# Sports Pharmacy

DECODING THE SCIENCE OF ELITE HUMAN PERFORMANCE

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# TOPICAL ANALGESICS

**The Pharmacist's Guide to Transdermal NSAIDs**

**"You Are an Ironman" My Journey to Obtain a Lifelong Goal**

**Advancing Women's Sports Through Performance Health**

# Letter From the Editor

Dear Sports Pharmacy Magazine Subscribers,

Welcome to this issue of *Sports Pharmacy Magazine*! This month, we're focusing on **topical analgesics**, a key tool in pain management for athletes. Whether it's muscle soreness, joint discomfort, or injury recovery, understanding how these products work—and their role in sports medicine—can enhance athlete care. Our experts dive into the science behind topical pain relief, explore clinical applications, and discuss best practices for pharmacists working with athletes.

We'll also highlight the importance of interdisciplinary collaboration, showcasing how pharmacists, athletic trainers, physical therapists, and other professionals can work together to optimize recovery strategies.

The *Clinical Sports Pharmacy Summit* is quickly approaching on **April 11-12** in **Fort Lauderdale, FL**! This inaugural event is your chance to network with leading experts, explore new research, and earn continuing education (CE) credits while deepening your knowledge of sports pharmacy. Be sure to check our website for registration details.

Thank you for being part of the Sports Pharmacy Network. Your dedication to clean sport and athlete health drives our mission, and we look forward to growing together in the months ahead!

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# Introduction to CBD

Highlights from The Sports Pharmacy Network Podcast

Hosted by Brandon Welch, PharmD


The Sports Pharmacy Network Podcast brings you dynamic conversations at the intersection of sports and healthcare. Join Dr. Brandon Welch and Dr. Jessica Beal-Stahl as they sit down with a variety of expert guests, including pharmacists, physicians, dietitians, athletic trainers, mental health professionals, and other specialists, to explore the latest in sports medicine and athlete care. Whether you're a healthcare professional, athlete, or sports enthusiast, the Sports Pharmacy Network Podcast is your go-to resource for optimizing health and performance.

**Dr. Brandon Welch:** Today's guest is Chad Collins. Chad is the chairman, CEO, and co-founder of Corganics, a leading life science company dedicated to developing and commercializing cannabinoid CBD therapy, exclusively available to pharmacists and healthcare professionals.

Today we discuss CBD, also known as cannabidiol, and its potential impact it can play on athlete health and performance. Over the past decade, CBD has surged to popularity for its potential therapeutic benefits, whether that be for anxiety, a pain reliever, to help combat sleep, speed up muscle, recovery, and the like.

Within the realm of elite sports, evidence suggests CBD has increased exponentially, which is likely due to both its removal from the World Anti-Doping Agency prohibited list alongside the evolving legal landscape.

Today, Chad discusses the evidence and science behind CBD and its clinical utility in athletes. I really want to start the discussion off with just some basic level science on CBD and what do cannabinoids do in the body?

**Chad Collins:** Yeah, that's a great question. And you are spot on what you said earlier. You see CBD everywhere, and so there's a lot of confusion on why and what it's doing in our body.

So interesting enough, the endocannabinoid system was actually discovered about 27 years ago. Now, for 2,000 plus years, cannabinoids have been used for a number of medicinal reasons in ways. But really about 27 years ago, they really uncovered what the endocannabinoid system is, what it's doing, and the basis of it is really trying to regulate homeostasis, or balance in our body. So why do we have that? Why is it important?

Well, we all know about the central nervous system, the cardiovascular system, the endocrine system, and all of that, and how those function. But this endocannabinoid system really is there to help, really stimulate all of it, and help with homeostasis or balance, so that they all work efficiently the way they were meant to.

The body in general already produces cannabinoids. A lot of people don't know that, but our system, it's producing cannabinoids every day. There are times where we may be in what we'll call cannabinoid dysfunction or endocannabinoid dysfunction or ECS dysfunction, and what that means is maybe we're not able to produce enough cannabinoids to keep up with certain things, like inflammation.

So obviously, you're involved in the sports world, it's a daily occurrence of managing inflammation, whether it's an athlete or not an athlete, but your athletes for sure. So how do we produce enough cannabinoids? Sometimes maybe we're not able to produce enough. Maybe the inflammation is driven by an acute injury or a chronic injury that you're dealing with, and the body is trying to, at a cellular level, drive down that inflammation.

And as you control inflammation, there's a tremendous number of other ancillary benefits to that, as you probably can tell. That's why there's some people that go, you know what, I reduced inflammation and I'm feeling better from that pain. And you know what else, I'm sleeping better. Or I'm less anxious.

The body is just working more efficiently when we drive down that inflammation. And cannabinoid therapy, and particularly working with our endocannabinoid system, you're bringing that inflammation down through added cannabinoid. Then hopefully your body starts to adjust and bring even more cannabinoids. And now we've got a more efficient athlete. We've got a more efficient, just person out on the street, if you will.

So in short, we've got receptors, CB1 and CB2 receptor sites. They're located all over the body, and that's why you'll see in the future, Brandon, Pharma is coming to this space with a number of prescription-based products that deal with modalities all over

We think patients deserve something better than that. And I'm not saying that all the products out there are bad, but what I'm saying is a majority of them are mislabeled. Up to 30% have detectable THC.

the body, because those therapies can interact with those receptor sites that are located literally all over the body.

So I'll give you one example, the skin. The skin has both the CB1 and CB2 receptor sites. So with that, that means that cannabinoid therapy really has a strong role in skin-related inflammatory issues, or even right below the skin. CB1 is predominantly found in the brain, right? And so now you have therapies that will interact with that CB1 receptor site, maybe around central nervous system modalities or disease state. So it's a fascinating area without question.

It's going to continue to expand, especially as pharma comes to the table with numerous education platforms, kind of like Corganics. So we're kind of the tip of the spear when it comes to cannabinoid therapy and educating healthcare professionals and pharmacists.

**Brandon:** Great explanation, Chad. And what I always find pretty interesting, and I'm sure that this was an insightful moment for a lot of our readers here is knowing that the body has a natural endocannabinoid system, where these receptors or these functions are actually produced endogenously.

But it sounds like too, sometimes if we want to elicit or alleviate that pain response, we may need a CBD product to help better attenuate that response. And I think sometimes, you know, when we hear CBD, it can be foreign to a lot of people that our body doesn't naturally have an endocannabinoid system, but you just kind of laid down a lot of different functions, especially with keeping our body in homeostasis.

And I really like how you touched on or distinguished the difference between CB1 and CB2. Between CB2, maybe being a little bit more selective toward the dermis or the skin, and then CB1, you may find more in the central nervous system. There may be certain CBD products that may target more of the CB1 receptor versus CB2. The binding affinity can be different, and I'm sure that's something we're going to touch on a little bit later but moving on to our next question here. Can you tell us a little bit about the rigorous process that you guys have gone through to offer such a high quality and clean product?

**Chad:** Yeah, I appreciate that question. A lot of times, companies will throw a lot of other ingredients on their products, whether it's scents, flavors, other actives. And the problem with that at times is they can't control for the quality of where all it's coming from. Or a lot of times in the retail space, what happens is they source from multiple locations. And when you do that, you are losing total control of quality, literally from ground and seed to end user being a patient. And for us, that's just not acceptable.

If I go back to even some of that data, Johns Hopkins and the FDA, Penn Medicine, they've all done these retail audits of the market. And it's pretty disturbing. Most of the products, 88% are mislabeled by at least 15%. 44% of what they've pulled from the market is mislabeled by more than 25%. So what that means is they really have no idea what's actually in their box. And we think patients deserve something better than that. And I'm not saying that all the products out there are bad, but what I'm saying is a majority of them are mislabeled. Up to 30% have detectable THC.

A lot of people don't know that, that it has detectable THC, which means you could very well test positive on a drug test. And even though the box says THC free or no THC, 30% of them out there do have enough where you could possibly test positive on a drug test. And again, we think patients deserve a much better option than that. And that's why we partner with health care professionals and pharmacists that are having these conversations with their patients, more intimate conversations around the real health journey of that patient.

And patients are seeking these safe natural alternatives and they're asking their pharmacists. So we want to bridge that gap together. That's why we appreciate what you and your peers are doing, really trying to help be an incredible filter and guide for your patient.

**Brandon:** We try to be the good gatekeepers. Now, you know, one of the things that I really appreciate about the rigorous process and due diligence that you guys do.

**Chad:** We operate, and I keep going back to it, we operate more like a pharma company, though it's a supplement. But we put the rigor behind it like you would a pharmaceutical company. I mean, we are produced in a CGMP, FDA registered facility. We even have NSF Safer Sports Certification for our whole facility. We can guarantee that there's no detectable THC in our products.

I'll add this back to kind of the first question you asked around the endocannabinoid system and cannabinoid therapy in general. CBD actually interacts with both the CB1 and CB2 receptors. THC actually only really interacts with the CB1 receptor. That's where it has its affinity. What they have found is CBD is the most effective cannabinoid when it comes to reducing inflammation and having an impact on inflammation, more than THC, more than any of the other minor cannabinoids. CBD is the most rigorously tested already, but it also has already proven out to be the most strongest when it comes to anti-inflammation.

**Brandon:** Yeah, that's great to know. And look, we've seen CBD marketed to do a plethora of things, from helping to combat anxiety, stress, insomnia, help with muscle recovery, and then as obviously you just mentioned, help serve as a pain reliever. What are some of the science and evidence-based therapeutic areas athletes can benefit from the use of CBD products?

**Chad:** Yeah, all great questions. One of the things that we're proud of, we actually at Corganics, we invest in research and data. We already have our first IRB approved study in pain, sleep, and anxiety.

As a cannabinoid CBD company, we can't make claims, right? We can't say, oh, it's going to do these three things or four or five things. But we do have data, and that data will tell you that our products are effective in pain, sleep, and anxiety.

If you think about an athlete, most athletes are going to at some point in time have some level of pain or injury or recovery needs that they have. And even in that recovery, sleep becomes such a vital element.

We work with also a lot of professional athletes through their physicians and pharmacists. Anxiety, that's a big deal. In America, a lot of patients are just very anxious. And so we hear these success stories with patients on our products. We can't necessarily make certain claims, but what we can say is we're even getting more data.

So for example, we have studies that are starting at Rush in Chicago, NYU Langone, that will be around sports medicine, orthopedics, and looking at somebody who's got chronic injuries versus somebody who's maybe in an acute setting and using different regimens of our products to help reduce the volume of narcotics, namely opioids, as an alternative to NSAIDs, patients that really can't take an NSAID because of GI or liver or allergies to it. And then also looking at functionality afterwards, sleep improvement after an injury.

Now CBD in general, there's a number of third-party peer-reviewed papers and data out there that suggest that especially driving down inflammation is going to be very positive for patients, especially athletes. We know that there's data and we'll even have more and more data specifically to Corganics as well, which is really, really exciting.

**Brandon:** And part of the role of the clinical sports pharmacist outside of counseling some of these athletes on the different clinical aspects to optimize health and performance, the other thing that we really try to focus on is really dialing into protecting these athletes from clean sport. As you're probably aware, the World Anti-Doping Agency, also known as WADA, they have the regulations. NCAA has drug testing standards, professional leagues. They have the collective bargaining agreement that they have to abide to.

And so a part of that, it's very important to make sure that we're vetting these products appropriately, making sure they're third-party tested, NSF certified, which it's clear that your company is checking off those boxes. But now one of the things that I see has kind of surged and caused some confusion is the different spectrums of CBD products.

There's full spectrum, there's broad spectrum, and there's CBD isolate. Can you kind of speak to the differences between the three?

**Chad:** Yeah, absolutely. So full spectrum, obviously, that's going to include THC. That also typically is going to include like delta 8, delta 9, which are synthetic THCs. A lot of times those products will be involved in those particular products.

Those are going to be north of 0.3% THC concentration, where that's going to now make it a full spec-

trum product, which means that you would most likely test positive if you were to drug test for THC. Then you've got broad spectrum CBD, the broad spectrum CBD, which is what Corganics is.

In fact, in our products, you're going to find between 10% to 15% of our product is made up of other minor cannabinoids. And I mentioned it earlier, but we believe in the other minor cannabinoids. And as there's more data, some of those may have more affinity to helping with sleep. Some may have more affinity to helping with inflammation or anxiety or a number of other areas that are going to be important as we learn more. So we feel strong enough to put those in our products.

We also think it benefits almost taking different approaches into the endocannabinoid system that gives you this what we'll call an entourage effect. Not the entourage that involves THC, but an entourage effect around cannabinoid therapy in general.

Then you've got CBD isolate. CBD isolate is what you find in probably 95% of retail CBD. It's easier to grow. It's easier to extract because it's just we're going to take the plant. We're going to basically just literally go with isolate. It's less expensive. And at the same time, from a therapeutic standpoint, what we believe, again, this is in our company, we believe that sometimes you're going to start to have to ramp that dose up because you're going at it from one angle, right?

You're probably going to get to a point where you plateau and you go, OK, if I want the same dose response, I might have to take two of them or three of them. What we know with us and in broad spectrum, it's been shown that you don't have to do, there's not a dose response like that necessarily or it's much slower. And so you get more angle, more entourage effect may increase the efficacy of a product. That's where we stand.

Now, we don't have THC, so we're not full spectrum. And here's the why. It has nothing to do with us not believing that there's any value in THC. For us, from a strategy standpoint, we understand pharmacists like yourself, physicians like yourself are more comfortable if they venture into cannabinoid therapy without having to add the other regulatory environment of THC into the mix.

You've also got a number of patients across the US, adult patients, that are not necessarily looking to get high when they look for a cannabinoid-based product. They're looking for safe, natural alternatives to prescriptions because they don't want the addictive potential, or they don't want the side effects that comes with a lot of prescriptions. That's why patients are like, you know what, I want to try cannabinoid therapy. I don't necessarily need or want to get high, or I can't because of drug testing, whether you're an athlete, truck driver, or law enforcement or whatever their background is, that safe drug testing is part of their day to day.

They know that they may get drug tested. We believe in broad spectrum and the efficacy associated with it more than isolate. And we believe in full spectrum, but we don't necessarily have full spectrum products today. Broad spectrum to us meets the needs of most of the American adult population that is looking for safe, clean cannabinoid therapy.

**Brandon:** And I think that distinction is very important. The THC component in high concentrations is considered a banned substance according to WADA. And it's interesting because I was actually reading a study a few days ago done in Europe where they anonymously surveyed 500 rugby players to ask them what they know about CBD. Why are they taking it? Where are they getting their source or information from? And there were some staggering numbers I saw, saying that close to 60% of athletes or at least that population of rugby players were getting their information from the internet and word of mouth from friends.

When we think about the different CBD products that are available, whether they be full spectrum, broad spectrum, CBD or CBD isolate, it's important for athletes or even sports personnel to understand what this difference is to help protect the athlete for staying

> If I was an athlete, I would ensure third party testing, and I would ensure that I'm having a conversation with my trusted healthcare professional and pharmacist, without question.

compliant with clean sport. And then also building or garnering that trust so that athletes can go to a health care professional, which is why I appreciate what Corganics does.

It's not direct to consumer. It's direct to health care professionals, who are the trusted and credible person to make these recommendations.

**Chad:** You're spot on. And if I can go back one of your comments around just the safety side. If you look at the retail setting, even though most of it is isolated, Johns Hopkins, the Leaf Report, these big major third party audits of the retail space found up to 30% of retail products have detectable THC in them.

Detectable meaning it's very likely an athlete would test positive; it will show up on a drug test. So if you're, for example, one of those rugby players that's relying on a friend who said "I've got some great CBD down here at the corner shop or on Amazon", you go and buy it and it says there's no THC on the product bottle. The label says it, but when you do real third-party testing of that product, up to 30% could have detectable THC. Now you're in a bind, you're in a problem spot.

I've got two sons that play Division I football. One just graduated last year from Tulsa, was on our products daily, our soft gels. I have one that plays at Texas Tech University today. Takes our soft gels every day. Been drug tested multiple, multiple times. We work with team physicians for professional sports. They love the fact that they can trust a Corganics product. We just don't have THC in it. And I think that's an important area, especially for your athletes that are concerned about that or the sports that do have that as banned substance. We want to help protect those patients.

## The Wrap Up

**Brandon:** It's always important to do your due diligence, talk to a healthcare professional who has knowledge on what to look for in these products. And to kind of piggyback on that note, what are some best ways athletes or sports personnel can find a high quality CBD product? Anything in particular they should be looking for?

**Chad:** Well, I mean, of course, I'm a little bit biased, but here are some tips:

1. I would always encourage them have a conversation with their pharmacist or healthcare professional first. Before you put anything on your body or in you and take anything, you should really have a conversation about all supplements. Because not all supplements are designed the same way or have the quality rigor, whether it's CBD or any supplements in general.
2. You really need to make sure that they do have things like a QR code in batch specific numbers. If you were to go to a website and find a, and you can't find that or you can't find it on the product, so you're clear. Don't touch a CBD that you cannot tell what's in it and that they don't have what I will call thorough, very thorough third party tests. A thorough third party test should tell you every chemical makeup of what's in that product. You should be able to see what's the percentages of everything in it.
3. So the label tells you one thing. What is the third party test say? How close is it? Is it mislabeled? Does it have levels of detectable THC in it while even the bottle says it doesn't? Those should be readily available on every third party ISO certified lab test of a product. It should also show you heavy metals. It should also, if there's any heavy metals or that they've been tested, or pesticides or molds or microbes. And again, I'll go back to when you're throwing scents and flavors and all these things to kind of cover quality gaps. You could be putting yourself at risk for molds or other things that you inadvertently, but those third party tests, I would always start with that to really understand what you're getting.

Make sure that it's not really giving you full spectrum product that says it's a broad spectrum or isolate. So that's what third party testing should be. And unfortunately, a lot of companies out there don't make that very transparent to patients, unfortunately. But I would for sure, if I was an athlete, I would ensure third party testing, and I would ensure that I'm having a conversation with my trusted healthcare professional and pharmacist, without question.

This transcript is based on a podcast episode and has been edited for length and readability. While we have made every effort to accurately capture the essence of the conversation, certain sections have been modified or condensed to enhance clarity and flow. Some filler words, pauses, and non-verbal cues have been omitted. The views and opinions expressed in this interview are those of the speakers and do not necessarily reflect the official policy or position of the podcast producers or the Sports Pharmacy Magazine. Please visit sportsrxnetwork.com to listen to the full episode.

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# The Pharmacist's Guide to Transdermal NSAIDs:

## Modern Innovations in Sports Medicine

*By* Dr. Alexandra LaStella, PharmD, RPh and Sakhi Patel, PharmD Candidate 2027

**AuTHOr BIO:**

A PharmD graduate from St. John's University and a New York native, Dr. LaStella relocated to San Diego to escape the harsh winters, and to pursue a passion for pharmacology and medical writing. Her work is driven by a deep interest in pharmaceutical fields that directly impact the people closest to her—including psychiatry, urinary health, diabetes, pain management, and HIV/AIDS treatment. In 2024, she founded WritePharma, the USA's #1 Pharmacist Medical Writing Agency, that provides highly specialized, evidence-based, PharmD-curated content.

**AuTHOr BIO:**

Sakhi Patel is a second year pharmacy student at the University of California, Irvine's School of Pharmacy and Pharmaceutical Sciences (UCI SPPS). Prior to pharmacy school, she also received her Bachelors of Pharmaceutical Sciences at UCI. She is currently serves on the board of Industry Pharmacists Organization (IPhO) and on the executive board of the Indian Pharmacists Association.

### Introduction

*Imagine the "Pain Relief" section at your local pharmacy–which products immediately come to mind?*

Nonsteroidal anti-inflammatory drugs (NSAIDs) are essential in sports medicine for the temporary relief of musculoskeletal pain and inflammation. Still, they are often associated with troublesome side effects that further impede an athlete's return to their sport. Recognized over-the-counter (OTC) NSAIDs such as Advil (ibuprofen), Aleve (naproxen), and aspirin are among the most commonly used prescription and OTC medications in the United States. NSAIDs account for approximately 60% of the OTC analgesic sales in the United States; survey results suggest 30% of American adults use NSAIDs regularly.[1] Modern clinical trials have repeatedly shown transdermal NSAID preparations- - due to their unique pharmacokinetic (PK) and pharmaco- dynamic (PD) profiles -offer a therapeutically equivalent yet exponentially safer alternative to their oral counterparts. In this article, we compare and contrast topical vs. systemic NSAID therapy, focusing on three notable drugs: diclofenac, ketoprofen, and ketorolac. With this information, we hope to illuminate the potential role of transdermal NSAIDs in managing localized pain and inflammation within the scope of sports medicine.

### Background

Pharmacologists have long understood that route of administration significantly impacts a drug's relative efficacy and safety outcomes. *Systemic* NSAIDs, taken orally or via injection, enter the bloodstream and provide widespread anti-inflammatory, antipyretic, and analgesic effects.[2]

How *exactly* do NSAIDs work? NSAIDs exert their therapeutic activity primarily through modulation of the arachidonic acid cascade by binding to and inhibiting cyclooxygenase (COX-1 and COX-2) enzymes. NSAIDs ultimately decrease the production of inflammatory biomarkers such as prostaglandin E2 (PGE2) and thromboxane A2 (TXA2). COX-1 is a naturally expressed isoform that plays a role in maintaining various physiological functions, including preserving renal function, protecting the gastrointestinal mucosa, and promoting platelet aggregation. Due to their widespread activity, the blockade of systemic COX-1 is directly responsible for the gastrointestinal, renal, and hematological effects observed with NSAID toxicity.

In contrast, COX-2 is the inducible isoform whose expression is regulated by cytokines and inflammatory mediators in multiple tissues, including endothelial cells. COX-2 is primarily associated with regulating pain, inflammation, and fever. The blockade of COX-2 expression by NSAIDs precipitates their therapeutic anti-inflammatory, antipyretic, and analgesic effects. However, this is not without its own concerns; NSAIDs with COX-2 selectivity are associated with an increased risk of cardiovascular events, which complicates their use in practice.

NSAIDs present a double-edged sword: although the systemic blockade of COX enzymes is a highly effective method in treating generalized pain and inflammation, it also presents a significant risk of gastrointestinal upset, ulceration, cardiovascular complications, and renal toxicity. To improve patient outcomes, researchers are looking to expand the availability of locally-acting NSAIDs,

which offer a targeted alternative by delivering the drug directly to the site of pain and inflammation, minimizing plasma exposure and, subsequently, the risk of systemic adverse reactions.

## The Transdermal Delivery of NSAIDs

Immediately upon application, the drug begins its journey by penetrating the skin's outermost and most significant barrier: the stratum corneum.[3] From there, it travels deeper into the dermis, then the hypodermis, eventually accessing nearby blood vessels. This direct path allows the topical drug to bypass the liver and GI tract notably, which means more of the medication reaches the target tissues where it's needed most.[4] When used appropriately, transdermal NSAIDs maintain minimal systemic plasma concentrations. Not only does the drug reach therapeutically efficacious levels within the targeted tissue(s), such as muscles, joints, and/or tendons, but also associated plasma drug levels are typically insufficient to precipitate systemic side effects.

After the transdermal NSAID has penetrated through the layers of skin, absorption rates affect how quickly the medication provides localized relief to the targeted tissues. Factors that affect the absorption rate include the formulation type (gel, patch, cream), skin condition, drug vehicles, and patient-specific factors.[4] Typically, gels and creams provide faster relief due to quicker absorption than patches, which utilize controlled-release technology for prolonged analgesic relief. Using permeation enhancers, nanoparticle technology, and electrophoresis increases absorption by enhancing drug permeation.

Following absorption of the medication through the skin, the next key factors to consider are bioavailability and half-life. These two critical factors determine how much of the drug reaches its target and how long it stays active in the body. Because transdermal NSAIDs bypass the gastrointestinal system and liver, they achieve higher bioavailability at the site of pain, ensuring more effective and sustained relief. At the same time, the steady absorption process influences their half-life, allowing for longer-lasting effects with fewer fluctuations in drug concentration.[5]

Transdermal delivery systems aim for the medication to reach the targeted tissue at concentrations high enough to exert a therapeutic effect with minimal concentration in the plasma to avoid systemic toxicities. As mentioned earlier, the drug has to penetrate the multiple layers of skin, and there are several parameters that affect transdermal delivery; ideally, a low molecular weight (<500g/mol), moderate Log p (1-5), low pKA (slightly acidic), moderate hydrophilicity, and high plasma protein binding.[4] If a drug lacks any of the parameters mentioned earlier, researchers may be able to utilize drug vehicles and/or innovative drug delivery techniques/technology to increase permeability and penetration through the skin and ultimately to improve absorption.

## The Star Players

**Diclofenac** (DF)

*History:* Diclofenac was first synthesized in 1973 by Alfred Sallman and Rudolf Pfister, with the goal of

> The end goal in transdermal delivery systems is for the medication to reach the targeted tissue at concentrations high enough to exert a therapeutic effect with minimal concentration in the plasma to avoid systemic toxicities.

> Transdermal NSAIDs offer a safer and more targeted approach to pain management for athletes, providing effective relief while minimizing systemic risks such as gastrointestinal irritation, cardiovascular complications, and renal toxicity.

creating a highly active and well-tolerated NSAID.[6] To date, diclofenac is one of the most commonly prescribed NSAIDs worldwide and is used to manage acute and chronic pain associated with musculoskeletal and/or inflammatory disorders. *Availability:* The following transdermal diclofenac preparations are FDA-approved: diclofenac sodium topical gel 1% (available OTC as of February 2020), diclofenac sodium topical solution 1.5%, 2%, 3%*, and diclofenac epolamine topical system 1.3%.

*DF sodium topical gel 3% (Solaraze) is indicated for treating actinic keratosis; it produces no musculoskeletal benefit. Solaraze is formulated to work on the stratum corneum rather than to permeate it.

*Kinetics:* MW: 296 g/mol Log P: 4.26-4.75 pKa: 4.0±0.2, Protein Binding: over 99.7% as a free (unbound) drug, diclofenac has poor solubility in water. However, DF salts (diclofenac as DF sodium, potassium, or epolamine) increase their hydrophilicity and cutaneous permeation, improving drug delivery to the affected tissues.[7]

**Ketoprofen** (KTP)

*History:* ketoprofen was first approved for managing pain ad inflammation in osteoarthritis and rheumatoid arthritis in 1986. In addition to COX activity, ketoprofen may exert its therapeutic effects via inhibition of lipoxygenase, as well as the stabilization of lysosomes.[8]

*Availability:* As of January 2025, FDA-approved transdermal preparations of ketoprofen are not available in the U.S. However, therapeutic efficacy and safety have been demonstrated in studies that have examined ketoprofen delivery via transdermal patches and semisolid (cream, ointment, etc.) formulas.[9]

*Kinetics:* MW: 254 g/mol Log P: 3.1-3.2 pKa: 3.8-4.5 Protein Binding: 99%[10]

A 2022 pharmacokinetic study by Senha et al. found that KTP reaches higher plasma levels with a patch when delivered through a transdermal patch compared to cream.[11]

**Ketorolac** (KT)

*History:* Ketorolac is an extremely potent NSAID that is typically used to manage acute, severe pain after surgery. Due to the significant systemic risks of oral KT therapy, unique restrictions exist.**

*Availability:* As of January 2025, FDA-approved transdermal preparations of ketorolac are not yet available in the US. Patients may utilize outsourcing facilities and/or compounding pharmacies with an appropriate prescription to acquire transdermal KT products. Therapeutic efficacy and safety studies have examined ketorolac delivery via transdermal patches and semisolid (cream, ointment, etc.) formulas.

*Kinetics:* MW: 255 g/mol Log P: 2.1 pKa: 3.5 Protein Binding: >99%[12]

When administered orally, KT's short half-life (4-6 hours) requires frequent dosing.

**Oral continuation of KT is solely indicated as a continuation of treatment following at least one IM or IV dose of ketorolac. Additionally, the duration of oral therapy is restricted to 5 days due to a significant risk of gastrointestinal hemorrhage.[13]

## The Athlete's Edge: Transdermal NSAIDs in Sports Medicine

Pharmacists are among the most accessible healthcare providers, with nearly 90% of the U.S. population living within five miles of a community pharmacy.[14] As trusted medication experts, pharmacists offer essential services such as dispensing medications, administering immunizations, and providing health recommendations to improve overall wellness. Pharmacists play a key role in optimizing patient care with their deep knowledge of medications and tailored clinical advice.

This accessibility becomes even more critical in the world of professional sports, in which athletes often face unique pain and injury challenges. Research indicates that athletes frequently self-administer over-the-counter medications such as NSAIDs with limited guidance. A 2022 study in the Scandinavian Journal of Medicine & Science in Sports revealed widespread use of these drugs among athletes, albeit the risks associated with prolonged NSAID use, such as gastrointestinal and cardiovascular complications, are well-documented.[15] While physicians and sports medicine professionals are readily available to manage physical injuries, Clinical Sports Pharmacists can offer specialized guidance to ensure safe, effective pharmacotherapeutic treatments that support an athlete's individual performance needs. Undoubtedly, Clinical Sports Pharmacists play a significant role in optimizing pain management strategies among all athletes.

## Conclusion

Transdermal NSAIDs offer a safer and more targeted approach to pain management for athletes, providing effective relief while minimizing systemic risks such as gastrointestinal irritation, cardiovascular complications, and renal toxicity. By delivering drugs like diclofenac, ketoprofen, and ketorolac directly to the injury site, transdermal formulations achieve high local bioavailability with reduced plasma exposure, making them particularly beneficial for sports-related musculoskeletal injuries. As research advances, innovations in transdermal delivery, such as permeation enhancers and nanoparticle technology, further improve efficacy and absorption. With their ability to provide consistent, localized pain relief, transdermal NSAIDs have the potential to become a key therapeutic tool for professional athletes, optimizing recovery while ensuring safer long-term use.

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# "You Are an Ironman" My Journey to Obtain a Lifelong Goal

***By*** Dr. Jeffrey J Gaarder

**AUTHOR BIO:**

Dr. Jeffrey J Gaarder is a pharmacist with Dakota Pharmacy in Bismarck ND, which specializes in nutrition, supplements and a certified compounding lab. He received his Doctorate of Pharmacy from North Dakota State University in 2005. After graduation, he worked for Chief Andrew Isaac Health Center as a Certified Diabetic Educator. This is where he developed his passion for nutrition and how nutrition and medication can support each other. Jeff competed as a winter biathlete for the Army's World Class Athlete program and has completed various adventure races, marathons, Mt bike races, road cycling races and various CrossFit competitions.

"You are an Ironman." The words still sends chills down my spine. Completing an Ironman had been a childhood dream, sparked by watching the Ironman World Championship on ABC's Wide World of Sports. Growing up with an endurance athlete for a father, I naturally followed suit - running, cycling, and competing in winter biathlons. I even qualified for the Army's World Class Athlete Program in high school. Yet, despite my experience, an Ironman felt out of reach, mainly because of one major hurdle: swimming.

Rewind to May 2023. A torn distal bicep tendon, my most significant injury, forced me into surgery, being braced for 12 weeks and a year-long recovery. This was a crushing blow for someone whose identity was built on movement. But instead of letting it define me, I shifted my perspective. If I would rebuild, why not chase the goal that had always felt beyond my grasp?

Around this time, I was reading *The Comfort Crisis* by Michael Easter, which introduced me to *Misogi*—a Japanese concept of taking on challenges so demanding that they have a high chance of failure. This is to challenge the fact that we as a society have become too comfortable in life. The book makes two rules for Misogi: Rule #1: Make it really hard. Rule #2: Don't die. Inspired by this philosophy, I set my sights on Ironman in 2024.

But this journey wasn't just about physical endurance - it was about science, strategy, and optimizing my body's recovery and performance. As a pharmacist specializing in sports medicine, I applied the same principles I use with athletes and clients: personalized nutrition, pharmacology, and rehabilitation strategies to push past limits.

This is the story of how sports, pharmacy, and a relentless pursuit of growth collided, leading me to redefine not just my athletic potential but also the way I approach performance, injury, and resilience.

Back to the story, swimming was still my greatest obstacle. Even six months after getting clearance to swim post-surgery, I struggled to make it more than 200 meters without feeling completely

> This wasn't just about endurance; it was about using my expertise to push my body further than I ever thought possible. The real question was: Could I bridge the gap between knowledge and execution?

drained. Just one month before my first sprint triathlon, I decided to swim 750 meters, no matter what it took. I committed to figuring it out, obsessively studying YouTube videos, reading every article on swim efficiency, and fine-tuning my technique. Eventually, I completed the full distance in a pool—slow, clumsy, and with a few backstroke recoveries, but I did it. And that was enough.

Race day came, and I finished the 750m swim in 22 minutes—far from perfect, but a personal victory. More importantly, I gained something I had lacked for years: *confidence*. That sprint triathlon proved I had what it took to push through discomfort and doubt. The Ironman no longer felt impossible—it felt inevitable.

I set my sights on a full Ironman at the end of 2024. My options were Florida, Arizona, and Cozumel. Arizona won out for two reasons: the cold water meant wetsuits were allowed (a lifesaver for weaker swimmers like me), and my parents lived there during the winter, making logistics easier.

With five months to prepare, *this would be extremely difficult*. I sought a brutally honest coach. Hiring a coach would give me the best chance at success. Still, he designed a training plan to maximize my chances of success. The structure was relentless - six days a week, cycling through three weeks of intense training followed by a deload week. Each week consisted of two runs, two swims, and two bike rides, split between tempo work and long, steady Zone 2 sessions. My "rest" weeks still demanded 5-6 hours of training, while peak weeks climbed to 16 hours, with weekends dominated by grueling 4-6 hour bike rides and 2+ hour runs.

Balancing this with my work as a pharmacist was a challenge in itself. But just as I applied sports science


to my patients, optimizing nutrition, recovery, and injury management, I now had to apply it to myself. I became my patient. This wasn't just about endurance; it was about using my expertise to push my body further than I ever thought possible.

The real question was: *Could I bridge the gap between knowledge and execution?*

With my training plan in place, it was time to focus on what many call the *fourth discipline* of long-distance triathlon: *nutrition*.

Luckily, I had a strong foundation to build on. My background in nutrition coaching with Working Against Gravity has given me a deep understanding of macronutrient needs and fueling strategies. But Ironman wasn't just about knowing what to eat. It was learning how to fuel for that long and training my gut to handle the sheer volume of fuel required to sustain my body for an event that could last over 12 hours.

The general rule of thumb for endurance athletes is to consume 80-100 grams of carbohydrates per hour, with some elite competitors pushing up to 200 grams. That's a staggering amount of fuel, and it's not something you can just *decide* to do on race day. I had to build up to it; just like training my legs for a marathon, I had to train my stomach to handle that intake without cramping, bloating, or worse (endurance athletes can have gastrointestinal effects).

Like I tell my clients, with any goal or habit, to start small break it down into steps. I started conservatively, aiming for 40 grams per hour and gradually increasing my intake over several weeks. Fortunately, my body adapted well, and I reached the 80-100 gram threshold without any significant issues. My fuel sources varied—I used a mix of gels, bars, and hydrogels (a carbohydrate gel mixed with water) and some whole foods, mainly fruits, that would be available on race day.

## Race-Day Fueling Strategy

**Swim:** Before diving in, I took in 65 grams of a gel form of carbs and 100 mg of caffeine. The swim could take up to two hours, and with no opportunity to refuel, I wanted energy on board before I hit the water.

**Bike:** The bike leg is where most of the fueling happens. My plan was to rely heavily on gels, bars, and hydrogels—fuel that was easy to digest and didn't require me to slow down at aid stations since I carried most of what I needed on my bike.

**Run:** By the time I hit the run, I knew my body would start craving more solid food, so I planned to transition to fruit and other aid station options. Electrolytes would also become critical here—dehydration and cramping could derail my race, so I took in water and electrolyte solutions at every aid station.

**Dialing It In**

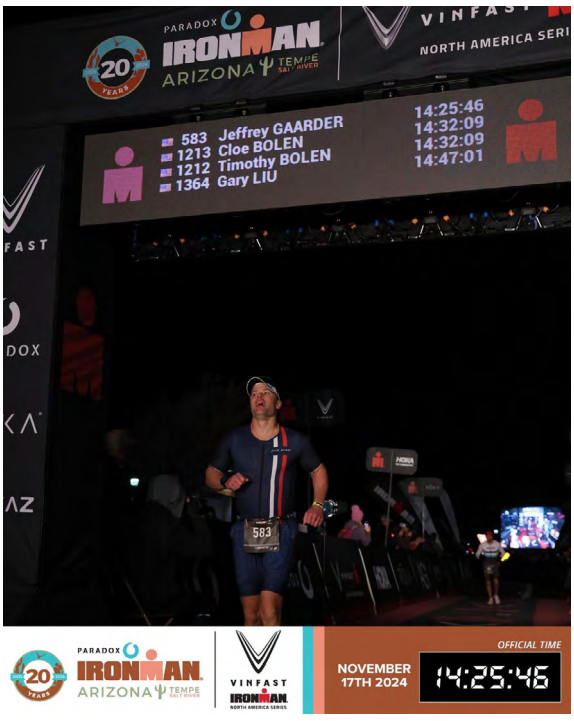
Nutrition in endurance sports is never one-size-fits-all, so this process was all about trial and error. I had to find the right mix of carbs, fluids, and electrolytes that kept my energy levels steady without upsetting my stomach. It was just as much of a science as the physical training itself.

With my nutrition plan dialed in and my training in full swing, the reality of Ironman Arizona was setting in. The months ahead would test my limits, but I finally felt like I had the knowledge, the plan, and the confidence to make this goal a reality.

With the physical training and fueling strategy for race day in place, I had to take another step and evaluate something just as critical—*my daily nutrition*.

Long-distance triathlon training requires enormous energy. Balancing 40-hour work weeks, quality time with my family, and hours of training meant constantly pushing my body to its limits. Early on, I found myself dragging from one day to the next, struggling with fatigue beyond usual training exhaustion. At first, I chalked it up to the increase in training volume, but after digging deeper, I realized I simply wasn't eating enough.

I adjusted my daily intake based on my workout demands to fix this. I bumped my calories by an extra 250 to 500 daily, with my longest training sessions requiring up to *1,000 additional calories*. Keeping my macronutrients balanced was also key—I aimed for around *1 gram of protein per pound of body weight*, kept fat at about *30% of my daily intake*, and the rest came from carbohydrates to fuel performance and recovery.




## Supplements for Recovery and Performance

Beyond a foundation and focus on whole foods, supplements were crucial in keeping me healthy and ensuring my body could handle the constant physical stress. My daily foundation included:

- **Fish Oil (2g)** – For inflammation and joint health
- **Multivitamin** – To cover any micronutrient gaps
- **Vitamin D** – Especially important for immune health and bone strength
- **Magnesium Glycinate** – Improved sleep quality and muscle recovery
- **Probiotic** – Gut health is critical for overall performance

For training-specific support, I added:

- **Creatine (5g daily)** – Helped with muscle endurance and recovery
- **Beta-Alanine** – Reduced muscle fatigue and soreness
- **B Complex** – On more challenging training days for energy metabolism

Beta-Alanine and Creatine significantly reduced my muscle soreness, which meant I could hit my sessions harder without lingering fatigue. The biggest game-changer was magnesium at night. It improved my sleep quality, and better sleep meant better recovery. Again, these supplements were truly supplements to a strong nutritional plan foundation and a structured training program that allowed for recovery.

## Race Week: The Final Countdown

After months of preparation, race week was finally here. The Ironman race was scheduled for Sunday in Tempe,AZ, and I arrived in Phoenix the Wednesday before. Coming from North Dakota in November, I needed time to acclimate to the heat and sun. My training was minimal at this point—it was all about recovery, maximizing sleep, and fueling properly so my body was fully ready for race day.

Thursday was check-in day; that's when everything started to feel real. I received my official race numbers, swim cap, and transition bags. Walking around the venue gave me my first real look at parts of the swim and run course. Standing on the bridge at the swim start and looking down to where we'd turn around was a humbling moment—it was a *l*ong way down and back. But seeing it in person helped me mentally prepare for what was ahead.


Next, we drove the bike course to the turnaround point. This was one of the best things I could have done. Knowing the layout, elevation changes, and where I could push versus conserve energy gave me added confidence.

## Prepping for Race Day: Transitions and Special Needs Bags

The next big task was packing my transition and special needs bags. In Ironman, once you check these bags in, you can't access anything outside of them, so I had to be strategic.

### Transition 1 (Swim → Bike)

This bag held everything I needed for the bike leg:

- Bike shoes
- Helmet
- Nutrition (gels/bars)
- A windbreaker (with morning temps around 40°F, this would be disposable at an aid station)

### Transition 2 (Bike → Run)

This was all about getting ready for the marathon:

- Running shoes
- Fresh socks
- Hat & sunglasses
- Anti-chafing cream (a lifesaver after hours on the bike)

## Special Needs Bags (Mid-Race Essentials)

I had two special needs bags—one for the bike and one for the run, accessible mid-race if needed.

**Bike Special Needs Bag:**

- Spare tubes & CO2 cartridges (just in case of a flat)
- Peanut Butter Snickers (*something different in case I craved real food*)

**Run Special Needs Bag:**

- Small headlamp (in case I was still running after sunset)
- Anti-chafing cream
- Another Peanut Butter Snickers (because why not?)

## The Night Before: The Calm Before the Storm

On Saturday night, we checked in our bikes and transition bags. This was a big help in simplifying race morning—no last-minute scrambling, just focusing on getting to the start line.

As I stood there looking at all the bikes racked in transition, I had a moment of realization. This was it! Months of training, planning, and preparation had led to this moment. I had done everything I could to set myself up for success. It was time to trust the process and prepare for race day.

## Race Day

Race day was finally here. Everything I had trained for came down to this moment. To say I was nervous would be an understatement.

The race started at 6:50 a.m., so I woke up around 4:30 to eat and get to the venue an hour before the start. My breakfast was primarily carbohydrates to ensure I had the glycogen stores needed for the day ahead. Proper fueling before a race is key - aim for familiar, easily digestible carbs with a bit of protein to stabilize blood sugar. A common mistake athletes make is trying something new on race day. If you haven't trained with it, don't eat it before or during competition.

Upon arrival, I headed to the transition area to check my bike. I ensured the tires were properly inflated, the gears were shifting smoothly, and all my hydration and nutrition were in place. Then, it was time to put on my wetsuit, goggles, and swim cap before heading to the swim start. The water was a chilly 60 degrees, with the air at 40 degrees, making for an extremely cold start, even for a guy from North Dakota. Cold water immersion can shock the system, increasing heart rate and breathing rate, so it's essential to practice in similar conditions before race day.

The swim start was self-seeding, with five people entering the water every five seconds. Knowing the unpredictability of open water, I positioned myself in the 1:30–1:40 pace group, a bit slower than my pool training times. The cold water took my breath away, and it took nearly 1,000 meters before I could settle into a rhythm. The first half of the swim took me an hour, but as I adapted, I picked up the pace, completing the second half in 50 minutes. Transitioning out of the water was tougher than expected—my legs gave out as I tried to stand, a reminder of how different swimming is from land-based movement. Fortunately, volunteers were there to assist.

I was exhilarated, knowing that the swim was my biggest challenge. With that hurdle cleared, I felt confident moving into my strongest discipline: cycling.

The bike course was an out-and-back route, featuring a tailwind on the slight uphill outbound leg, which meant a challenging headwind on the return. Despite this, the ride went exceptionally well. One major mistake was losing two bottles from my aerobar-mounted holder due to poor positioning and rough road conditions, an important lesson in securing hydration properly. The bike leg is often the best time for solid fueling, as digestion is still efficient; my goal was to consistently consume 100 grams per hour. The increasing wind made the final stretch challenging, but I finished strong in 6 hours and 15 minutes, right around my goal pace.

Heading into the marathon, I felt good, still riding the high from the bike. I planned to complete the run in around 4 hours, stopping at aid stations for water, electrolytes, and carbs. The first few miles felt better than expected, though I quickly grew tired of bars and gels and switched to oranges and bananas. Note to self and others, consider in future training for variety. The run was a three-loop course, so I was uncertain about pacing early. By mile 9, my left knee and hamstring started to ache, and by mile 13, I was in significant pain. This is where race-day adaptations become critical- listening to your body and adjusting as needed. By mile 18, I alternated between running for three-quarters of a mile and walking for a quarter-mile to manage the pain.

At mile 25, I tore the toenail off my pinky toe, reducing me to a shuffle for the final stretch. The last mile was sheer grit and determination, but I crossed the finish line in 14 hours, 24 minutes, and 46 seconds. I became an Ironman

Reflecting on the race, several key takeaways stood out:

1. **Train in the conditions you'll race in.** Cold water, wind, and long endurance efforts all require specific preparation.
2. **Dial in your nutrition and hydration strategy.** What works in training is what will work on race day.
3. **Listen to your body and adapt.** Pain and discomfort are part of endurance racing, but knowing when to adjust pacing or fueling can make the difference between finishing strong and struggling.
4. **Prepare for the unexpected.** Losing hydration bottles, changing food preferences mid-race, and dealing with pain are all challenges that require quick problem-solving.

Every race is a learning experience. Completing the race, no matter the time on the clock, was a testament to training, resilience, and the power of perseverance.

## Embracing the Journey: How You Can Apply This to Your Own Goals

Looking back, I realize this journey wasn't just about race day, it was about the months of dedication, the early mornings, the grueling training sessions, and the mental battles along the way. It was about proving to myself that I could push past my limits and achieve something that once seemed impossible with discipline, consistency, and the right mindset.

Hearing my name called at the finish line was a powerful reminder that we are capable of far more than we often give ourselves credit for. But this isn't just about completing an Ironman—it's about the lessons learned through the process. The same principles apply to any goal you set, whether in fitness, health, or life.

Your journey may not involve a starting gun or a finish line, but it will require commitment, resilience, and belief in yourself. Break big goals into smaller, manageable steps, fuel your body and mind with intention, embrace the setbacks as part of the process, and most importantly—keep moving forward. Because on the other side of that struggle is a version of yourself you haven't met yet—one that is stronger, more confident, and unstoppable.

Whatever challenge lies ahead for you, know this: if you show up, put in the work, and trust the process, you are capable of more than you ever imagined. And that finish-line moment—whatever it looks like for you—will be worth every effort. Now, go chase it. What is your misogi?

Completing a lifelong dream of hearing "Jeff Gaarder, You are an Ironman" will give me chills for the rest of my life. I would like to thank the Ironman volunteers, my parents for being present during the race, and the rest of my family for putting up with the insane training hours. When asked if I would do another race, I said absolutely. It is such an amazing event and atmosphere.

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# Advancing Women's Sports Through Performance Health:

## The role of a Sports Pharmacist

*By* Emily Shears, B.Pharm, Grad Dip. Ex Sc, M.Ed, FASLM FANZCAP

**AUTHOR BIO:**

Emily is a pharmacy leader with extensive experience in holistic athlete health and development. Founder of The Female Athlete Network, which empowers female athletes through innovative education programs and collaboration with healthcare professionals, creating streamlined referral pathways and best practice health outcomes. Emily holds a Bachelor of Pharmacy, Graduate Diploma Exercise Sport Science, Master of Education and is Fellow of the Australian Society of Lifestyle Medicine and Fellow of Australian and New Zealand College of Advanced Pharmacy. Emily is unashamedly passionate about driving improvements in health and wellbeing for female athletes having also had lived experience as an athlete as a University of Sydney graduate on a sports scholarship for rowing and athletics, and a former athlete in the Australian Institute of Sport's Talent Identification Program for the Women's Skeleton Team (Torino 2006).

Women's sport is experiencing a well-deserved surge in participation, media coverage, and spectator interest. Across the globe, young women are inspired by their sporting heroes, fostering increased grassroots and professional-level involvement. However, this growth also highlights gaps in the infrastructure supporting female athletes, particularly in funding and the knowledge base required for the unique needs of a female athlete across their lifespan. Globally, research specific to female athletes' accounts for only 4-13% of sports science studies, underscoring the importance of developing tailored strategies for their health and performance. (1)

At the heart of addressing these challenges is the concept of **performance health**, defined as "a state of optimal physical, mental, and social well-being related to an athlete's sporting success." (5) This holistic approach ensures athletes perform at their peak and thrive off the field. Emily Shears, founder of The Female Athlete Network, highlighting her role as Performance Health Manager for a professional Australian Football League Women's (AFLW) Club team, exemplifies how this principle can reshape female athlete care. Her transformative role demonstrates the immense value of interprofessional healthcare teams, including sports pharmacists, in advancing women's sports.

Emily Shears, founder of The Female Athlete Network, has served as the Performance Health Manager for a professional Australian Football League Women's (AFLW) team, applied her extensive knowledge to reshape female athlete care. Through her leadership and genuine collaboration with interprofessional healthcare teams, Emily has established herself as an integral leader within the health and performance teams, advancing women's sports and optimizing care for female athletes.

### Building a Culture of Health-First Performance

Over the past three years, Emily has driven a cultural shift within AFLW Club, embedding female athlete health as a cornerstone of performance strategy. This evolution has led to measurable outcomes, including increased engagement with healthcare services tailored to women, reduced player-reported impacts of menstruation on training and competition, and improved health literacy among athletes. Emily's initiatives have also increased demand for specialized practitioners, such as women's health physiotherapists, addressing critical issues like pelvic pain, incontinence, and other conditions that affect performance and quality of life.

Integral to Emily's approach is recognizing that female athletes face unique and ongoing challenges, including physical, social, mental, and cultural demands. In general population statistics, 2 out of 3 women report gender bias in healthcare, including 70% of women reporting experiencing bias on diagnosis and treatment, 62% of women finding health unaffordable, and 45% of women reporting healthcare as inaccessible. (6) Traditional high-performance sports medicine models often prioritize physical metrics alone.

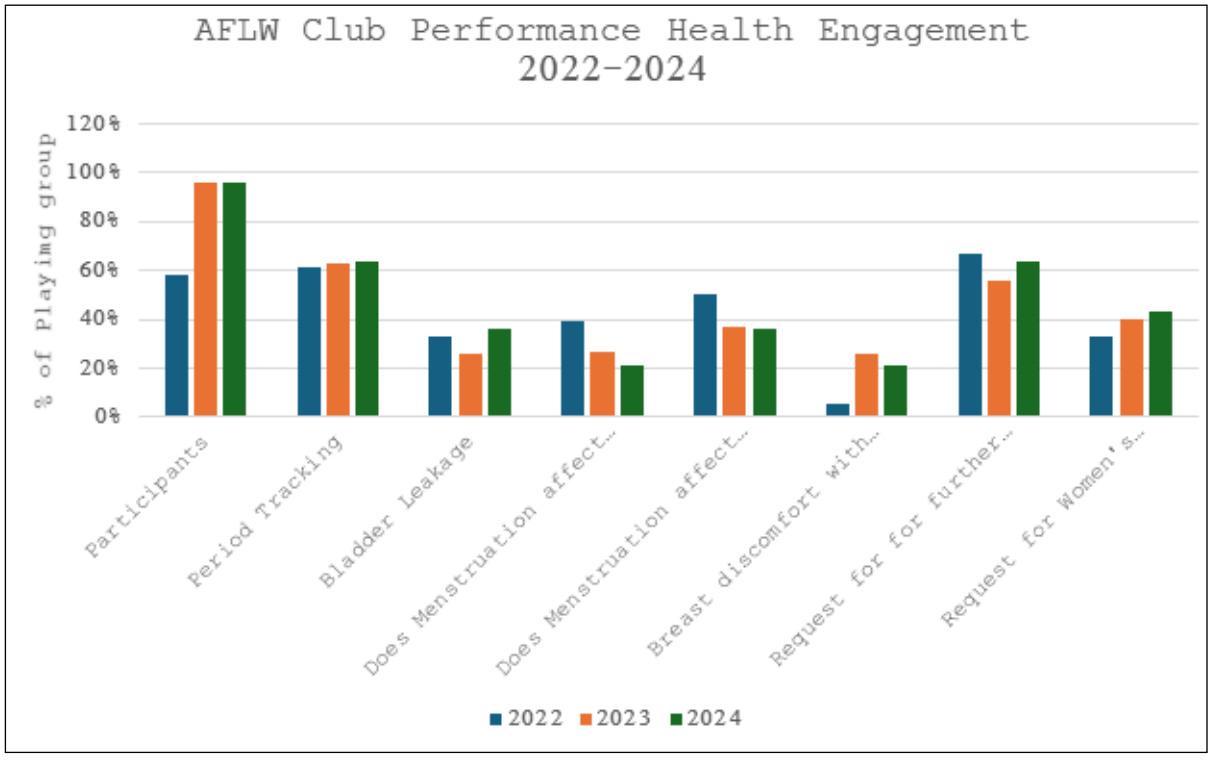


Table 1.1 Survey trends 2022-2024 Optima Performance Women's Health (annual) Screening

Emily, however, has championed a comprehensive model that considers mental well-being, overall health, and performance as interconnected factors.

## Innovative Strategies and Collaborative Teams

During Emily's tenure, a key innovation was the strategic shift from employing a traditional sports physician to hiring a general practitioner (GP) with expertise in women's health. This move expanded the team's capacity to address general health issues as precursors to performance. This model enabled comprehensive screening and management of players' overall health, with the Club subsidizing care beyond musculoskeletal concerns—an assurance that few AFLW clubs provide.

For instance, the team implemented intensive screening protocols for general and women's

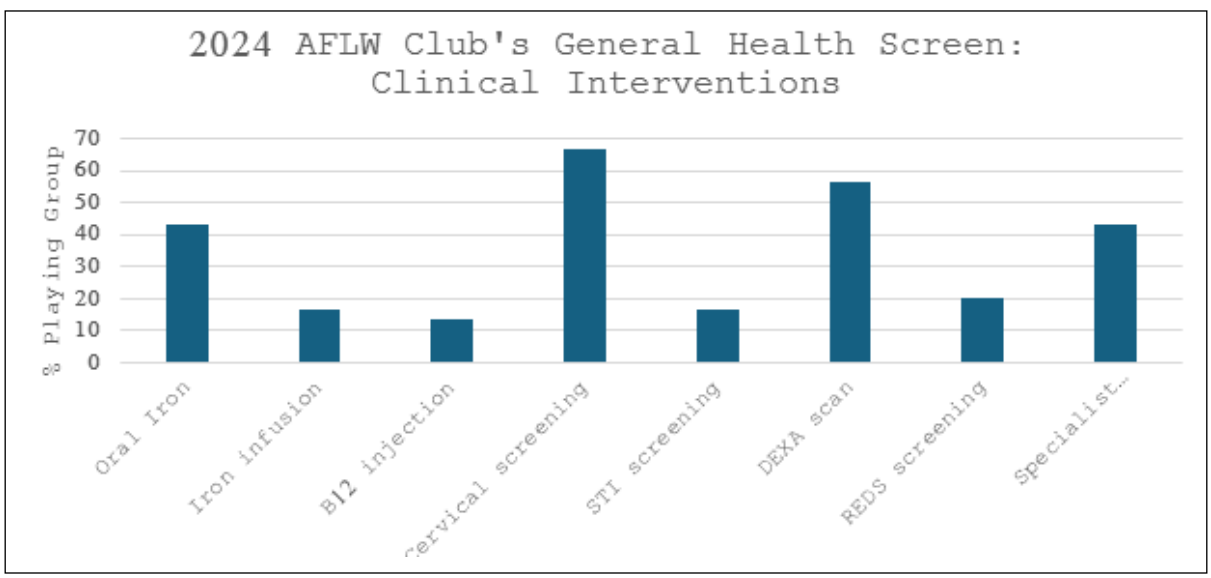


Table 1.2 AFLW Club Women's General Health clinical interventions as a response to General Health Questionnaire, February -> September 2024.

health. Although not represented in Table 1.2, the implementation of blood tests every three months in 2024 to obtain optimal iron levels (serum ferritin >35 µg/L) and B12 levels (400 - 700 pg/mL) for sports performance. (7,8) The number of iron infusions has reduced from 18 in 2023 to only 5 in 2024 at a cost saving of $4,290 for the 2024 season. Early intervention with oral supplementation and monitoring has been effective for athlete health and performance.

Outcomes from health screenings are triaged by a multidisciplinary health team comprising the Performance Health Manager, GP, sports physiotherapists, dietitians, and women's health specialists. The health team implemented case conferences, where the health screen results were overlaid with physical screen results obtained by their strength and conditioning coach and team musculoskeletal physiotherapist. The physical screening includes any indicators of lumbopelvic region pain or weakness in addition to absolute strength testing, balance, general strength, power, movement, speed, and podiatry assessment. This collaborative approach enabled the development of tailored care plans addressing health and performance.

## The Role of Sports Pharmacists in Female Athlete Care

As a sports pharmacist, I have witnessed the profound impact Emily's work has had—not just on her Club and those women but on the broader discourse around female athlete health. Her innovative strategies illustrate the critical role sports pharmacists can play in interprofessional teams. Pharmacists bring expertise in medication management, supplement safety, and personalized health strategies that optimize performance without compromising athlete well-being.

Emily's decade of experience in high-performance sports has revealed a persistent misconception: that all athletes are inherently healthy. Research tells a different story. The 2021 Global Burden of Disease study found that injuries account for 6% of the world's disease burden, with athletes experiencing injury rates 3-5 times higher than the general population. (2) Moreover, a 2022 Australian study reported a 3.6-fold increase in illness among female athletes compared to their male counterparts. (3)

Sports pharmacists address these gaps by integrating metabolic, menstrual, sleep, and nutritional considerations into performance strategies. Emily's collaboration with healthcare professionals has

demonstrated how pharmacists can support athlete care through evidence-based interventions prioritizing health and performance.

Emily's case study highlights the complex needs of female athletes for comprehensive, collaborative care.

## Case Study

*Presentation/History:* Athlete AB, a 25-year-old professional AFLW footballer, presented with complex diagnosed menstrual health (endometriosis) and gastrointestinal health disorder with many associated signs and symptoms, including chronic hip and pelvic pain flaring to the point that significantly impacted the ability to train or play. Additionally, at the time of presentation, she had a diagnosis of acute hamstring tendinopathy. Further assessment with the women's health physiotherapist identified the player as having hypertonic pelvic floor muscles (always switched on or in contraction) and hip and hamstring anomalies, supporting the musculoskeletal physiotherapist's identification of hamstring and hip weakness.

*Previous medical management:* Chronic pelvic pain secondary to endometriosis. Mirena IUD inserted and laparoscope completed 2023. Prior Left hip pain in 2023 that responded well to CT-guided intra-articular steroid injection. Athlete AB also has a history of general anxiety disorder with no current symptoms and a previous diagnosis of irritable bowel syndrome, no clear triggers, using a self-directed FODMAP diet plan.

*Assessment findings*: Right hip labral pathology (2024) and mild proximal hamstring tendinosis.

*Main problems:* Pain was identified as the most significant impact on the ability to play and train.

*Treatment interventions utilized:* Case conference with health and medical team concluded multiple interventions.

As a sports pharmacist, my pharmacological recommendation was to begin Amitriptyline at 10mg and titrate up to a maximum of 50mg nightly over 6 weeks. Amitriptyline was selected for its neuropathic pain mechanism of action, which influences signaling to the brain via serotonin and noradrenaline, giving the added benefit of an antidepressant and anti-anxiolytic; furthermore, Amitriptyline may also improve a patient's IBS pain and discomfort threshold. In addition to adding Amitriptyline, AB was taught to use self-relaxation techniques and breathwork to help with anxiety and overall body relaxation.

The health and medical team agreed to repeat a right hip intra-articular steroid injection. As a collective, it was concluded that given the good result from

her previous injection, this outweighed the side-effects risk profile at this time point of the pre-season if all other supporting mechanisms (women's health and musculoskeletal physiotherapy measures) were implemented and adhered to in readiness for in season. As the pre-season screening and subsequent interventions occurred, no Therapeutic Use Exemption (TUE) was required, as the athlete was not 'in competition.' The athlete was educated on the risks involved with multiple steroid injections as part of the consent process for medical procedures.

Athlete AB will also have weekly off-site women's health physiotherapy, including education on self-release methods. A musculoskeletal physiotherapist will also be involved in the weekly mobilization and creation an individualized pelvic floor and hip mobility strengthening program.

Lastly, as part of the comprehensive transdisciplinary team, the athlete will also work with the GFC Club performance dietitian to assess current nutrition and develop a comprehensive and sustainable anti-inflammatory dietary plan ensuring adequate caloric intake both in and out of season.

*Outcome:*

Within four weeks, Athlete AB self-reported a pain scale reduction from 8 to 3. The athlete could also return to full training with teammates and play

matches within this timeframe. Before this, training completion was impacted and reduced, and game time minutes were managed. Of the 11-game season, Athlete AB could play all 11 games following interventions. Across 11 games in 10 weeks, amitriptyline was well tolerated and titrated up to 50mg nightly for in-season. It was able to be ceased post-season as Athlete AB elected to focus on non-pharmaceutical interventions to manage pelvic pain for the off-season. Time on the field and playing are complex values, but for the Club, playing time and performance are vital for long-term success and contract renewal, but not at the expense of player health.

## Setting a New Standard in Women's Sports

As part of the end-of-season out-duction process, all players were surveyed regarding their experience implementing targeted Women's Health practices for Performance Health across the 2024 season. Overwhelmingly, 50% of the athletes believe that the interventions made in 2024 improved their ability to train in pre-season and in-season, and 90% of athletes reported that they would like to see the Women's Health focus on Performance Health continue in 2025 .

One example of the challenges faced and impacts made to support female athletes was dealing with breast pain. The AFLW athletes' within this cohort experience mirrored a recent Australian study published. Five hundred and forty female athletes competing nationally or internationally across 49 different sports participated in the survey. Sixty-three percent of respondents reported experiencing breast pain associated with their menstrual cycle, and 33% reported that this pain worsened during activity. Forty-four percent of athletes reported experiencing exercise-induced breast pain during training or competition. Both types of breast pain were also reported to negatively affect sporting performance (20% and 32%, respectively). (4) With education and simple interventions by Emily and her interprofessional team across the 2024 AFLW season, athletes within the AFLW club reduced the reporting of breast pain from 22% to 0%, as highlighted in the pre-and post-season Women's Screening conducted by Optima.

The AFLW Club's holistic approach to athlete care, led by Emily, sets a benchmark for what can be achieved when female athletes and performance health are prioritized. By fostering collaboration among healthcare professionals and emphasizing the unique needs of female athletes, Emily's work enhances athletic performance and advances the broader movement for equality in sports.

Her success highlights a replicable model that other teams and organizations should consider: an interprofessional approach where sports pharmacists are integral to promoting health, optimizing performance, and empowering athletes to excel.

Emily summarizes it best: Our story and experience very much support the groundswell of the need for more significant financial and professional resources within the elite women's sporting context. Managing and caring for a player list of 30 athletes and prioritizing health as a precursor to performance is both a challenge and joy; however, I look forward to a time when supply can meet demand for athletes in our care and your care everywhere.

Health and well-being are the foundation of success, whether in sports or everyday life. Just as the Club prioritized comprehensive care to support its athletes, we, too, can take a proactive approach to our health. Let's make 2025 a year in which we embrace holistic practices, invest in our physical and mental well-being, and empower ourselves and others to thrive in every aspect of life.

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# What Athletes Need to Know About Exosomes

*By The United States Anti-Doping Agency (USADA)*

**AUTHOR BIO:**

The U.S. Anti-Doping Agency (USADA) is recognized by the United States Congress as the official anti-doping organization for all Olympic, Paralympic, Pan American, and Parapan American sports in the United States. USADA began operations on October 1, 2000, as an independent, non-profit organization governed by a Board of Directors. USADA was given full authority to execute a comprehensive national anti-doping program encompassing testing, results management, education, and research while also developing programs, policies, and procedures in each area.

Medicines or treatments derived from the body itself or from other living organisms are referred to as biologics. The use of biologics in regenerative medicine is becoming more and more popular.

While the use of cells, whether normal or genetically modified, to enhance performance is prohibited by the World Anti-Doping Agency (WADA), many athletes have questions about the status of various biological treatments that do not contain cells. For example, the use of extracellular vesicles, such as stem cell exosomes, is often in question.

As such, below are answers to some commonly asked questions about therapies involving extracellular vesicles.

## What are biologics?

There are many clinics that offer all kinds of cell or blood-based therapies to treat medical conditions, including injuries to muscle, tendon, and ligaments. The most common type of therapy advertised is where the clinic takes blood from the patient and then isolates a component of the blood to reinject back into the patient, often at the site of injury.

Examples include Platelet Rich Plasma (PRP), which concentrates plasma and platelets, stem cell therapies that isolate stem cells from the blood, or exosome therapy, which isolates stem cell exosomes (a type of extracellular vesicle) and reinjects those back into the patient. There are other types of procedures in addition to these.

## What are extracellular vesicles?

Extracellular vesicles are released from all cells of the body and are considered an important part of cellular communication and maintenance. There are many types of extracellular vesicles depending on their size and the cell type from which they originated. Examples include exosomes, microvesicles, and apoptotic bodies. One type of extracellular vesicle used in therapy is the stem cell exosome, but extracellular vesicles are an inherent part of cell biology and are released by every cell type, not just stem cells.

Recently, extracellular vesicles, such as stem cell exosomes, have been explored and advertised as a form of personalized medicine. One common procedure is for blood to be harvested from the patient's own body, then the extracellular vesicles are isolated in some way by removing all of the cells (i.e., red and white blood cells and any other circulating cells are removed), and then the vesicles are reinjected back into the patient. As with all biologics, the anti-doping status is related to the actual contents of the product and whether any prohibited substances were added in the preparation of the product.

## Are extracellular vesicles (such as exosomes) prohibited by WADA?

In most cases, exosomes are not prohibited. However, there are circumstances where the use of such therapies could be an anti-doping rule violation. For example, it is prohibited:

1. If the exosome preparation contains red blood cells (even if by accident, such as when there are a few red blood cells remaining after most of them are filtered out) and it is then given intravenously.
2. If the procedure collects exosomes and then adds growth factors, hormones, or any prohibited substance to the preparation, and that is reinjected back into the patient.

The FDA goes on to clarify that anyone considering regenerative medicine, including stem cells, exosome products, or anything derived from adipose tissue (stromal vascular fraction), umbilical cord, Wharton's Jelly, or amniotic fluid, should be aware that none of these have been approved to treat tendonitis, tennis elbow, or pain of the back, hip, or knee. Exosomes and other regenerative medicine products are advertised for many other conditions as well, but are not approved for such uses. Read the FDA Consumer Alert for more information.

If the procedure has the potential to enhance performance, it could also be prohibited. Athletes choosing to receive exosome therapy should ask their doctor if any growth factors or hormones will be added to the exosome preparation. If so, the athlete should search for each substance that will be added on GlobalDRO.com to check the anti-doping status before receiving the treatment. If the substance is prohibited, athletes may apply for a Therapeutic Use Exemption prior to treatment

## Are there health risks associated with extracellular vesicles?

The FDA has issued an alert following severe adverse reactions of patients receiving exosome [a type of extracellular vesicle] treatment at a clinic in Nebraska. The FDA Safety Alert clarifies the following:

*"Exosomes used to treat diseases and conditions in humans are regulated as drugs and biological products under the Public Health Service Act and the Federal Food Drug and Cosmetic Act and are subject to premarket review and approval requirements. Clinics may claim that they these products do not fall under the regulatory provisions for drugs and biological products – that is simply untrue. There are currently no FDA-approved exosome products."*

## More questions?

For questions about specific products, substances, and methods, contact USADA's Drug Reference Line at drugreference@USADA.org or call (719)-785-2000 and follow the prompts. There is also a TUE Pre-Check Form that athletes can submit to get a quick response on whether a TUE is necessary.

## More education?

In addition to educating athletes and offering real-time support, USADA offers resources and tutorials for athlete support personnel, including health professionals and coaches.

- HealthPro Advantage (free and in collaboration with Stanford University)
- Coach's Advantage

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