

Transcript

Episode 125

The Pee Episode | Teaching Urinary & Renal Concepts

The A&P Professor Podcast

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Introduction

Kevin Patton (00:01):

The fiction author, Darynda Jones, put these words of love into the mouth of one of our characters. "You're the reason I get up in the morning. That, and I need to pee."

TAPP Orchestra (00:12):

[theme music]

Aileen Park (00:15):

Welcome to The A&P Professor, a few minutes to focus on teaching Human Anatomy and Physiology with a veteran educator and teaching mentor, your host, Kevin Patton.

TAPP Orchestra (00:24):

[theme music]

Kevin Patton (00:25):

In this episode, we talk about urine and about teaching renal function. You guessed it, it's The Pee Episode.

TAPP Orchestra (00:36):

[theme music]

Adventures With Tarzan

Kevin Patton (00:47):

Back in episode 121, which I called The Poop Episode, I told some stories from the olden days to help illustrate some points, mostly by analogy. Well, now here we are in The Pee Episode and well, I'm warning you, I'm going to be telling some stories about pee from the olden days. Here's the first one.

(01:15):

The first role when I first started as a zookeeper at the St. Louis Zoo was in the kitchen. That wasn't exactly what I had in mind as what I'd be doing as a zookeeper, but I learned a lot about food and nutrition. I learned how to coddle eggs and also how to boil them perfectly. I tasted every single food that we fed to the animals, even the mule worms and crickets. So now I know what those taste like, and actually they're not so bad. But I did not taste the mice, the rats, or the raw fish. I did nibble on a little bit of fresh hay and oat grains and all the dried chow pellets, the best of which was Dog Chow. Now I say it's the best, but it wasn't that great. But I tell you, it was way, way, way better than the worst of the pelleted animal foods, which was kind of a tie between rat chow and horse chow. I think rat chow probably edges out horse chow for the absolute worst. It kind of puts a bad taste in my mouth now just thinking about it.

(02:22):

Well, after a little while working there, my first mentor in animal handling, a supervisor named Wayne, told me that he felt bad that I hadn't worked with any animals yet, but a juvenile white-handed gibbon named Tarzan, who had been raised by humans but wasn't big enough yet to go into the exhibit with the adult apes, always enjoyed some company. So, "Hey Kevin, why not spend some breaks sitting and playing with him in his smaller enclosure?" So there was my first time. After a few minutes of gaining Tarzan's trust, which turned out to be pretty easy for me because Tarzan had only had very positive interactions with humans up to that point, and so that goofy ape just came over and sat on my lap and gave me a big warm hug, which is a really awesome experience with an animal with extra long, extra strong fore limbs meant for swinging from branch to branch, but now wrapping around me and giving me a hug. Of course, those same arms could snap my arm like a twig if he wanted to so I had to follow safety protocols.

(03:38):

And then you know what Tarzan did? He peed on me. Clearly his bladder had been full because I was soaked. Luckily, I didn't react by pushing him away or yelling at him or anything like that because well, that could have gone very badly for me and for Tarzan's future interactions with humans. Wayne laughed along with me. But when I said something about this being a less than auspicious beginning to my animal handling career, he kind of saved the moment, or at least tried to, by telling me that by peeing all over me Tarzan must feel really comfortable with me, that I used all of Wayne's tips on how to approach a wild animal, and that that process really did work, even if I did end up getting soaked with pee.

(04:37):

You know what? I didn't believe that thing about Tarzan peeing because he liked me. I didn't believe it then and I don't believe that now, but I did learn that by trying to make me feel good about my messy, smelly experience and pointing out what I did correctly, Wayne gave me a great insight about a teacher being empathetic and compassionate with any student who runs into a mess, and this was a mess. I also learned that I should always have an extra clean, zookeeper uniform ready to wear in my locker. To this day, I often keep an extra set of clothes in my car and in any office or lab that I use because one never knows when one is going to get peed on.

(05:30):

By the way, Tarzan and I spent most of my breaks and lunchtimes together and we got to be pretty close, and thankfully he never peed on me again.

(05:42):

When I have time, I do tell this story to my students and then I tell them, "Hey, as you read that urinary chapter before coming to class, I know that you felt overwhelmed and confused. Making pee is more complicated than it seems like it ought to be. Right? It's a mess, isn't it? Well, that's okay. I'll be Wayne, I'll walk you through this and show you how it works. And I'll also tell you all the parts you don't really need to remember," and I'll try to do that in this episode too, try to make you feel good about getting peed on by a smelly ape who acts friendly but then pisses all over your great days' adventure, or more literally for this episode, I'll help us get us through some discussions of teaching urinary structure and function without feeling like it's just too big a mess to really handle artfully and effectively.

TAPP Orchestra (06:46):

[music]

Making Heads or Tails or Loops

Kevin Patton (06:51):

You might be thinking, "Kevin is assuming that every listener has some kind of trouble, or trepidation, or timidity in teaching renal structure and function." Yeah, fair point. Or is it? It turns out that I did a study years ago when I chaired the task force that created HAPS Institute. Our original mission was to provide courses for A&P instructors on topics that are hard to understand, hard to learn, and hard to teach. And we asked ourselves, what should our first courses be? What are the hardest things to understand, learn and

teach in A&P? And all the task force members said renal A&P, along with a couple of others like neuroanatomy and respiratory physiology. But we did our due diligence and I put out a survey of A&P faculty back in 2006 where I asked that question of 401 A&P instructors, and it was confirmed renal, neuro, respiratory, and the science of teaching and learning all rated at the top of that list all about equally, and one of our first HAPS-I courses, which you may have been a part of, was renal physiology. It was a course taught by the awesome Dee Silverthorn and the amazing Jennifer Lundmark, and it quickly filled to capacity.

(08:35):

So, I think I'm safe in saying that there is some level of uneasiness in teaching about pee and how it's formed, but what is it that's so hard, or confusing, or intimidating? Well, I can't say for sure, but based on what I've heard and on what I've experienced myself as a student and as an instructor, I have some ideas. Now, it's an incomplete collection of experiences and ideas, I'm sure, and well, that's sort of my central theory in what makes renal A&P so frustrating, it's a perfect storm of issues. That is there are a bunch of different potentially confusing things going on, and these often get mixed up with each other, which adds to the confusion.

(09:34):

Let's use the example of the countercurrent mechanism. First, I used the singular form of countercurrent mechanism when in fact there are at least two major countercurrent mechanisms involved in the formation of urine in the kidney. One is the countercurrent multiplier mechanism in the nephron loop that increases the osmolality in the medullary region of the kidney. The other is the countercurrent exchange mechanism that happens in the peritubular capillaries that extend down into the renal medulla, turn and then go back up to the cortex, forming a functional looped flow pattern called countercurrent flow. That countercurrent flow allows a particular kind of capillary exchange that permits only small amounts of solute from leaving the medullary interstitial fluid. Thus, we have two different countercurrent mechanisms with the countercurrent multiplier mechanism in the nephron loop creating a hyperosmotic medullary environment and the countercurrent exchange mechanism helping to maintain that hyperosmotic situation in the medulla.

(10:58):

Now, yes, this is oversimplified. Just imagine if I gave a detailed version of what goes on. The first problem is that even the simple version is extraordinary. That is, it involves mechanisms that are new to us, such as what the heck is a countercurrent mechanism anyway? Well, it's simple. It's just flow going one way and then turning on itself and coming back, period. That's all it is. But countercurrent has four syllables and it's new to us, so it's intimidating. That's a real barrier to understanding. It's not an imagined

barrier. That really does stop students in their track and turns them off to even listening to how simple it really is.

(11:54):

Another issue is that there are two different countercurrent mechanisms, as I just said, each doing something different but both contributing to the same outcome. So that makes it easy to mix them up and get them confused with each other. We instructors don't help. We often make it easy on ourselves and simply call each one the countercurrent mechanism when we're focusing on just one of them. But then we fail to clarify to students that we're talking about one of two countercurrent mechanisms involved in keeping the renal medulla salty.

(12:34):

I got to tell you, as a student having studied kidney function in several different courses and never quite getting the countercurrent mechanism or its importance, I was always confused by it. I always seemed like I was getting it, but then I got mixed up again because there were two of them. The breakthrough moment for me was when I finally got the fact that they were two separate processes, but supporting the same result in different ways.

(13:11):

Another problem is that in trying to get students to understand all the details of how those countercurrent mechanisms work, we waste time and energy on a level of understanding that they really don't even need. The white paper that accompanies the 2019 revision of the HAPS Learning Outcomes states this from learning outcome P.4.16... "We intentionally removed all learning outcomes on the details of the countercurrent mechanisms in urinary physiology in this document because the details are not essential for understanding renal function. At the time of this writing, details of the countercurrent mechanisms have also been removed from many medical school level physiology courses."

(14:07):

Besides the countercurrent mechanisms, there's the issue of the convoluted structure of the nephron and associated parts and the linguistically convoluted terminology that describes it, not to mention the crazy overuse of oddly constructed acronyms for all of those parts. And it's not just the nephron and urine formation, pee a simple word, which can be used as either a verb or noun, which is an easy thing to navigate in our language. But as a noun, when does it become pee? When it's filtered out of the glomerular blood? No, that's filtrate. That's not pee yet. You see what I mean? We don't

even know at what point we should call it pee. And yes, I know that there are different people who do it different ways so yeah, that adds to the confusion, doesn't it? When the instructor describes things just a little bit differently than it does in the textbook without explaining the difference. I think we all do things a little bit differently than how things are explained in the textbook. I mean, I use my own textbook and even I do that, but I also stop and explain that to my students.

(15:26):

When we use pee as a verb, why do we have so many synonyms? To pee, to urinate, we have micturition, we have voiding, pissing, wetting, and so on. The list is almost endless. Now, I know that sounds silly, but it adds to the overwhelming nature of urinary discussions by adding all this confusion and complexity of terminology.

(15:53):

Another issue with learning and teaching renal physiology is that we often just dive right into the explanation without doing that essential step of, wait for it, telling it as a story. That is, we forget to set up the scenarios properly. We forget to introduce the characters and their motivations and their characteristics, and mostly we forget to connect this story to all the stories that they have already heard and come to understand. We should take it kind of slow, I think. There are more potential points of confusion and intimidation, as you already know. My point is that they all come together in renal A&P and we need to address that before we expect success in learning and teaching.

(16:51):

What can we do about these confusing issues surrounding teaching? Well, here are a few ideas to get us started. First, let's acknowledge to students that there are issues to face, but we're here to help sort that out and point out the issues as merely illusions. The version of the story we're going to tell is not really so complex or intimidating. It's like my experience with Tarzan and Wayne. Okay, I got some ape pee on me, but my coach helped me see the bright side to that. He got me through it.

(17:33):

Then let's do as the HAPS white paper suggests and clear away the details that our students don't really need so that we can understand the big picture of renal structure and function in its entirety. I know that's hard to do. I've spent all that time and effort in learning how it all works, and I want to tell that story, that detailed story that I now understand better than I ever have before, not completely but better than I ever have, but it has taken me years and a lot of effort to get to this point, and I'm sure I'll get to a better point in a few more years, but I need to remember that detailed story is not what

my students need, and it's potentially going to slow them down or even block their understanding of that all-important big picture.

(18:36):

Next, let's focus on that big picture. Let's come up with a big picture that's simple but accurate and start with that. Refer back to it time and again, anchoring each part of our story to that big picture, and let's conclude our story with a recap of the big picture.

(19:00):

As we do all this, let's not forget that there really isn't much that our students aren't already familiar with. They're already comfortable with salutes and solutions, ion carriers and ion pumps, osmotic pressure, membrane transport processes such as filtration, diffusion, osmosis, and active transport with the idea of homeostatic balance and well, all those other things that come into the details that support the big picture. Okay, maybe they're not as familiar as we'd like them to be for students, or that we imagine that they are for students, or pretend that we were when we were students at that stage of learning, but you know what? That's okay. We're going to take it slow, right? We're going to help them refresh that prior learning, aren't we? So that they are ready to apply these core concepts with little trouble or confusion. We're going to point out and refresh at every stage of our explanation. I've had good success with this approach. Maybe you have some of your own hard-won advice to share with us. If so, please let us know about it.

TAPP Orchestra (20:28):

[music]

Sponsored by AAA

Kevin Patton (20:32):

I try to make this podcast easily accessed by all A&P faculty. One of the ways I do that is to provide a searchable transcript and a caption audiogram of this and every episode, each in multiple, easy to find locations and formats. That costs money. You know who helps me with that? You bet, it's our friends at AAA, The American Association for Anatomy. I've been a member for a very long time. As a matter of fact, I just renewed my membership and I saw that I've been a member continuously for the last 20 years, and I don't regret a minute of it. There's just so much going on in AAA and so many resources that I can use for my A&P teaching. Check it out at anatomy.org.

TAPP Orchestra (21:26):

[music]

Big Picture of Renal A&P

Kevin Patton (21:31):

Here's my approach to that big picture of urine formation that I just mentioned. Before I introduce it to my students, I always clarify that the term urine formation, it's a bit misleading. The process is not really about making urine as much as it's about balancing the blood. Or simplifying that, it's about cleaning out the blood. If we condense the story of urine formation or blood balancing into its essential elements, we have a very clear and simple picture on which we can easily and logically hang any other detail we think our students need. You already know these steps, so feel free to say them out loud with me. They are filtration. I can't hear you. Let's do that again. Filtration, reabsorption, secretion. Hey, did you really say them out loud? Oh, come on, let's do it. Those other people in your world, they won't mind if you say it out loud and they won't think any less of you. They'll simply think that you're having an episode of genius. Okay, here we go. 1, 2, 3,

Chorus (22:48):

Filtration, reabsorption, secretion.

Kevin Patton (22:54):

Hey, thanks for playing along. Those looks you're getting now, that's not pity or even confusion, it's awe, really.

(23:06):

As simple as the filtration, reabsorption, secretion story is, the notion isn't as intuitive as we might like it to be so that our students will understand it immediately. They sometimes struggle with the idea that the kidneys filter almost a barrel of water from the blood, and that filtrate becomes urine, and they bock at that, "Wait, nobody pees 50 gallons a day," At which point I say, "Hey, you've never met my uncle Tommy. He could pee two barrels a day on a good day," but of course, it only seemed like he peed that much, he didn't really, I don't think. Anyway, that's a ridiculous idea, but still it gets in the way of student understanding so I use a simple analogy to make it work better for them. It's based on an actual childhood event with my daughter Aileen, whose voice you hear at the beginning and end of every episode, and it's recounted in my book, Survival

(24:24):

So the story goes something like this, when my daughter Aileen was very young, and I don't remember, maybe she was eight or nine or something like that, and it was just she and I in the house for the day, and she was just really bored and everything I suggested just wasn't interesting to her. You've had that experience, right? Or you've heard about these experiences. And so she said, finally, "You know what? I think I'm going to clean out my junk drawer." And I thought, "Holy smokes, she must be so bored that she's willing to clean up her junk drawer."

(25:05):

Now, it turns out that she really does have a fondness for cleaning things and keeping things orderly and so on so maybe this wasn't too, too surprising, but she did have the top dresser of her drawer full of junk. It was like all kinds of little toys, like little toys from fast food child meals and little souvenirs from theme parks and little favors that she got at birthday parties and just a lot of junk. Some of it was very valued, probably mostly for sentimental reasons, and some of it she just threw it in there because that's where all that kind of junk goes, and it had gotten to the point where she really couldn't always even open the drawer because it was so piled up with stuff. And of course she could never find anything in there because again, it was just a bunch of little stuff.

(25:58):

So she decided, okay, she's going to clean it. And she said, "Nope, Dad, I can do this by myself." "You sure you don't want any help? I'll just sit in here and talk with you while you do it." "Nope, I want to focus on this." "Okay, fine." So I left the room and not long after she started, I heard this crash. I thought, "Holy smoke, she tipped over the dresser or something. She's laying under it." I pictured all kinds of awful things as us parents often do when we think there's a big emergency with our child and so I ran into her bedroom and she had taken the entire drawer out of the dresser and flipped it over onto her bed, which was nicely made of course, because that's who she is.

(26:42):

So here's all this junk laying all over, and I said, "Oh, I'm so sorry that that dropped out of your hand. You could have asked me for some help and I would've helped you get it out." And she said, "No, I meant to dump it out." I said, "What?" And she said, "Yeah." She said, "That's the only way I'm going to get it clean." And I said, "Really? You're just going to throw everything away?" She said, "No, I'm not going to throw everything

away." She said, "I'm going to put this drawer back in my dresser and I'm going to sort through this big pile and I'm going to pull all the things I know I want to keep off to one side and I'm going to take all the stuff that I know I don't want to keep, that I want to donate or throw away, and I'm going to push that over to the other side of my bed." I said, "Wow, that's a great idea."

(27:24):

So I left her to it and I stuck my head in, checked on her every once in a while and she was actually having a good time sorting things out. I think she was having that kind of experience that you and I have when we're going through old stuff, and that is, it sparks memories and we enjoy reliving those memories. So I think she was doing that and so it took her quite a while. She got through it all and she took all the stuff that she wanted to keep and put it back into her junk drawer.

(27:52):

Now, once she did that, she realized she still had too much junk. She really didn't need to have all of that stuff. So what she did was after it was back in the junk drawer, she started going through it and looking at all the things and thinking, "Okay, this thing here, I don't really need. This thing here, I don't really need. And you know what? Now I have room for this other thing that was sitting on top of my dresser that I never put in the junk drawer because it didn't fit and so now I can put that in there. I want that now in my junk drawer." So she got done and she felt very satisfied that she had accomplished a lot that day, and she did.

(28:31):

The reason I tell that story is because that's kind of how our kidneys make urine and that's how they balance the blood. There's all this stuff in our blood as it travels through the renal blood supply and into the kidney and into that glomerulus, and it would be very complicated and very energy intensive to try and sort everything out all in one step. I don't know that that could even be done using the physiological mechanisms that we're aware of right now. So what we do is we do filtration. That's like dumping the whole drawer out onto the bed. We take tons of fluid, mostly water, sodium and chloride as far as solutes, but lots of other stuff too, and it gets filtered out into the filtrate. So that filtrate's like all the junk on the bed. And then what we do is we take a lot of it, actually most of it, and it's stuff that we know we want to save, things like water, things like sodium, things like chloride. We know we want to save those things so we shove them over to the side of the bed. That is we reabsorb them.

(29:44):

So we've already covered filtration, which is dumping the drawer out onto the bed, and then we have... And that's not very discriminative. It's discriminating on size only. But considering the size of the things that are in our blood supply, it's almost everything. I mean, except for the blood cells. So yeah, we're dumping all this fluid onto the bed and doing filtration that is into the tubal. And now what we're going to do is we're going to very quickly reabsorb what we obviously want to keep, water, sodium, chloride, et cetera. So we pull that in right away. So that's the reabsorption part.

(30:24):

So now the stuff we want to keep is back in the drawer, it's back in the blood. And then the next thing we do is figure out, "Okay, in doing that process, did we really fine-tune it as much as we'd like? Aren't there some things that we still want to get rid of that just didn't make it out during these initial two stages of filtration reabsorption? And aren't there some things that maybe they're still in the filtrate there, but maybe they're pretty valuable and maybe we want to pull them back in." We can still continue to do a little bit of reabsorption in that last part of the tubal, but we can also do the secretion part, which is taking stuff from the blood and moving it into the tubal. It's either things that we didn't dump out in the first place during filtration or things that we accidentally reabsorbed and on second thought, we don't really want to keep all of that stuff so let's secrete some of it from the blood into the tubal.

(31:30):

So I realize that like any analogy it's not a perfect analogy. It doesn't match up in terms of exactly what's going on at all levels, but it gives you the general idea and clears up that real stumbling block I think that there is for students, and that stumbling block is that students can't get over why it's so complicated. Why are we moving things this way, then we're moving things that way, then we're moving things this way again? How is that cleaning it up and how do we get around the fact that we're really, in filtration, dumping out way more fluid than we can afford to lose in any one moment? So it handles all of those issues. It answers all of those questions. It clears up all of those confusions. So I think it works pretty good. It has worked pretty good for me.

TAPP Orchestra (32:23):

[music]

Pee Values With Greg Crowther

Kevin Patton (32:27):

Longtime listeners will remember Greg Crowther's previous visits to this podcast. He's an A&P educator who's had a strong interest in using songs to help students learn, and you've already heard some of his songs on previous episodes. He's also developed an awesome strategy for helping students prepare for high level exam items and shared his test question templates, or TQTS, with us on this podcast. I'll have links in the show notes and episode page at theAPprofessor.org/125. But right now, Greg is back with another song, one that is especially appropriate for The Pee Episode. It's called Pee Values, and it helps reinforce that all important big picture or core story of urine formation by the kidney. Okay, Greg, take it away.

Greg Crowther (33:28):

[singing] Solutes in the plasma may be lost in the urine. They're governed by a formula that's well worth learnin'. Three different processes control what your releasing, filtration plus secretion minus reabsorption is excretion.

Kevin Patton (34:07):

Well, thank you Greg Crowther for your original song, Pee Values. If you want to use this song you just heard, or just the music, or just want the sheet music, or if you want to explore some cool instructional ideas to compliment the use of this song, there are links in the show notes or episode page at theAPprofessor.org/125.

TAPP Orchestra (34:26):

[music]

Sponsored by HAPI

Kevin Patton (34:34):

As you can imagine, it does cost money to syndicate this podcast in all the channels and websites and podcast players and book readers and music players, and well, you know all the bazillion places that you can listen to or read this podcast. That funding comes from the master of science in Human Anatomy and Physiology instruction, the HAPI degree. I've frequently mentioned that I'm on the faculty of this program at Northeast College of Health Sciences, and a new cohort of students has just started, all now starting their own exploration of evidence-based teaching strategies that they're learning to apply to their review of all the major topics in the typical anatomy and physiology course. Check out this online graduate program at northeastcollege.edu/hapi. That's HAPI. Or click the link in the show notes or episode page.

TAPP Orchestra (35:35):

[music]

Scared?

Kevin Patton (35:39):

Ever wonder why someone might pee when they're scared? I'll tell you the prevailing theory of that in a moment. But first, yes, you guessed it, another story from the olden days.

(35:55):

Whenever a student asks me about peeing one's pants when scared the image that comes immediately to mind is something that happened when I was a lion tamer's apprentice. Something I learned during that experience is anthropological. It seems that in our culture some people have this ritual that they think makes them look tough and perhaps even invincible by teasing and harassing dangerous animals who are confined to an enclosure. I saw this a lot as a zookeeper. But there's something about a circus that really brings out this behavior in people.

(36:35):

For the record, I don't think that keeping wild animals in a zoo or circus is inherently cruel or harmful to the animals, but there are circumstances when it can be, and one of them is when random people harass wild animals to force an interaction that the animal doesn't want, or to somehow demonstrate one's toughness by sticking an arm into a giant carnivores home territory that is it's yard or it's den. This is why zookeepers and lion tamers stop this behavior right away, to keep the animals safe and secure and happy, but also to keep some idiot from being mauled or killed.

(37:23):

So one day, I and another trainer were sitting behind a large double-fenced play yard occupied by a couple of lions who were sleeping. This is typical behavior of lions on a warm afternoon. But this person and a small group of acquaintances decides to execute that ritual and started banging on the outer fence. I got up to walk in the space between the inner fence of the yard proper and the outer safety fence to courteously ask them to stop harassing the lions. My buddy held me back and whispered, "Let Duke take care of this one." Duke was our staff German Shepherd who was trained for guard duty and he also performed in our big cat act, but mostly he just laid on his back and asked us to rub

him. So Duke got to do some guard duty. He was sent to deal with the intruder. I'd like to think that I'd have stopped it if I'd known the outcome, but who knows?

(38:31):

Duke jumped up and slowly crept along the passageway unnoticed by the human guests. When Duke got to where they were, still not seen by the person banging on the outer fence and yelling for the lions to wake up, Duke jumped up so that he was face to face with them and he gave this horrifically loud and menacing bear-fanged bark right in the guy's face. Everyone jumped back from the fence of course and then walked away from the exhibit. The loud mouth person who had been harassing the lions had stopped talking and was sort of separating himself from the others. I thought it was that he was ashamed of his behavior, but then I saw the growing wet spot on his pants. He was trying to walk in a way that the others wouldn't notice that Duke had made him pee his pants, which kind of illustrates that trying to scare another being has its consequences. Duke scared him like he was trying to scare the lions.

(39:51):

But let's get back to our question that sparked this story. You and I already know that a center in the brain stem helps coordinate the holding of urine, which is continuously produced by healthy kidneys until a socially acceptable time and place to empty the bladder, when the brain stem center allows voluntary micturition, which is what we call peeing when we want to maintain a high level of awe and mystery surrounding the act of pissing. Well, it turns out that process doesn't always work in its standard way, and then that leads to incontinence, the magical and mysterious term for peeing one's pants that is involuntary micturition.

(40:43):

One way of many ways that incontinence happens is when a fearsome wolf like bear-fanged barking face unexpectedly appears inches from your face while you're focused on trying to wake up a humongous jungle killer, specifically you have a stress response called the fight or flight reaction. Your amygdala, acting as part of the limbic system, goes ballistic and interferes with the normal operation of the brain stem's regulation of the bladder's sphincters.

(41:18):

Now, this doesn't always happen or we'd pee our pants every time we have to teach the urinary module in our course, but it happens sometimes, and it happened that day to that poor guy who I hope will never harass another animal again.

TAPP Orchestra (41:34):

[music]

Sponsored by HAPS

Kevin Patton (41:39):

Marketing support for this podcast is provided by HAPS, the Human Anatomy and Physiology Society, promoting excellence in the teaching of Human Anatomy and Physiology for over 30 years.

(41:53):

Did you know that when you join HAPS you get access to the HAPS Educator journal for A&P teaching and you'll unlock all kinds of HAPS members only benefits and resources, such as courses taught by master A&P teachers, access to HAPS safety guidelines and sample learning outcomes? And well, that list just goes on and on. You can join me as a HAPS member at theAPprofessor.org/haps. That's H-A-P-S.

TAPP Orchestra (42:28):

[music]

Urinalysis

Kevin Patton (42:33):

There are so many things we can learn from Pee, right? After all, urine testing or urinalysis is a commonly done procedure. It's used to screen for drug use, as an early indicator of pregnancy, to screen for diabetes mellitus and other metabolic conditions, and it can give clues about all kinds of health or disease conditions, including hydration level, whether we've been taking multivitamins and whether we'll be lucky in the lottery. Okay, not that last thing, I don't think. I don't know. Oh man, is that a thing? Let's look into that. But anyway, there are all kinds of things that we really can add to that list, things that we can discover by analyzing our pee.

(43:24):

In fact, all kinds of new things to look for and new ways to interpret existing urine tests are being developed all the time. In episode 121, the Poop Episode, I talked about how

the appearance of poop can give us all kinds of useful information. That's true of pee too. Blood in either poop or pee can be an important finding, for example. And as with poop, even the frequency of urination can be telling of all kinds of health conditions. Reduced or increased frequency of urination can be signs of a wide variety of conditions.

(44:01):

Something I like to do at my students is have a discussion where we deduce the how and why of changes in urination. That way they can apply each kind of change to what they know of the story of urinary anatomy and physiology. It can be a struggle, but through collaboration with peers and coaching from us, they do get there. And by getting there, they deepen their understanding of the basics by applying those basics. Which brings me to another favorite activity, and that is many case studies. These can be done individually, in small groups, and with the class as a whole.

(44:48):

It can be fun and rewarding to throw out a scenario such as, let's see, "When my uncles come over to play cards, Uncle Tommy seems to get up to pee every few minutes. What might be the cause of that?" Well, that's not enough information for a precise diagnosis, but it gets us all thinking about the many different aspects of urinary structure and function. Could it be diabetes mellitus where the high glucose reduces reabsorption of water and produces high urine output? Or could it be an enlarged prostate and Uncle Tommy isn't producing more urine he just can't void as much at one time as he ordinarily would? Or is it all the beer that he drinks while playing cards? If so, is it the extra fluid consumption of his beer drinking or the diuretic effects of beer, or both? I could also throw out additional information at various points and direct the conversation toward a more precise conclusion. Or I could change the direction and ask about what could be going on if uncle Tommy complains of reduced trips to the bathroom to pee.

(46:05):

We used to do urinalysis in our community college lab course using urine that each student had collected from themselves. I'll never forget what happened one time. The year analysis lab always came at the end of A&P 2, so there was a particular group that had stayed together from their A&P 1 lab section and were now in the same or all together in their A&P 2 lab section. They were kind of a goofy group and so that means that I just fit right in with them, and we had a lot of fun during those two semesters. We learned a lot too, but we had some fun.

(46:53):

So at the end of the urinalysis lab, which was at the end of the lab course, two semesters of lab course, we were finishing up the lab report. So the students were working in pairs and other small groups, and I was interacting with them and answering their questions and helping them figure out the results from their urinalysis tests and how to interpret them, and everybody was pretty much done and getting ready to clean up, and I was joining in that process and so I went to the front of the room where there was a teacher's desk and I had some things laid out there that I had used for demonstrations. So I started straightening those out and wasn't really paying attention to the fact that all during the last part of the lab, during this last phase, students had been getting up and leaving the room one at a time. I always allowed my lab students to do that. If they weren't feeling well or they needed to use a restroom or whatever, just go do it and come back and let's not disrupt things by doing that. So that was no big deal so I didn't really notice what was going on. So I didn't notice that they were all kind of conspiring, I guess, while I was cleaning up at the end.

(48:04):

All of a sudden I heard this tink, tink, tink, like you would hear at a wedding or some other gathering where someone's about to give a speech, only they were clinking the test tubes that they had put their urine in, in order to do these various chemical tests on them, and so I looked up like everybody else did, and they were all standing up and looking at me, and I'm like, "Okay." So one of them, the one that was usually their spokesperson, she says, "Dr. Patton, we have had a great time these last two semesters with you and we've really learned a lot, and so we'd like to thank you and say cheers." And with that, they all lifted up a test tube of urine and sort of lifted it toward me and then immediately put it to their mouth and drank it like it was a shot of something, and that was my reaction, "Ugh". I couldn't say anything. I couldn't speak. I couldn't move. It's like, "What just happened? No, don't do that."

(49:12):

Well, it turns out that what they were doing when they left the room, besides their usual business, is they had put a can of Mountain Dew on a little table outside the lab room, that table's always there, there was a little lobby area outside the lab room, and so they had gone out and taken a clean test tube and filled it up with Mountain Dew. And once everybody had their Mountain Dew, then they did this thing and so what they were really drinking was Mountain Dew. To me, it looked like pee. It wasn't pee. Now, that story has all kinds of safety issues embedded in it, I know, and I'm not holding up student violations of lab protocols as desirable in any way. All I'm saying is... it made an impression on me.

(50:03):

So thank you for listening to this story and all the other stories in this episode. And to you, I say thank you and cheers.

TAPP Orchestra (50:12):

[music]

Staying Connected

Kevin Patton (50:17):

You've been listening to The Pee Episode in which I discussed some issues related to teaching renal A&P and told some stories that may or may not be helpful to you. According to Kevin's law of professional development, if I learned just one new thing during a professional development experience, it's worth the time and effort. I hope you got at least one thing out of this episode and don't feel like you just pissed away your valuable time for nothing. And don't forget to share this episode with a friend or even with a peer who is not your friend. If you didn't like this episode, then maybe you want to pee on the parade of your nemesis so you can share it with them too. There are all kinds of sharing opportunities, right? As always, there are links right there where you're listening, or go to the show notes at the episode page at theAPprofessor.org/125.

(51:26):

Now while you're there, you can claim your digital credential and professional development for listening to this episode. We had a poop episode, now we have a pee episode and coming soon, or at least eventually, is a mucus episode. I'll bet you can hardly wait for that. I know I'm pretty excited about it.

(51:49):

If you have any thoughts on mucus or some good mucus stories or some rotten mucus puns, please send them my way as soon as you can. Just call me and leave me a message at the podcast hotline, which is 1-833-LION-DEN or 1-833-546-6336. Or send a recording or a written message to podcast@theAPprofessor.org. I'll see you down the road.

TAPP Orchestra (52:19):

[theme music]

Aileen Park (52:25):

The A&P Professor is hosted by Dr. Kevin Patton, an award-winning professor and textbook author in human anatomy and physiology.

TAPP Orchestra (52:32):

[theme music]

Kevin Patton (52:39):

Batteries are not included with this episode.

TAPP Orchestra (52:41):

[theme music]