Lab 7 Review: IMMUNOLOGY

Immunology- study of our protection against macromolecules and foreign bodies and our response to them

What are foreign invaders called? Pathogens- any disease causing organism

Many of us think of viruses and bacteria as the foreign invaders, but also includes protozoans and larger parasites

What is our 1st line of defense? Skin and secretions such as tears and saliva (non-specific)

If an invader gets past the skin, macrophage and neutrophils (wbc) engulf the invader (no need for antibodies-yet)

What is our 2nd line of defense? Specific (adaptive) immune system
-Responds to invaders by producing antibodies

What is an antibody? Soluble proteins that bind to specific antigens and help destroy the
pathogen
So what are antigens? A substance that initiates an immune response and ultimately reacts with the specific products made from an immune response

After our body sees a given pathogen, we have memory B and T cells that help to recognize the invaders and produce antibodies sooner than the 1st time the invader was in our system

Non-specific immunity	**specific immunity**
Antigen independent	antigen dependent
Immediate defense	lag time in defense
Not antigen specific	antigen specific

No memory cells produced
Some components may help in Specific immunity

memory cells produced
some components may help in non-specific immunity

Phagocytosis- surrounding and breaking down of foreign particles

Phagocytic cells- nuetrophils, macrophages, and monocytes
Function is to destroy invading bacteria cells

Immunogen-substance that induces a specific immune response

Lymphocytes- 1 type of white blood cell (which can be broken down into sub-types)

Humoral response-anti-body mediated response to invader,
Macrophage engulf invader and some digested pieces are displayed on the outside of the macrophage
The cells bind to these pieces and cause B cells to secrete antibodies
Plasma cells secrete antibody that binds to antigen and ultimately removes it from the body

B lymphocytes (plasma cells)- mature in bone marrow; secrete antibodies; need to be activated by T helper cells

Cell mediated response-cells attack foreign invaders; T cells recognize antigens on self-cells and T helper cells secrete cytokines and altered self cells are killed

T cells-mature in the thymus gland; responsible for the operations of cell-mediated immunity, involving the direct destruction of mutated or virally infected cells. In addition, they have other “helper” and “suppressor” roles.
They do not secrete antibodies (used for recognition)
Display receptors

Helper T cells-These cells enhance the development of antigen-stimulated B cells into antibody-secreting plasma cells, enhance the activity of cytotoxic and suppressor T cells, and activate macrophages. They do all these things, and more, by releasing chemicals, the by now well-known cytokines:

Suppressor T cells-once infection is under control, these cells turn off T and B cells

NK cells-natural killer cells that are not B or T cells. Ability to destroy invaders without prior exposure to anitgen

Factors influencing immunogenicity

-foreignness, size, chemical composition, physical form, degradability

Types of Antigens

-T-independent antigens-directly stimulate B cells to produce antibodies without the requirement for T cell help

-T-dependent antigens-cannot stimulate B cells to produce antibodies without T cell help

Antibody formation

-self vs non-self discrimination (acts normally against non-self)

-memory (ability to remember antigens)

-specificity (antibody acts only against specific antigens)

Lab 8 Review

FUNCTIONS OF THE BRAIN:

The **cerebrum** is divided into the **right and left hemispheres**. Each hemisphere has four “lobes” (or areas): **frontal** (solving problems, making decisions about appropriate behavior, planning), **parietal** (expressing thoughts and feelings), **temporal** (hearing, converting sensory information into memory), **occipital** (vision). The two hemispheres of the cerebrum engage in different activities: the **left hemisphere** accepts sensory information from the right eye and the right side of the body; it also controls the muscles on the right side of the body. The **right hemisphere** does the opposite. The two

hemispheres also take charge of different tasks: for instance, the left brain deals primarily with speech, reading, writing, math and logical problem-solving whereas the right brain controls spatial visualization, pattern and face recognition, creativity, and the ability to recognize and express emotions. If you are right handed you are left brain-dominant. The two sides communicate information through the **corpus collosum**. The corpus collosum is a critical bridge: the right brain allows you to recognize your best friend in a crowd, and the left brain allows you to say her name. Some people have damaged a corpus collosum, or have had them surgically cut to curb the symptoms of epilepsy. In experiments where a familiar face is displayed to such a person's right field of vision, the patient will not be able to recognize the face (because the sensory information goes to the left brain only) and might only be able to say something like "woman" or "man". When the face is displayed to the person's left field of vision, they can recognize the face, but not speak or write the person's name.

FUNCTIONS OF THE EAR:

The visible structure of the ear, the **pinna**, collects sound waves from the environment, and channels them down the auditory **canal** to the **eardrum** (also called **tympanic membrane**). Sound waves cause the ear drum to vibrate, which moves a delicate hinge mechanism made of three tiny bones: the **hammer, anvil,** and **stirrup**. These three bones and the **auditory tube** (equalizes air pressure by connecting the middle ear with the throat: it's what "pops" in a plane ride or driving up a mountain) evolved from bones originally associated with the gill arches of fishes and make up what is called the "middle ear." When the hinge made of the 3 bones jiggles back and forth it pushes on the thin surface of the **oval window**. Behind the oval window is *liquid*: at this point sound waves in air are transformed to fluid waves. The fluid waves pass through the spiral **cochlea**, which is lined with tiny **hair cells**. The hair cells move in the current (just like seaweed in waves), which excites neurons located at their bases. Nerve impulses travel from here to the **cochlear nerve** and on to the brain, where they are ultimately interpreted as voices, music, noise, etc. A similar arrangement of hair cells are located in the **semicircular canals**: the difference is that here the movement of liquid on these hair cells helps your brain tell up from down. (Spinning makes you dizzy because agitated waves in the semicircular canals trigger many hair cells at once-- which disturbs your sense of equilibrium).

BE ABLE TO DISCUSS HOW 1) WAVES IN AIR TURN INTO 2) MECHANICAL ENERGY AND THEN 3) WAVES IN LIQUID. WHAT ARE THE SENSORY RECEPTORS IN THE EAR?

Lab 9 Review

Lab #9: Animal Behavior Pages C59-C64

Key words and concepts from introduction

This lab builds on the concept of sensory reception (receiving stimuli) and motor response (responding to the stimuli) we discussed in the nervous system lab.

Behavior = any animal's response to a stimuli or set of stimuli. Behaviors can be simple (move away from light) or complex (a mating ritual). Examples of stimuli include a change in climate (heat, dark, rain), the presence of another animal, a smell (food? another animal?), a sound…. there is an infinite variety of stimuli that animals might respond to!

Innate Behavior Behavior that is genetically determined… animals are born with innate behaviors and thus can engage in them from day one, or innate behaviors are triggered by hormones (i.e. puberty). Instincts fall under the innate category. Examples of innate behaviors include:

1. reflexes (pulling hand from hot burner)
2. eat food when hungry, hunt or graze
3. make sounds

There are *many many* examples of innate behavior: things you do without ever having to be told how to do it or witnessing someone else doing it.

Learned Behavior Behavior that is the product of experience: good examples would be a behavior that is acquired through trial and error or that is acquired by watching others. Examples include:

1. not touching a hot burner

2. using a tool to help you hunt (i.e. chimps or birds can teach each other to use twigs to catch ants); avoiding plants that will make you sick, octopus opening jar with food in it after observing people do it
3. using a language (English versus French); baby birds learn courtship and territorial songs by listening to adults

Innate and learned behaviors are often intertwined. Kittens know how to eat and will catch things to eat without instruction (*innate behavior*), but kittens also learn particular hunting techniques from their mother that will make them more successful… or they may discover a new hunting technique that is successful and will then continue to use it (*learned behavior*).

The examples above should illustrate how difficult it can be to tease apart the role of *nature* (genes, innate behavior) and *nurture* (experience, learned behavior) in the behavior of people and other animals. It is probably obvious that there is variation among individuals based on different experiences (learned behavior) but there is also variation among individuals based on genetics (innate behavior). Am I a shy person because of my genes or because of my experiences? Perhaps both!

Examples of ubiquitous (commonplace) behaviors in animals
Courtship, aggression, submission (we will observe all three in class)

Agonistic behavior may be innate or learned: Agonistic behaviors are any behaviors that are threatening (aggression) or that are ways to avoid threats (submission or running away). Basically, agonistic behaviors occur when the question is asked" "Who is the boss?" These kinds of behaviors are like two sides to the same coin, and you cannot have one without the other (see territoriality discussion below).

Aggression→ behaviors that communicate dominance. ("I am the boss!")
Examples are often similar in many species… think about how people, dogs, crickets and fish do the following when they are being threatening:

Make self look big and imposing

Orient head-to-head with adversary, direct eye contact

Make loud noises

Submission→ behaviors that communicate subordinance ("OK, you're the boss!"). These behaviors are designed to demonstrate that you are NOT a threat… again, people, dogs, crickets and fish all do the following:

Make self small (crouching, laying down, lowering head)

Orient to the side, avoid eye contact

Stay very quiet

Territoriality Animals will engage in aggressive behavior when they are defending a territory. Territories are areas where an animal makes use of resources: breeding, food, water, shelter, nesting materials, etc. Animals squabble over these resources and try to establish ownership because without resources animals will die. However, being able to indicate that you are submitting to the dominance of another animal is critical… in every fight, someone must back down. Otherwise, fights might end in mortal injuries for both parties and neither would survive to reproduce. Knowing when to back down means you survive another day to potentially reproduce: fighting to the death or until you are injured is NEVER an advantage because it reduces your reproductive capacity!

You should learn to recognize:

Males vs. females: ovipositer is on female. Both males and females have cerci.

stridulation (know all three types!): notice that only the male stridulates. Stridulation is made by rubbing the scraper (one pointy bump) of one wing across the file (long bumpy vein) of the other wing. (This is like a guitar pick strumming strings). Would you expect females have a file and scraper?

antennation, grooming, examples of submissive behaviors, examples of aggressive behaviors, cerci,

ovipositor structure that the female cricket uses to lay eggs under the soil

tympanic membrane: a membrane on each foreleg that allows the cricket to hear noises (it works like an eardrum). Consider the three kinds of stridulation and what each kind is communicating …. now: do you expect that both males and females have tympanic membranes, or does just one gender have tympanic membranes?

You should learn to interpret a data sheet of behavior observations. Tally up observations that indicate: relaxation, aggression, submission, courtship. Your crickets may have shown repeated confrontations or just one.

Answer questions pages C62-C63!!!!!!