Transcript

Episode 142

Muscle: A Gripping Story by Roy Meals

The A&P Professor Podcast

Contents

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Introduction

Kevin Patton (00:00):

G. Stanley Hall, who some consider to be the founder of educational psychology, once wrote, "muscles are, in a most intimate and peculiar sense, the organs of the will. They have built all the roads, cities, and machines in the world, written all the books, spoken all the words, and in fact, done everything that man has accomplished with matter. Character might be, in a sense, defined as a plexus of motor habits. "

Aileen Park (00:41):

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.

Kevin Patton (00:56):

In episode 142, I chat with Dr. Roy Meals about his new book that's all about muscles.

Re-Introducing Dr. Roy Meals

Kevin Patton (01:13):

Almost three years ago, in episode 82, I introduced you to Dr. Roy Meals. He had just written a book about bones and well, he happens to have had quite a bit of experience with bones—as an orthopedic surgeon. In the time since we last heard from him. Roy has been hard at work on a new book that kind of takes that bone story to, well, the next logical step. Yep, you guessed it. This book is all about muscle. We'll talk about his new book in a moment, but right now I want to remind you about a few more details about Roy's background. He grew up in Kansas and then as a bio major at Rice University, he gained a deep appreciation for the diversity and adaptations of animal life. At Vanderbilt University Medical School, he further explored the workings and failings of human tissues, especially bone and muscle.

(02:23):

An orthopedic surgery residency at Johns Hopkins Hospital gave Dr. Meals the opportunity to work directly with living bone and muscle, and then he did a hand surgery fellowship at Massachusetts General Hospital and from there joined the faculty at UCLA, where he's currently a clinical professor of orthopedic surgery. For most of his career, he's been very active in the American Society for Surgery of the Hand. He served as president and he's also been on the editorial board, including five years as editor-in-

chief of the Journal of Hand Surgery, Dr. Meals has authored several previous books, including the Hand Owner's Manual: a Hand Surgeon's 30 Year Collection of Important Information and Fascinating Facts, and his book, Bones: Inside and Out, which he and I chatted about in episode 82, was his most recent book before this new one.

(03:29):

Hey, why don't we just go ahead and jump right into the conversation that I recently had with Roy about that new book that just came out all about muscle. By the way, I just want to mention that he had some technical issues with connecting online with us from home, so he went over to his department at UCLA and phoned in, and it turns out that his end of the conversation is a bit echoey. I apologize for that—and please bear with us because you really are going to be interested in what he has to say.

Muscle Strain & Why We Train

Kevin Patton (04:08):

I'm here with Dr. Roy Meals again and it's so good to talk to you again, Roy.

Roy Meals (04:14):

Well, thank you. It's been an interesting two and a half year interim since we spoke before,

Kevin Patton (04:21):

Right? Yeah. And last time you had a book about bones, Bones: Inside and Out it was called, and we had a chance to talk about that. And we're here together again to talk about your brand new book. When this episode is released, your book will have just been officially released and this new book is called Muscle: The Gripping Story of Strength and Movement, and I love your titles.

Roy Meals (04:49):

Oh, thank you.

Kevin Patton (04:51):

The titles are gripping too, besides muscles being gripping, and thanks to a advanced copy that you had sent me, I've already started reading the book and it's very similar in

style and tone to your bone book. And as I mentioned then, what I love about these books is that as a teacher of anatomy and physiology, I and my colleagues can use this in a lot of ways. I mean, number one is for our own teaching, we can incorporate this in what we know about bones and in this case, muscles, not only in providing information for our own students, but we get a lot of questions and discussion from our students, and this makes us better prepared for those questions.

(05:35):

And there's one question that many of us who teach undergraduate anatomy and physiology get from our students. It might even be a major reason why some of us have decided to listen to this podcast episode talking about your new book is answered in your new book. And that question is, if I go swimming right after a meal, well my muscles cramp up and cause me to sink to the bottom and die. So can you tell us the answer to that or is that like a spoiler?

Roy Meals (06:08):

No, not at all. That was the admonition that I grew up with, and we had to wait an hour after we ate, before we could go swimming. And the truth is that when you eat well, then more circulation goes to your intestinal tract in terms of providing the digestive qualities. And theoretically, that could deprive your muscles of necessary circulation and function, but in reality, the competition is not sufficiently severe that anybody has cramped and died from going swimming immediately after eating. And so that's an old wives' tale that dies slowly.

Kevin Patton (07:03):

Well, it's all that swimming you and I missed as a kid because we thought we were going to die.

Roy Meals (07:11):

My mother thought I was going to die. I didn't.

Kevin Patton (07:14):

Yeah, yeah. Maybe you didn't, but your mom did. Yeah. Oh man. So okay, we talked about the fact that a few years ago you came out with a book about bones, and I can think of a few reasons why I might want to then turn to the topic of muscles. Why did you decide to write about muscles?

Roy Meals (07:37):

Well, I'm an orthopedic surgeon and a lover of nature and have always been interested in biology. And of course bone was my first love professionally. And so that book came out right in the middle of lockdown. And so I was left at home wondering what I was going to do after I finished the bones book. And so I said, well, naturally muscle is bone's closest friend, both figuratively and literally. And so I said, I think that there's plenty of material to write a similarly formatted book about a muscle. And so that started getting into it and with immediate internet access to the world's literature, thanks to the UCLA library, that I could easily access all the literature, particularly about nutrition and weightlifting and conditioning that I didn't know enough about to just write off the top of my head. And so the muscle book just naturally followed after bones.

Kevin Patton (08:41):

So I mean, any of us, when we write a book about something that we're interested in, even if you, I mean you spent decades working with bone and muscle professionally in a medical context, but as you just mentioned, when you write a book about something, you need to go and look at the literature and see what the latest thing is and fill in maybe any gaps that you might have. Like you say, it's not necessarily right there on the tips of your fingers or the tip of your tongue or whatever. Then as you'd went through all that and were doing that research, were there things that you found that really surprised you or maybe really piqued your curiosity and interest? Like, oh, that's cool, I want to know more about that.

Roy Meals (09:31):

Well, I've never been a bodybuilder to speak of, but I decided that when I had the contract to write the book on muscle that I should practice what I preached. And so I hired a personal trainer and I've been working out with him twice a week doing resistance exercises. He has a degree in sports nutrition so that he approaches his work scientifically based background. And if you go to the gym, talk to the gym rats, and they say that in terms of building muscle, you have to on that 10th or 11th repetition in your third set, you have to bring your muscles to maximum exertion to where you can just barely perform that last repetition. And they say, when you feel the burn, that's your muscle tearing. And then your body responds from that tearing to build new muscle. And just intuitively, from a biological point of view, I just could never understand why tearing would be beneficial because we tear any other tissue, it bleeds, granulation tissue forms, inflammation forms and scar forms.

(10:47):

And so intuitively that didn't appeal to me, talked to my trainer about that, and he rolled his eyes and said, I think that's bro science. And then to go to the literature is that

there's really nothing in the literature. There's one histology section, I don't know, from 1940 or something like that, that shows the sarcomere on an histological section where they're torn after exertion. But other than that, there's absolutely nothing in the last 60 or 70 years of the scientific literature to suggest that in fact that muscles tear. And so the trainer and I decided that the better word was strained and that that's what I used in the book. And that certainly when you do exert your muscles near their maximum capacity is we do know that they do respond by adding cells and adding a size to the cells. So that was one interesting thing that I learned

Kevin Patton (11:48):

As you did that muscle training. I've been doing strength for a number of years, and actually what first motivated me was I'm registered as a body donor, and so I just imagined these poor medical students trying to find muscles on my body. And so I thought maybe I better work on that. And then I did some reading and found out that, well, there's lots of benefits to strength training besides building muscle.

Roy Meals (12:19):

That's very altruistic of you, Kevin, to [garbled]

(12:23):

Yeah, I didn't, I just didn't want to feel so embarrassed for myself. Yeah, I think it's more about me than being altruistic. But anyway, but I did some reading and found out that there's, in the gym I go to is kind of set up for adults who really want to improve their overall health, and they kind of emphasize the idea that this isn't about bodybuilding what we're doing here, it's about becoming healthy. And you touch on that in the book about that there are other benefits to building muscle and strength besides making it easier for medical students or becoming a bodybuilder or something like that.

(13:06):

Oh, yes, absolutely. The stress that we put on our muscles is that that's also transmitted to the bone, so it's keeping the bone healthy as well as ligaments. And then the secondary cardiovascular effects from getting your heart rate up and keeping the circulation flowing is that it has great benefits. The endorphins released make me feel good. I was always bored with weightlifting in the past, but having the trainer and having wide ranging conversations about all aspects of musculoskeletal health has been enlightening and beneficial.

Kevin Patton (13:53):

You're listening to episode 142 of The A&P Professor podcast, and I'm chatting with Dr. Roy Meals who's just written a book about muscles. Now, if you've known me for a while, you know that if there's ever an opportunity to talk about circus arts, I'm going to take it. Well, here's my opportunity.

(14:19):

All right, so this book, it touches on, well, it's a widely known but rarely practiced art of swallowing swords, and you talk about the role of smooth muscles in that, and I love it when we can take something so strange and dramatic and use it to help us understand more about the body. So in sword swallowing, you explain that the smooth muscles play a role. What's going on there?

Roy Meals (14:51):

This is very interesting. I don't know how I came around on it, but there's one article in the peer-reviewed scientific literature and thanks to the internet, and I came across it, but I was talking about smooth muscles in the esophagus and the gastroesophageal sphincter, and that typically these are not under voluntary control, but that for instance, in belching or it used to be that people would, as a performance act, would actually spew the contents of their stomach perhaps 15 feet across a stage, if you can imagine that.

(15:33):

But anyway, so that there is at least some people can have some voluntary control gastroesophageal sphincter, but for the storage swallow or to extend their neck to the point where they have a straight shot down through their mouth and pharynx into their esophagus, in order to get a sword through their gastroesophageal sphincters, they have to have some control of it to prevent it from becoming spastic and resisting the sword. I think there are actual sword swallowing classes and so forth, but from an anatomical point of view, there's an anatomical limit on how long a sword can be before it. The tip of the sword touches the greater curvature of the stomach and can proceed no farther.

Kevin Patton (16:26):

Yeah, I don't think I'm going to test that limit.

Roy Meals (16:30):

No, thank you.

Kevin Patton (16:31):

Or sign up for that course or anything. That's wild that you can take a course in that. Yeah, I guess you got to get ready for that final exam, right?

Roy Meals (16:41):

That's right.

(16:42):

You want your muscles to be in top shape before you do that.

Kevin Patton (16:47):

Exactly. Well, speaking of voluntary and involuntary muscles and smooth and skeletal muscles and so on, I think that those of us that teach undergraduate A&P, we have a hard enough time covering any concept, sort of like everything you know about the body in one or two semesters. And so that's tough giving any topic it's proper attention. But when it comes to muscles, it seems like it's pretty common for us to sort of gloss over cardiac and smooth muscle. And I noticed in your book you have a whole chapter on each one of those, and that's great. And I'm wondering, as you were focusing on them, are there things that you were talking about there or ran across in your research and so on that you think is something that we often overlook or underemphasize when we talk about muscles? Either just when we talk about muscles in general, but maybe even in our courses and that...

Roy Meals (17:48):

When somebody says muscle, I think that the immediate mental image that comes to mind is biceps or deltoids or pectorals or quads or something like that. And one of the interesting thing about muscle is that we can have a general impression of somebody's general health by looking at them across the room, and their physique is related to the skeletal muscles that unless they're obese, that we can get a sense of them. And that's completely different than looking at somebody in public and assessing the quality of their bones or assessing the quality of their heart or their liver. But the smooth muscles, for instance, are pervasive throughout the body from the ones that the small little wisps of smooth muscle in the adjacent to the hair follicles that make the hairs stand up on in when we're cold or scared and account for goosebumps. And then consider all the

smooth muscles that are in our arterial system that regulate the vasoconstriction and vasodilation.

(18:57):

And then really every system is imbued with smooth muscles, respiratory tract and the cilia that will tend to move mucus and foreign material up into the throat where it can be swallowed or coughed. And of course, all of the smooth muscles in the gastrointestinal system from beginning to end that cause digestion and peristalsis to take place. And so these are underappreciated, I guess the most worked and the most worked and underappreciated muscle is the heart, which is beating 70 to hundred times a minute, under exertion even faster, and that it does so from about the third or fourth week in embryological development. And if the owner is lucky that it could continue to be efficiently for over a hundred years without any conscious involvement. So indeed, that's a very remarkable also, and then if you look across zoology is that some of the cold water marine fish will survive as long as 400 years, and even though their heart rate is lower, that's a remarkable work of anatomy and physiology to have a structure that works that long. We wouldn't come anywhere close to that with a made device. I mean, I've always marveled at how durable a cell phone is rarely breaks down, or an automobile, but that its life expectancy is numbered in years, not in decades or centuries.

Kevin Patton (20:53):

Yeah. Wow. 400 years, it's amazing. I don't know, I don't think my retirement plan is set up for that, even if we could do that, but that is amazing, and

Roy Meals (21:07):

That's a long time, Kevin, for you to pump iron to have your body in good shape for the students.

Kevin Patton (21:11):

Yeah, that's right. Well, maybe I should start later, but then if I start later, I might not live to 400. So kind of a vicious circle there. Yeah. So I mean, when you brought up animals, and I noticed that there's a whole section of your book where you dive into the animal world and talk about some muscle concepts there. And what are some, besides the one that you just mentioned, what's one or two other or things about animals that are kind of an adaptation of the way we use our muscles or the way our muscles are built?

Roy Meals (21:51):

Okay, well, let's talk about tails. We don't even have one. Across zoology, the diversity of tails and the adaptability and the functionality of tails, it's amazing. I mean, for instance, cheetahs have a long bushy tail and they actually use that as a rudder and as a counterbalance. And so as they're changing directions very quickly, as you can see, YouTube videos where their tail helps provide their balance as they quickly change directions. And then you think about the prehensile tails where animals hang on, opossums are a classic example. The seahorses, they use their tail to attach. Lizard tails are particularly interesting because certain lizards, when their tail is trapped by a predators, the tail will actually break off and then wiggle or more than a few seconds, up to a minute, and that will distract the predator and they'll be interested in the tail, whereas the lizard escapes and ,in fact, will grow a new tail.

(23:07):

It's never as long or as well developed as the original tail, but a tail that has distinct survival advantage, I think the gold record would've to go to these lizards. Woodpeckers for instance, have an incredibly long tongue, it actually originates at their eye socket and it's little bit hard to conceive, but there's diagram in the book and you can see them on the internet, but the origin of the tongue muscles is at the eye socket, and then this muscle crosses over the top of the skull and then comes into the pharynx. And so that this is an extremely long course. And so that when the tongue projects into a small hole or the woodpecker is trying to access an insect, is that the tongue can project, I believe, about a third of the body length of the animal project for several inches to get the delectable insects from the deep inside of decaying log.

Kevin Patton (24:15):

Yeah, wow. So I mean, those are some amazing adaptations. And something I've found in teaching undergraduates is it's those kinds of examples and stories that really intrigue students and get them to think more about how human structure and function of muscles or whatever body region it is that we're talking about or system that we're talking about. So I love having these kinds of stories available.

Muscle Stories: Learning Should Be Fun

Kevin Patton (24:49):

I'm talking to Dr. Roy Meals, the author of a new book about muscles. In this segment, we talk about some teaching strategies that he uses in the book that we've come to appreciate in our courses—that is, storytelling and making learning fun.

(25:14):

I think I mentioned this on episode 82 when you were with us before that I'm a big proponent of teaching as if we're storytellers and we're telling the stories of human structure and function. And I find that in your books and in your blog posts too, that you tell great stories that end up teaching us a lot about the human body. And some of those stories I've already adapted in my own teaching and telling of stories. And I'm just wondering, does that ability to take these complex and sometimes not even completely worked out concepts and explain them through engaging stories, does that feel like it comes naturally to you or is that something that you really struggle with? Or maybe it's some of both? I don't know.

Roy Meals (26:05):

Probably some of both. I think I have a strong teacher gene. I love to learn. I get excited about identifying new information and integrating it. And my feeling is, and I think most teachers would agree with this, one doesn't really understand something until they can successfully teach it to somebody else. And sometimes I think I understand something, but then when I go to articulate it, I realize that my presentation is not clear, so I have to work it over in my mind and oftentimes ask questions, well, why isn't that clear? Or it's the basis for this. And so one of the reasons that I enjoy teaching is that clarifies my own thinking. And then my other attitude is that learning should always be fun. And that I remember as a second year medical student, microbiology lecturer was presenting material that he had recently presented at a national conference, but basically it was summation of his research to date.

(27:20):

But I sat there with my head on my chin and just shook my head and told myself, he's telling us what he wants to teach, but he's not telling us what we need to know next. And I said, there just has to be a better way. And I think so for a lot of my career is that I use that terribly tedious moment as marching orders to what does the learner need to know next and how can I integrate this information into knowledge that he already has and so that he has a framework to understand it. And so with the blog posts and with the book is that the way I write is I read, read, read. I walk the dog every day. I may go for a jog or work in the garden, and I pretty well have down in my mind what I'm going to write when I sit down and write it because I've worked out the problems in my head and understand the sticky points and have tried to work them out so that when I finally sit down to write, it flows pretty quickly. But the unseen part of it is the hours and days that I've gone into the background in terms of my digesting it and getting it clear in my own mind in order to be able to present it in an effective way.

Kevin Patton (28:43):

I think that really parallels what a lot of us do as teachers is I think when I was first started teaching all those many moons ago, it seems like I kind of expected it to be a lot. Oh, I don't know. The words had just come out of my mouth and I just know what to do next. And it took me a little while to figure out that in teaching we need to do what you just described in your writing. And that is really think about it, think it through and think about what is that next thing that we need to say that is going to do the trick .And a real benefit for me and why I was so glad to see you come out with this book is that you've done a lot of the heavy lifting here on trying to boil down some, not just the core concepts of muscle, which you've done, but also add in some of these extra stories of interest that we talked about with the woodpecker's tongue muscle and so on, and the cheetah tail and the lizard tail and so on.

(30:00):

You've mixed those interesting little spices in there too. And so now we have something that we as teachers can look at and get ideas from. And that's why I like seeing come out with new books. And speaking of other books, and this might be a little bit too soon, but I think this will wet people's appetite, and that is right before I pressed the record button, you and I were chatting a little bit and it came out that, okay, you did a book about bones and the muscle book just now came out, and I'm anxious to finish reading that. And you said that you have an idea for a third book after that. And what is that? Do you look at that being about,

Roy Meals (30:53):

Well, that would complete my trilogy on the musculal skeletal system. I was telling a friend about that the other day and he said, oh yeah, a boxed set, but the ligaments and that the muscles and bones on their own would be entirely ineffective. If our musculoskeletal system just consisted of muscles and bones, we'd just be a quivering, non-functional mass of bones flopping around as the muscles contracted, but it's the ligaments that stabilize and control the joints. So that muscle contraction then has effective movement on the skeleton. So I guess my never-ending quest for learning myself is that the tentative title for the book is two or three years down the road is Ligaments: Quietly Holding You Together—Until They Don't.

Kevin Patton (31:55):

[chuckles]

Roy Meals (31:56):

T here's a lot of interesting information about the anatomy and physiology of ligaments and how we can strengthen them more, gradually stretch them, and then all of the injuries that can occur and can be career ending according to how they're managed and so forth. So I'd say two thirds of the way through the research of that and perhaps 15% into the writing of that and having great fun with it, that would conclude my box set of work on the musculoskeletal system.

Kevin Patton (32:33):

I'm looking forward to that.

Roy Meals (32:35):

Well, one thing that was fun in the muscle book is that my trainer is a former champion bodybuilder. And so one of the things that he asked me about my goal when we started training together, I said, well, is it possible for a senior to develop a six pack? And he said, Roy, I says, you have a six pack in there. It's just covered up. So we started talking about bodybuilding and I started reading it. It has a fantastic history, but the bodybuilders, when they go for a competition, they get their body fat down to six or 7%.

Kevin Patton (33:17):

Oh wow.

Roy Meals (33:19):

A man has over 20% body fat. And he said that it's incredibly tedious that they on a very strict zero fat diet for a month or two before the competition to try to lose as much body fat as they can. And of course, it's dangerous to get down to that low and not to be recommended. And he said that the bodybuilder can't compete more than once or twice a year just because of the stress on the system. And so I said, okay, well, as we talked about bodybuilding, I said, well, I want to go to a bodybuilding contest as a spectator, not as a contestant, and so I write about that in the book, but that was real eyeopener to go over to Burbank on Saturday and the witness this bodybuilding contest, it was just amazing.

(34:15):

We can talk about it more if you want, but the thing that came to mind was that when we were talking about ligaments is that contortionists are probably naturally ligamentously lax, but then they stretch their ligaments for hours on end to be able to

contort their bodies into these amazing postures. And so that, as I continue with the book on ligaments, I've looked on the internet and there are contortion classes. So I'm going to go join a contortion class and I'm sure I'm going to knock the socks off the teacher for a senior to come in.

(35:01):

I want to be a magician's assistant, double myself up in a box in a unseemingly contorted position, and I can't wait to do that. And then write about that.

Kevin Patton (35:17):

Oh man. Okay. So we need to set up, we need to schedule your next interview for when your next book comes out. I want to hear what happens when you sign up for contortion class...

Roy Meals (35:31):

I want my body to be in fantastic flexible shape for when the students dissect it, Kevin, you not only have to have buff muscles, but you also have to have lax ligaments.

Kevin Patton (35:47):

Oh my gosh, I learned so much from you, Roy.

Roy Meals (35:53):

Oh, thank you. That makes me feel good as a teacher that I can share my enthusiasm and knowledge about muscle.

Kevin Patton (36:06):

Oh, I love talking to you. And for anyone who's listening here, this comes through in Roy's books. If you haven't read either of 'em yet, you really need to pick up, I mean, there really is a lot of practical stuff you can pick up. I mean, beyond the contortion class thing, but stuff that we can use in our teaching and this voice of telling interesting stories really comes through too. So even if we weren't going to use it for our teaching or recommend it to our students, it's just fun to read. I just love you reading your stuff and your blog posts as well. And I really appreciate you once again, taking time out of your day, taking time out of your ligament book it sounds like, to talk about your new muscle book. Again, it's called Muscle: The Gripping Story of Strength and Movement by Dr. Roy Meals. I wish you well with your contortionism.

Roy Meals (37:09):

Yeah. Thank you, Kevin. I always enjoy talking about this. You mentioned the blog. If somebody wants to see the blog, I'd be happy to have more readers, and if you like it, then click on the subscribe button and then every month or so when I post a new article, then you'll get a quick email about it. But the blog is MuscleandBone.info ...MuscleandBone.info. So I'd love to have readers for that. And you talked about the practical information, talk about nutrition and protein diet and benefit of a higher protein diet, but not necessarily a high protein diet. And then also supplements and have a section on performance hacks and drugs and their history, and also then some general guidelines on muscle conditioning and whether you want to develop your muscles for strength, endurance, or bulk. But you have to choose one because the type of conditioning that you do will favor one, but disfavor the other two. So Kevin, thank you very much for the opportunity to share our interest in anatomy and physiology.

Kevin Patton (38:33):

Alright, well, like I say, we're going to have you back before you know it when your next book comes out. And in the meantime, I want to finish this book, and I hope all of you will too.

Staying Connected

(38:48):

Well, that was fun. I always enjoyed talking with Roy Meals and I enjoy reading his books too. I'm glad you were able to listen in on this chat focused on his new book about muscle. This book is also a recommendation in The A&P Professor Book Club, a link to which you can find in the episode notes right there, right there where you're listening, or at theAPprofessor.org/142. Wherever you find the link, you can also find the link to claim your digital credential in professional development for listening to this episode. Want to be in touch with us? Well, the podcast hotline is 1.833.LION.DEN or 1.833.546.6336. Or send a recording or written message to podcast@theAPprofessor.org. I'll see you down the road.

Aileen Park (39:55):

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

Kevin Patton (40:10):

This episode is safe for use around pets.