the nervous system, the cells of the nervous system, and the anatomy of a neuron.
2. Explain the communication within an axon and the synapse.
3. Compare and contrast the sympathetic and the parasympathetic nervous systems.
4. Relate the seven major regions of the brain.
5. Summarize each of the five senses.
6. Examine the endocrine system, hormone types, and modes of action.
7. Relate the functions of the hypothalamus.
8. List the 12 major glands and their hormones.

Reading Assignment

Chapter 27:
Communication and Control 1: The Nervous System

Chapter 28:
Communication and Control 2: The Endocrine System

Unit Lesson

Alois Alzheimer was born in June 1864 in Bavaria, Germany and graduated from medical school in 1887. In 1888, he began his psychiatric career in Frankfurt at the Hospital for the Mentally Ill and Epileptics. His main interest was neuropathy and he researched the cortex of the human brain. One of the important things he did was develop an archive of autopsy cases.

In 1894, Alzheimer married Cecilia Geisenheimer, who was wealthy and her financial support allowed him to continue his research unimpeded. They had three children, but Cecilia died in 1901.

Alzheimer became director of the asylum in Frankfurt and in 1901 attended a woman named August Deter. Deter was suffering from disorientation, loss of memory, and difficulties with reading and writing. Her symptoms gradually worsened until she died in 1906. Even though Alzheimer had since moved to Munich, her brain and medical records were sent to him. At a medical meeting late that year, Alzheimer gave a talk and described his findings about August Deter as, “a peculiar disease of the cerebral cortex” (Maya, n.d.). She had an unusual amount of cortical thinning for her age, but Alzheimer also noted two other significant findings: 1) neurofibrillary tangles, and 2) amyloid plaques. Alzheimer asserted that these abnormalities were the cause of Deter’s dementia and so August Deter became the first person diagnosed with Alzheimer’s dementia. Alzheimer’s description of the disease and the histopathologic observations he made “have not been corrected or amended but only confirmed” (Maya, n.d.), to this day.

The pathophysiology of Alzheimer’s disease was discovered and described by Dr. Alzheimer. That is, the brain suffers a loss of neurons and exhibits a buildup of microscopic structures Alzheimer described as plaques and tangles. The plaques are made up of a protein called beta-amyloid and the tangles are made of a protein called tau (Novartis, 2012). Why the neurons die, the connection between neuronal death and the plaques and tangles, and where the plaques and tangles are coming from is all presently unknown.
In 1906, he and Franz Nissl published “Histologic and Histopathologic Studies of the Cerebral Cortex.” Alzheimer also made contributions to the understanding of general paralysis, cerebral atherosclerosis, chronic alcoholism, acute syphilitic infections of the brain, tuberous sclerosis, and Huntington’s chorea.

Unfortunately, Alzheimer died at 51 years of age in 1915 of an infection of the heart. He is buried in Frankfurt, Germany, next to his wife.

Alzheimer’s major groundbreaking concept was that the clinical observations of a patient matched the anatomical findings. He showed that patients with Alzheimer’s dementia always had the tangles and plaques in their brains that scientists are still trying to understand today.

The major symptom of Alzheimer’s disease is memory impairment, and this is the symptom usually noticed first by friends and family of the patient. The Alzheimer’s Association (http://alz.org, 2009) has developed a checklist of ten signs for early detection. They are:

- Memory loss that disrupts daily life
- Challenges in planning or solving problems
- Difficulty completing familiar tasks
- Confusion with time or place
- Trouble understanding visual images and spatial relationships
- New problems with words in speaking or writing
- Misplacing things and losing the ability to retrace steps
- Decreased or poor judgment
- Withdrawal from work or social activities
- Changes in mood and personality

Of course, almost all people will have some of these symptoms in mild form as they get older and may not have Alzheimer’s. In addition, other illnesses, such as depression, can cause these symptoms. Therefore, a person with these symptoms needs to be evaluated by a physician to determine if treatable causes exist. Some treatable causes of these symptoms include:

1. Infections
   a. Meningitis
   b. Encephalitis
   c. Syphilis
   d. Lyme disease
2. Immune disorders
   a. Multiple sclerosis
   b. Leukemia
3. Endocrine abnormalities
   a. Hyper or hypo thyroidism
   b. Hypoglycemia
   c. Vitamin B-12 deficiency
   d. Blood electrolyte disorders
4. Medication side effects
   a. Any sedating drug
   b. Drug interactions
5. Chronic alcoholism
6. Heavy metal poisoning
7. Brain tumor
8. Circulatory problems (Staff, 2011).

There is no cure for Alzheimer’s disease. There are some medications that slow the loss of memory, but they do not slow the loss of neurons. Doctors can also treat some of the symptoms, such as insomnia, depression, and behavioral changes.

Dr. Alzheimer met August Deter over 100 years ago, and not much has changed in the knowledge about, and the treatment of the disease. Indeed, while research is ongoing, the main call for “the next ten years...(is for) major advances in early detection as well as in therapy and comprehensive care” (Hampel, Prvulovic, & al.,
Despite 100 years of work, there is still a lot of work to do to understand and treat this dreaded disease.

References


Suggested Reading

Click here to access a PDF of the Chapter 27 Presentation.

Click here to access a PDF of the Chapter 28 Presentation.

Learning Activities (Non-Graded)

Mastering Biology

In this unit, you will explore two major animal body systems, the nervous system and endocrine system. The function, structures, processes, and importance of each system will be considered.

You will access the Unit V Evolution Laboratory Assignment using the MasteringBiology link found on the Course Menu. The laboratory assignment consists of three steps, which include: a pre-test, activities and tutorials, and a post-test. These steps will support your learning of the Unit V content as well as explore the major themes and topics. The laboratory assignment will take several hours and can be completed over a few days.

- Step 1: Take a pre-test. Complete the 10 questions to assess your current knowledge and retention of the reading material.
- Step 2: Activities and Tutorials. Complete the activities and tutorials within MasteringBiology.
- Step 3: Take the post-test. Complete the 10 questions to assess your learning throughout this unit. Consider your achievement and determine if you need additional review.

Non-graded learning activities are provided to aid students in their course of study. This is a non-graded activity, so you do not have to submit it. If you have any questions, contact your instructor for further guidance and information.

Key Terms

1. Action potential
2. Autonomic nervous system
3. Axon
4. Central nervous system (CNS)
5. Endocrine gland
6. Homeostasis
7. Membrane potential
8. Midbrain
9. Neurotransmitter
10. Peripheral nervous system (PNS)
11. Reflex
12. Sensory neuron
13. Somatic nervous system
14. Steroid hormones
15. Synapse