**Questions from the class generated after the spiderweb discussion on 10/24:**

1. Does cell communication play a role in autoimmune disease?

Yes! The body sends signals for the cells of the immune system to respond to things in the body that they actually should not be responding to, so a cascade of immune responses is set off by the cells incorrectly responding to things in the body.

1. How does cell communication differ between eukaryotes and prokaryotes?

Cell communication between euks and proks involve the same type of mechanisms, but a multicellular eukaryote will use it to coordinate the system as a whole and the unicellular organisms will use it to communication between them, like with the bacteria, to coordinate something like a virulence attack. Both may use phosphorylation cascades to transduce signals.

1. How does the receptor protein get back to the cell membrane after receptor mediated endocytosis?

The receptor will separate from the ligands inside the vesicle inside the cell, and the vesicle will deliver the receptors back to the membrane for recycling in a separate vesicle.

1. Can a cell ever not contain any receptors?

Not that I am aware of! The cell would not be able to respond to anything.

1. If something goes wrong along the pathways, will the cell try to overcompensate and produce more ligands?

Other cells might…like in the case of diabetes and feedback loops. If blood sugar is not being properly taken up by cells due to a resistance to insulin at the target cells receptors, then the high levels of sugar will induce the pancreas to release more insulin, which is a hormone. But, it won’t really matter, because the cells can’t respond anyways because there is a problem with the ligand (the insulin) binding to the receptor.

1. What happens when a receptor turns off? Does every activity in the cell have a ligand and receptor for it to occur?

Every activity is the result of something. Actions are only elicited when stimulated! Most of these involve a signal sent by another cell or within the cell itself, and the resulting pathways that influence the molecules in the pathway cause a response.

1. Does the signaling pathway change the shape permanently? No. It has an active and inactive state. It will revert to its inactive state when the ligand dissociates from it.
2. What are ligands made of? Only hormones?

There a number of different ligands used by the body. Some are hormones, either protein or steroid, some are neurotransmitters, growth factors, extracellular matrix components, cytokines, and other chemicals. So, basically, there are a LOT of ligands… so many that they are broken up into families!

1. Can receptors be inhibited?

Absolutely! It is the basis of a lot of pharmaceutical research and drug development. Receptors can also be inhibited by endogenous (things made inside the body) or exogenous (made outside the body) chemicals.

1. How does “cross-talk” work?

Cross-talk is when one or more component of one signal pathways affects another. This is most commonly achieved when proteins of one signaling cascade affects another signaling cascade because they both involve the same protein.

1. What are some of the most important ligands our body uses?

Steroid hormones are a very important class of hormones, but really all of the ligands are important for coordinating response and regulation throughout the body. See question #8 above.

1. Do cells signal for your heart to beat?

Your heart beat is actually controlled by a chemical signal and automaticity, which is electrical regulation which heart cells are capable of. However, there are ligands that can bind that will increase your heart rate, such as epinephrine (adrenaline) which leads to increased heart rate via a cell signaling pathway that leads to relaxation of smooth muscle tissue and an increase in heart rate, or chemicals that can set of a signaling cascade that leads to the opposite, causing heart rate to decrease.

1. What is the most common kind of cell signaling, one in close proximity or far?

Both are very common and used for different regulation and response within a multicellular organism.

1. Why do only animal cells, and not plant, have local regulators?

Plant cells DO have local regulators, the cells are just connected to each other differently than animal cells. Plan cells are connected through plasmodesmata, so the local regulators will actually from directly from one plant’s cytoplasm into the cytoplasm of the adjacent cell.

1. A G-protein is a “coupled” receptor…what does that mean?

It means that it works in conjunction with a G protein. There is an actual receptor protein which receives the ligand and so thus has an extracellular component, and a G protein, which is intracellular, which is activated when a ligand binds to the receptor portion.

1. What is Camp’s function in cell signaling?

Camp is a secondary messenger.

1. Can medicine act as an inhibitor for receptor proteins? Competitive/non-competitive?

Yes! Many medicines and pharmaceuticals are designed specifically to inhibit certain ligands, thus affecting the signaling pathways they are associated with that lead to the diseased state. They can be either competitive or non-competitive.

1. If we can find a way to change the signal for cancer cells to divide, can we cure cancer?

Yes! And that is what cancer research is often focused on…the challenge is that there are many different mutations that lead to cancer, and many different steps in the cell division cascade, so where a drug might work to treat cell division (and cancer) in one type in one person, it may not be effective in another person/type.

1. Do the 3 main types of membrane receptors use ATP?

Not during the binding process, but phosphorylation involves ATP so ATP is usually involved in the cascade, just not at the receptor/ligand binding itself. Tyrosine Kinases do directly use ATP as they are phosphorylated after dimerization, but not all receptors directly use ATP.

1. What happens to the ligand after the signal is received?

It will dissociate and either become degraded, taken into the cell (as in endocytosis) or reuptaken by the cell that secreted it.

1. What are some diseases that interfere with cell signaling?

You will see during the cell signaling projects!

1. Do some receptors work to activate/start more than 1 cell activity?

Indirectly they can through cross talk and integration with other cell signaling cascades.

1. How often are steps messed up?

Amazingly, not that often, unless there is something causing a misinterpretation by the cell like a mutated chemical or an exogenous chemical interfering with the pathway.

1. What if a cell misinterprets a command then it keeps making other cells perform that command?

Disease!!

1. What happens if one type of cell wants to signal to a different type of cell?

It secretes a chemical messenger that can be used as a ligand by the target cell.

1. How come there are not that many health-related issues [stemming] from cell communication?

Oh but there are!

1. Are hormones specific or do they go to the entire body?

They travel in the blood stream but will only effect the cells that have receptors for those ligands.

1. Do cells change ligands produced throughout their lives?

Sometimes as a result of ageing cells behave differently, but for the most part, cells behave the way they do because they have certain genes turned on/off in them that MAKE them the cells that they are. As a result of this, they behave in certain ways and produce certain chemicals and have certain signaling cascades because of the type of cell that they are.

1. Do viruses/bacteria create inhibitors or ligands to set off an adverse reaction in the body or stop an essential process in their hosts?

Yes, they can create things that interfere with signaling pathways in the body and can wreak havoc on the body’s ability to regulate!

1. How did each cell develop its own signal unmatched by any other?

Cells behave the way they do because they have certain genes turned on/off in them that MAKE them the cells that they are. As a result of this, they behave in certain ways and produce certain chemicals and have certain signaling cascades because of the type of cell that they are. Evolution selects for energy efficiency and these signaling pathways have evolved to meet the needs of the organism.

1. How are chemical messages formed?

By cells (they make them) or by something that is taken into the body exogenously (like a drug or chemical).

1. Do ligands correspond with a DNA sequence?

If they are protein hormones, then their sequence is encoded in the DNA of the cell that makes them. The ability of different cells to make different ligands is a factor of those cells being differentiated as the type of cells they are, which is a result of specific genes (and thus DNA) being turned off/on in those cells.

1. Where are ligands made?

By cells (they make them) or by something that is taken into the body exogenously (like a drug or chemical).

1. How do signals find the right cells?

Because they travel in the blood stream (or lymphatic system) to the cells that have a right receptors.

1. Are receptors’ shapes changed permanently?

They have an active and inactive state, so they can revert back to the inactive state after the ligand dissociates from it.