>> Deb Feickert: Okay, let me just do something fairly quickly. I think this view is very strange. We don't want this view. We don't – we want the – we want a presenter view, so let me check that out for you.

[Clicking Sounds]

There we go. All right, so our topic today, "The Skin". And I'm just going to open my chat back up so I can see that. And I mentioned to all of you already that how important your skin is; you need to take care of your skin. And here's why. Since we're moving through today, let's start with some general information about the skin. So the skin – we said this when we were talking about the tissues, that one of the specializations with epithelium are membranes. And we gave some information in a lot of detail about serous membranes and mucous membranes. We also have something called a "subcutaneous membrane", which is our skin, and that we were going to spend a whole lecture on it; and here we are. So that word "subcutaneous" is the Latin word for "skin". That's why it's also called a "cutaneous membrane". And it is the largest organ of the body. Sorry, I'm going to take myself out of the screen. It is the largest organ of the body by weight and surface area. We would also call the group of structures, including the skin, the "integumentary system". And "integument" is the Latin word for "covering". So this is the covering of our body, right? So we're going to talk about the skin first, and then accessory structures in the skin that together make up the system called the "integumentary system". So we're going to start with layers. And we have three general – this is a very important word, right, "general" skin layers, called the "epidermis", "dermis", "hypodermis". "Epi" means "on top of"; so the epidermis is on top of the dermis. And it is the superficial most skin layer. So if it's superficial most, that is – that's layer that's exposed to our outside environment, the air all around us. Then deep to the epidermis is what we call the "dermis". And that is – the word "dermis" means "true skin". "Hypo" always means "under". So under the dermis is the hypodermis, also called the "sub", right, under "cutaneous", which we already defined as the skin; subcutaneous layer. These two terms are interchangeable. This layer is deep to the dermis. And I would also say, just as an aside, that when we're talking about the skin in many textbooks, other places that you might find information, the epidermis and dermis are often discussed only as layers of the skin, and hypodermis is a layer deep to the skin. We're going to just name all three layers as three skin layers. Now, each of these, epidermis and dermis – again, these are general terms, they then have sublayers that you need to know and love. We're going to be using this diagram throughout the day. And we'll come back to it time and again because it's an excellent diagram of the skin. This is from your textbook. It's reference for those of you that have it in your lecture outline. So what we're going to look at today in this order – here is – here's the outside of my skin. So here is the superficial most upper layer, the epidermis, following by deep to it the dermis, and deep to that the hypodermis. So as we're looking at these layers and these structures today, we'll come back to this diagram to point those structures out. So let's start with the epidermis, the superficial most layer. Here's what we're going to see. We said

early on that we have been learning tissues. We've had two lectures on tissues; we've have two labs on tissues. But we are not finishing with tissues after that. Every, every, every, every, every system we talk about we're going to identify tissues that make up the structures in that system. The epidermis of the skin is composed of stratified squamous over cuboidal epithelium. So what that means is I'm going to have – what we know what stratified squamous epithelium is, it's layers. So I'm going to layers, my layers of stratified squamous epidermis, and then the very bottom layer, the deepest layer of the epidermis is going to be simple cuboidal epithelium. So we have [inaudible] like this. The epidermis is composed of stratified squamous over cuboidal epithelium. Know it, know it, know it. When we are looking at tissues, it's because I'm going to ask you about it. So please know it. What else is happening at the epidermis? Seems kind of weird because if I cut myself, if I cut my skin, I bleed. But the blood vessels are not in this top layer called the "epidermis". We're going to encounter blood vessels again in the dermis layer. But there aren't blood vessels in the epidermis; very few nerves. Does it hurt when I cut my skin, of course. But the nerves are also going to be found in the dermis layer, not the epidermis layer. We have – you've heard – right, you've heard this before, "That person's very thick-skinned." There really is such a thing as thick skin. So we can have thick skin or thin skin. And here is the difference. We are going to have an extra layer of the epidermis in those areas of the body where we would find what's called "thick skin". And those areas are the plantar, right, bottom, surface of the feet, the palms, palmer surface of the hands, the surface on the toes and fingers. So in those areas of my body that are in constant contact with the environment, where there's constant abrasion happening, I'm going to have an extra layer of skin. And so we'll identify it in just a moment. The other thing that we're looking at then is how many layers are there in the epidermis? Depends on where we're talking about. If we're talking about these areas, these thick skin areas, there are five layers. Every place else there are going to be four layers of skin. So again, we'll identify that extra layer as we encounter each of the layers of the epidermis. The topmost superficial most layer; okay here's where we need to know specifically the names of the epidermis layers. We need to know their names. We need to know their location one to the other. We need to know what – if there are any specialized structures or cells perhaps in the layer, and what is the primary job of that layer. Because why do I have all these layers? Each of the layers has its own specific function. Otherwise, we wouldn't need all those layers. So we have the topmost superficial most layer of the epidermis, the layer that is in direct contact with the environment, is call the "stratum corneum". So the word "stratum" – we've seen it before, "stratum" "stratus" means "layer"; so the corneum layer, stratum corneum. Here's what's happening in the stratum corneum. This is that layer – and we've seen it in lab. When we look at stratified squamous epithelium, we know that the outermost layers, the layers that are open to the outside of the body, are already dead; they're dehydrated. This is all – this epidermal layer is stratified squamous epithelium so they're squamous cells that are fluffy, that is flaking off the surface of the body. So this layer, dead, dehydrated squamous cells in the

stratum corneum. It's about 15 to 30 layers of this stratified squamous epithelium. And they're constantly being shed as dead dehydrated cells. And I'm in our discussion today going to underline for you the functions of each layer. So if you have a highlighter handy, or just want to underline it yourself – well it's already underlined [inaudible] but maybe highlight, "Why do I have these 15 to 30 layers of dead cells?" These are protecting me against debrasion, right, that constant rubbing against my skin. So I don't want live cells being damaged. So I've got this top most layer that's protecting me from this constant rubbing against my skin, the stratum corneum. The layer deep to the stratum corneum – and remember, these are all part of the epidermis. So the layer deep to the stratum corneum is called the "stratum lucidum". The stratum lucidum is composed – still squamous, because what did we say, the epidermis is stratified squamous epithelium over a layer of simple cuboidal. So we – until we get to the bottom most layer of the epidermis, everything's going to be stratified squamous. So the stratum lucidum is a group of clear squamous cells that are filled with a protein called "keratin". "Keratin", we're going to see this word a lot today, because this protein, keratin, is a structural protein that helps to prevent from breaking. So it's a very strong protein; gives structural support. So these clear squamous cells filled keratin are the extra layer in thick skin. So in my, right, soles of my feet, the plantar surface of my feet, the palmer surface of my hand, my fingertips, my toe tips, I have this extra layer called "stratum lucidum". These cells are filled with keratin. Why; what are they there for, because I have this – even more contact with the environment. These cells help to reduce friction in those areas, right, that constant rubbing, constant rubbing, we don't want them filled up with heat, and so these clear keratin-filled cells help to reduce friction in those areas of the body where I have thick skin. Deep to the stratum lucidum, still epidermis, still epidermis, stratum granulosum. The stratum granulosum then, it's this layer where – remember what we said here, these are all dead dehydrated squamous cells. This is where the nuclei start to disintegrate and cells begin dying. Because what do we know about the nucleus; the nucleus directs all of the actions of the cells. So when the nuclei start to disintegrate, all of the other organelles will start to disintegrate, then the cells begin to die. So the stratum granulosum, because of that, because of this disintegration, the cells in this area look like they have these little teeny tiny spots in them, little grains; because everything inside the cell is breaking apart. One of the things that has been released as these nuclei and other membranous organelles break down is that the lipids that make up the membranes around the organelles are released. And then the cell itself becomes coated in lipid. And lipid is water-tight. So this layer when the nuclei disintegrate and the cells start to die forms a water-tight barrier because of lipids that have been released as the cell begins to die; stratum granulosum. Still epidermis. Deep to the stratum granulosum is the stratum spinosum. And so this word comes from the look of these cells. They look like they have sharp little spiny edges. And they have little sharp – they look like they have little sharp spiny edges because they have protein fibers that are extending from one cell to the other that are locking and hooking the cells together. And they – that's forming –

and again, a very tight interlocking barrier for structural support. So this is giving my epidermis structural support. The cells again that we're seeing in here are called "keratinocytes", keratinocytes that are producing great amounts of protein. And in this case the protein fibers are these little protein fibers that makes it look like it has little sharp edges along the outside of the cell that are connecting each other. Within the stratum spinosum is a specialized group of cells. So we've said that all of the epidermis is stratified squamous epithelium over simple cuboidal epithelium. Interspersed in some of these layers are some specialized cells. And in the stratum spinosum, the specialized cells are called "Langerhans cells". And the Langerhans cells are immune cells. They are going to initiate a response if we have any pathogens that have actually made their way through the top three layers of the epidermis, and attack and engulf these pathogens. But the other amazing thing about Langerhans cells is that they will also detect if our own cells, our own epidermal cells, undergo a mutation and start to grow uncontrollably; and that's called "cancer". So we have some cells in our skin because our skin is so exposed all the time to the elements it's very susceptible, and because it's epidermis and it's constantly replenishing itself, very, very susceptible to mutations and the possible development of those mutations into cancer. And so these cells are our own immune system cells, directly in our skin in our epidermis to help to combat that very early on. Amazing. The deepest epidermal layer is the stratum germinativum, also called "stratum basale". Either of those are correct. It doesn't matter what you might say, just spell it correctly. So "stratum germinativum" means the "growing layer germinating"; "basal" it means "basement", or "bottom". So that's why it's called either of those things; "germinate", right, to "grow" or "develop". So the stratum germinativum, finally, is that single layer of cuboidal cells. Because at the beginning we said the epidermis is composed of stratified squamous over cuboidal epithelium. So the simple cuboidal epithelium, one layer of cuboidal epithelium, is making up this bottom layer of the epidermis. These are actively dividing. They are the stem cells of the epidermis. They're constantly replacing those superficial layers that lie above it. How's that happening? They undergo mitosis. They are growing then and developing from underneath the other layers. And as the new cuboidal cells undergo mitosis, they push the layers that were developed first above. We have a couple of other new cells, specialized cells, within the stratum germinativum. Along with the cuboidal cells interspersed we'll find melanocytes. And melanocytes are going to form and distribute the pigment; the primary pigment. There are the pigments in our skin, primarily keratin; but the primary pigment in our skin, melanin. So this is where the cells that produce the pigment for our skin are found. They then – as they produce this melanin, it is moved into vesicles that can wander through the skin layers and give our skin its coloration. Another specialized cell in the stratum germinativum is called – are called "Merkel cells". And these particular cells are very sensitive to touch. So what happens is when someone touches our skin – when we touch our skin. Touch your skin. What happens is that mechanical pressure, that compression of a finger against our skin releases a chemical in our Merkel cells – so that chemical that – mechanical pressure

releases a chemical in the Merkel cells that in turn stimulates the sensory nerve endings in our dermis layer, and then we feel the sensation of touch. So cool. Those are the five layers of the epidermis. So here's a microphotograph. Here are the layers that we just discussed, superficial stratum corneum, the – very thin, the stratum lucidum. It's anywhere only from three to five layers, then the stratum granulosum – you can see the kind of granular look inside of these squamous cells, and the spinosum layer, which is kind of irregularly layered, as we're looking here, and the dendritic cell. A dendritic cell is the same thing. It's a [inaudible] cell. And then finally, this single stratum basale, this bottom layer that has the Merkel cells and the melanocytes. So very cool, very cool, very cool, excellent diagram of the epidermis. Deep to the epidermis then is that next layer of the skin called the "dermis". And the dermis is composed, not of epithelium, but connective tissue. And so it's a very thick layer. And it can – this is where we're going to find blood vessels, nerve receptors, and our specialized structures that we'll be discussing here in just a few minutes; things like our hair follicles and sebaceous glands. So we have two layers. And the topmost layer, the uppermost layer of the dermis, that is the layer directly deep to the stratum basale, is called the "papillary layer". So the papillary layer now is – what do we say, the dermis is composed of connective tissue. Now we're going to be specific. Be specific, be specific, be, be specific, that's good, okay; areolar connective tissue. So we said this before; let's say it again. Whenever we're connecting two structures, two layers anywhere in the body, most likely the tissue connecting the two layers, or tissues, or structures is going to be areolar connective tissue. So in this case, the papillary layer, areolar connective tissue, is connecting the stratum basale above it, and thus the entire epidermis to the second dermis layer that's deep to it, holding them together. So here's the other thing. We're almost always going to see this as well. When we have areolar connective tissue that's connecting different layers, different structures, we're going to see blood capillaries and nerves running through that areolar connective tissue. So the papillary layer is not smooth, it's not straight. It has a lot of bumps in it, which are called "contours"; right, hills and valleys. And these bumps, these contours determine – and are called "friction ridges" that at the skin surface are, what, causes out fingerprints. So those friction ridges, these contours of the papillary layer, are what at the surface of the skin we would see as our fingerprints. What do I know about areolar connective tissue; it has two types of protein fibers. Review. The two types of protein fibers in areolar connective tissue are collagen and elastin. And the collagen fibers are somewhat bundled together in the areolar connective tissue in the papillary layer of the dermis, and they go from the papillary layer and extend into the next layer deep to it, which is called the "reticular layer"; so that those collagen fibers extend from the papillary layer into the reticular layer. What did we say; because the areolar connective tissue is connecting structures' layers. So it helps to connect the layers. The dermis is composed of two layers only. So whereas the epidermis was four or five layers, depending on if we were talking about thin or thick skin, the dermis is composed of these two layers, papillary and reticular. We've seen this word "reticular" before. Remember that "reticular" – the word

“reticulum” means “net;”net-like“. So the reticular layer is now dense irregular connective tissue. Now, when we talked about dense irregular connective tissue and we talked about histology, we said one of the places we’re going to find dense irregular connective tissue is in the dermis of the skin; and now, here it is. And so an irregular connective tissue, dense irregular, that word”irregular" means the arrangement of the collagen fibers. They are interlocking; they’re not in any particular kind of pattern. When I have interlocking fibers and they – and again, review, the arrangement of protein fibers in connective tissue gives the tissue its functions. So dense irregular connective tissue with the irregularly patterned collagen fibers give the dermis strength, structural support, and flexibility. So this is the layer that if you take your hand right now and kind of rub your hand on the skin of your forearm back and forth, and back and forth, and up and down, your skin is not tearing. Your skin is not tearing because these fibers all run in different directions, and it can take the stress from all of those directions as it’s being pushed and pulled; structural support, flexibility. Remember, collagen fibers can bend and then retain their original shape. So if I am kind of pulling on my skin back and forth and around and around, those fibers aren’t going to break, they’re going to bend and then go back to their original shape. Now, let’s just say this; that happens for the younger part of your life. [Sighs] But as you get older, those fibroblasts don’t work so well anymore, and they don’t lay down as many collagen fibers, and then you start to lose some of that elasticity in your skin. That’s what happens when you get sun damage or wrinkles, right, we start to break down the fibrocytes. The fibrocytes can’t make collagen fibers. And then you get wrinkles; you get some sun damage. What the heck? Okay, okay, I’m Okay. All right. Dermis; so here’s what we’re seeing. We’ve got our epidermis. We had our stratified squamous, stratified squamous, stratified squamous, epithelium, until the bottommost later, simple cuboidal epithelium. Then we have our dermis. Deep to that first the papillary layer, areolar connective tissue, and then the reticular layer, dense irregular connective tissue. Lastly, hypodermis, subcutaneous layer; again, you will see in some resources that you read that just the epidermis and dermis are actual skin layers. We’re going to talk about the hypodermis as a skin layer, even though it’s under the dermis. So the subcutaneous layer is composed now of both areolar and adipose connective tissue. Does that make sense; yes, because now I have to connect the reticular layer to the next layer of tissue underneath the hypodermis. So I’ve got a layer of areolar connective tissue that’s going to do that. But I also have – and we notice about ourselves, we – and this is called – this adipose connective tissue is subcutaneous fat. We have a layer of fat underneath the dermis; subcutaneous. So whenever we see adipose – we’ve talked about it before – what’s it doing there, storing energy; storing energy for a rainy day, okay, so energy storage. But here’s what it also does under the skin in the subcutaneous layer, the hypodermis. It also is going to provide some insulation against the cold. So it is going to have some sort of thermoregulation properties that we’ll talk about in a bit. And of course, the areolar portion, areolar connective tissue portion of the hypodermis, is going to connect the dermis to underlying muscle; so some reasons for having that

areolar and adipose connective tissue in a hypodermis. All right, so here are accessory structures in the skin that you already know about. Let's talk about what they're there for, why they're important, what their functions are. So I'm going to make the statement that I'm going to show with the – our same diagram to explain it. So these accessory structures are located in the dermis, but they're – they originate from the epidermis. And I'm going to show you what that means in just a minute. So they're embedded in the dermis, but they arise from the epidermis. I'm going to show – I'll show you the diagram in a second to show you that. So here's what we're talking about before we move on. Here's my epidermis; here's my dermis. Here's my simple cuboidal epithelium layer. And here's what I mean by "epidermal in origin". Here's the hair and its hair follicle. Here are some glands that we see in the dermis layer. And even though they're located in the dermis, if we follow the simple cuboidal layer, we see that oh, in fact, there's my simple cuboidal epithelium layer; right, these are sebaceous glands. And so the structures are found in the dermis, but they started off, and arose from, and grew from the stem cells, the cuboidal cells of the epidermis. Love it. Okay, now let's talk about your nails. What are they? There it is again, keratin. You know that our nails are protein. And so there's that keratin again, that protective structural protein. It helps prevent tearing and breaking. So the – your nails are plates of flat epidermal cells that are filled with keratin. Why are they there? They protect your fingertips and your toe tips. So side note – I'll wait for you to finish whatever you're writing there. Side note; when I ask you a function – for the rest of the semester, when you're asked to write a function, almost never – and I'll give you a couple of exceptions, and I'll tell when the exceptions are coming, should you write one word. So if I were to ask you on Tuesday's test, "Name one function of the nails," if you would just write the word "protection", that's only half credit. Because that doesn't tell me much, this word "protection". I need you to tell me protects for what, or protects in other cases from what. So I'm telling you this the first time. I will say this to you multiple times. Because on your test, you're going to write "protection", and you're only going to get partial credit. Start now with writing – with functions it's almost always at least two words. So what could we say? We can make it simple and just say, "Protects fingertips." Protects toe tips." That is one function of the nails. Don't use one word. Don't just use a verb. Use a verb with a noun. This is a nail. [laughs] Okay, that's all, that's all. Okay. Your hair is a specialized structure in your skin. So what do we know? The hair follicle, which is the tube, right, and your hair are – here it is again, epithelium, keratinized filled with this protein keratin epithelium. So the follicles is the tube. Your hair – your actual hairs are actually tubes too. But this tube is inside of this tube; so hair follicle and hair keratinized epithelial tubes. And each hair – every hair follicle, every tube for every single hair – you have about 100,000 on your head – well some of you do. Like nothing personal but, you know, you've got 100,000 on your head. We lose about 50 a day. But every – about five million on our whole body, even though they're small; again, some of us more than others. And – sorry; and as you get older, they grow in really strange places like out of your chin, but whatever; okay. A hundred

thousand on the head, about five million on your whole body. And every single one has its own blood supply, its own sensory nerve, and its own arrector pili muscle; every single one. I'll show you a picture of this in a second. Why do we have hair? It protects us on our head against UV radiation. So what did I say just a moment ago; we don't just say it protects. What's one function of the hair. Don't say it protects; protects against what, UV radiation from the sun, right, directly shining on our head. Some of us have enough hair that the hair on our head could actually give us a little cushioning against blows to our head; little bit, right? And especially on our head. Not much else on the rest of our mammalian bodies insulates against cold. But certain relative – mammalian relatives of ours they would be covered with hair, and it would like absolutely insulates against cold. For us it's mostly on our head insulating against cold. Very important. So this is what it looks like. So here's the follicle, right? Here's the hair. They're both tubes; keratinized tubes. Here's its own blood supply. Right, at the root, has its own blood supply, has its own nerve endings, has its own arrector pili muscle. And we're going to talk about the arrector pili muscle in a second. It has its own special job. This helps with the helping to prevent cold thing. We'll talk about it in a second. But – well I just want to show it to you. I'll talk about it but I want to show it to you. What happens here? This little teeny tiny muscle will contract; because that's what muscles do, they contract, they shorten. When it shortens, it pulls on the follicle, which pulls down on the hair. And when it pulls down on the hair right up here, you get little bumps called what, yes little goose bumps. The little goose bumps help to somewhat keep your body warm, right? I don't have that many on – we don't have that many on our bodies. But in other mammalian bodies, that helps to cause their hair to stand on its end, brings air in-between the hairs, and that's insulating the body. Amazing. Well, the hair [inaudible] right there, that little muscle. So it helps to insulate and keep us warm. I know, Amy, it's so amazing. Okay; so this is what it looks like. The hair, we have some exocrine glands. We talked about exocrine glands already. We said exocrine glands are glands that have ducts that are passageways. So these are exocrine glands specifically of the skin; of the skin. So here they are. We have what are called "sudoriferous", also called "sweat". Know them both. Know them both. Know them both. You should know if I use this word in a test, "sudoriferous", that it means "sweat". It's an exocrine gland. Sweat glands have ducts to the surface of my skin. What do sweat glands produce; a secretion called "sweat". Why is sweat released? That's what "regulated" mean – "regulated by" means. When does sweat gets released? That's what this means, when and why does sweat get released? When there are temperature changes either inside or outside of my body, my body will – my sweat glands will produce sweat to be released. And psychological factors, right; boo, when you get scared sometimes you sweat. So psychological factors can cause you to sweat. And so why; why am I sweating? Function; here's one exception. I told you a moment ago I'll tell you when I'll make an exception to the function rule. If one word tells me both an action and what it acts on in one word, I can use that one word. And one of those words is "thermoregulation". I have the word "regulation" right in the word. Another

way to say that would be "regulates body temperature". But I can just say "thermoregulation". So this is an exception to using two words when you are giving – at least two words when you are giving a function. So sweat helps to regulate my body temperature, and it excretes some wastes; so it's a little bit of waste excretion by way of my sweat. Don't just say "excretion", excretes what, excretes waste. My other exocrine gland of the skin are sebaceous glands. And they product a material called "sebum". When is sebum released? How is it regulated? Sebum begins to be released at puberty when I also have the secretion sex hormones; or sebum, again, can be released when I am under stress. And so what does sebum do? What is its function? Sebum helps to lube. Sebum is an oily substance. We know this, right, our skin can feel oil, our hair can feel oily. And that's from the release of sebum from our sebaceous glands. So why; why do we have oil on our skin – [clears throat] excuse me, oil in our hair? It helps to lubricate our skin and hair, right, reduces friction. The word "lubrication" – write it to the side, means "reduces friction". So it helps to reduce friction. And sebum actually has an antibacterial property, so it will inhibit bacterial growth on my skin and on my hair. Because I'm going to be exposed to a lot of bacteria. I'm exposed. It's the environment. So my sebum helps to inhibit growth of bacteria on my skin and my hair. Love it. We didn't think we liked our oily hair and skin, but we really do. So what are we looking at, right? The sebaceous glands are directly attached to the hair follicles. And so sebum is release into the tube of the hair follicle. It makes its way to the surface of the skin at our hair. Our sweat glands, right, duct, duct, duct, duct, goose, are coming to the surface of the skin, releasing sweat, cooling the body. So let's finish the specific functions of the skin. We said thermoregulation. So we need to know specifically what structures, what layers of the skin thermoregulate. So what does "thermoregulation" mean; we're going to conserve heat, or we're going to release heat at the skin surface by way of either the little blood capillaries that are found in the dermis layer. When the blood capillaries and the dermis constrict – the word "vaso" means "vessel". When they constrict, that is they become – the lumen become smaller, they pull away from the surface of the skin, and they retain heat. When blood capillaries dilate, that is the lumen, the opening gets larger, they get closer to the skin, and that releases heat. Love it. The sweat glands; when they release sweat onto the surface of the skin and air moves over the sweat, that cools the body. And we said our hair can help insulate, and our arrector pili muscle contracting produces goose bumps, which pulls the hair up straight and, again, insulates. Three, three, three, and one more, adipose connective tissue in the hypodermis; we said insulates against cold. So we have lots of things happening for thermoregulation. Our skin has some kind of absorption properties. Absorption means it can actually – some things the skin can actually absorb from the surface. Now, this is limited. It doesn't absorb everything. And we don't want it to absorb everything. We don't want our skin to absorb water like a frog's skin will, because, you know, we would explode when we're in the pool or in the shower. But it does allow for some absorption. So the waxy sebum hair, right, prevents water-based items from being absorbed. The keratin layers prevents some water-based items from

being absorbed. But we do have some absorption of things like certain pain relievers. Right; now we know this, right, we can rub a pain reliever on our skin and it makes it feel better. Nicotine patch; I'm trying to quit smoking, and what do I do, I try a nicotine patch. It can absorb. Hormones can be absorbed through the skin. Dramamine, Ritalin; there are things that are if they are oil-based, they can be absorbed through the skin, right, so fat soluble drugs or medications. Hydro, water regulation; right, we've mentioned it several times. The skin guards against our uptake of water through the skin, or losing excessive amounts of water through the skin. Now, by way of the sweat glands, surely, we're losing water. We can lose up to, you know, about a pint of water a day, about 500 mils just by perspiration. And even if we don't feel like we're perspiring, we are. So that's why it's important that we continually be drinking water to replenish that. Protection of – right, did I just say "protection"; protects against bacteria. My skin protects against parasites. My skin protects against UV radiation. It protects against chemicals from the environment. It protects against friction and abrasion. We mentioned all of these in our discussion. And so some of the protection is a chemical barrier. Right, sebum is protecting us against bacteria, and parasites, and friction, and abrasion. Melanin is protecting us against UV radiation. Then we also have physical barrier protection. The stratum corneum protects against abrasion. The stratum lucidum protects against friction. Hair protects against kind of all of these things. Langerhans cells protects against bacteria. Fingernails protect against friction, abrasion. We mentioned all of these. Our skin has many sensory nerves and receptors in the dermis for detection of all types of what we call "sensory reception" in terms of general senses. We mentioned already touch; touch, pain, pressure, temperature. And in particular, when we talked about the specialized cells in the skin – they were called the "Merkel cells". And the stratum basale detect touch; that our skin has sensory receptors for all of the general senses. And lastly, our skin makes vitamin D. It makes vitamin D. Come on. So it does that. We have to have vitamin D to absorb calcium and phosphorus in the foods that we've eaten, but that doesn't happen with vitamin D. So what an amazing thing, our own skin makes vitamin D. It makes it from cholesterol that's stored in the cells; in our cells. And so when the sun hits our skin, it causes a reaction, so that the cholesterol in our skin undergoes a chemical reaction, and it produces vitamin D. So what do I know to finish up today? So what it's doing is this. It is not good to be out in the sun for great periods of time because we don't want to get skin cancer, but we do want a little bit of sun almost every day, because that's our – because our body needs sun to make vitamin D. So, so cool; so cool. All right, everyone, if you miss something, it's the – remember, I'm recording; you can always go back and check the podcast. And this podcast will be posted probably early tomorrow; sometime tomorrow. So it has to be captioned. All right, everyone, I'll see you in a bit; I'm seeing you in 30 minutes. I will see you in lab in about 30. Everyone else, here's the first time I'm going to say this to you, study, study, study, study, study. You're so welcome. And I'll see you on Monday or this afternoon. Bye, everybody.

>> Bye. Thank you.

>> Deb Feickert: You're so welcome.

>> Thank you.

>> Deb Feickert: You're welcome. Bye, everyone.

>> Thanks.

>> Deb Feickert: My pleasure.