

SPECIAL EDITION: MUSCULOSKELETAL

# colleagues in care

BRINGING RESEARCH INTO PRACTICE  
WINTER 2017



INSIDE:  
**Human growth  
hormone may  
preserve  
musculature  
strength in  
ACL tears**

# colleagues in care

**HUMAN GROWTH HORMONE MAY PRESERVE MUSCULATURE STRENGTH IN ACL TEARS** ..... 4

**IMPORTANCE OF BONE HEALTH IN FEMALE ATHLETES** ..... 7

**HAND AND UPPER EXTREMITY INJURIES IN MUSICIANS** .. 10

**TREATING PAIN WITH NON-OPIOID MEDICATIONS** ..... 12

**MANAGING OVERALL HEALTH IN PATIENTS WITH CEREBRAL PALSY** ..... 15

**MICHIGAN INTEGRATIVE MUSCULOSKELETAL HEALTH CORE CENTER ACCELERATES CROSS-DISCIPLINARY RESEARCH** ..... 18

**ADVANCED TREATMENT OPTION FOR TENDINOPATHY: PLATELET-RICH PLASMA INJECTIONS** ..... 20

**INVESTIGATING THE DISPARITY BETWEEN IDENTIFIABLE DAMAGE AND CHRONIC PAIN** ..... 22



**PAGE 4**



**PAGE 20**

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# HUMAN GROWTH HORMONE MAY PRESERVE MUSCULATURE STRENGTH IN ACL TEARS

**Anterior cruciate ligament (ACL) tears are among the most frequent traumatic knee injuries in both professional and recreational athletes.**

But despite the fact that surgical procedures to repair the injuries have good outcomes, many patients face lengthy periods of muscle atrophy.

“Even with our best efforts in terms of rehabilitation, when we send patients back out to play sports, they still have muscle weakness at the site of the tear, particularly at the quadriceps, the main thigh muscle extending from the knee,” says Christopher Mendias, Ph.D. (below left), associate professor of orthopaedic surgery, and molecular and integrative physiology. “Short term, patients are weaker on that knee and could get reinjured. Long term, what we see is a very good chance of developing osteoarthritis and eventually needing a knee replacement.”

Mendias explains that normally during exercises, such as jogging, forces are transmitted through the muscles. If the muscles are weak, those forces will instead travel through the bones, hitting the cartilage that connects the bone to the joints.

“You’re looking at decades of having a painful knee,” Mendias says. “It’s a slow process in which the cartilage erodes. Average weekend warriors may need to wait six months after ACL surgery to return to normal activity. For professional athletes, that time is likely to be up to 11 months.”

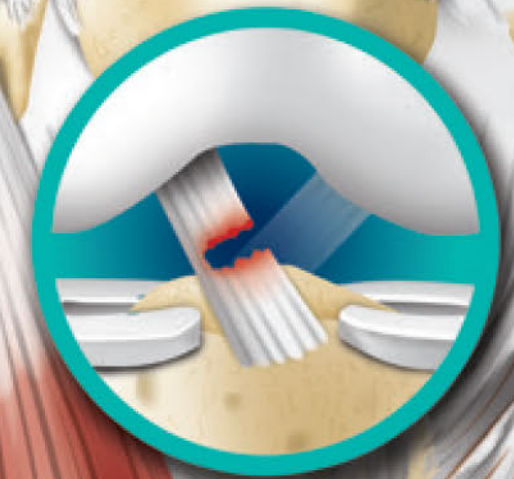
With \$800,000 in funding from the Mark Cuban Foundation, Mendias and his colleague, Asheesh Bedi, M.D. (below right), service chief for sports medicine and associate professor of orthopaedic surgery, are now studying human growth hormone (HGH) as a potential means to preserve the strength of the thigh musculature that would otherwise be lost through an ACL tear and resulting treatment.

The clinical trial will compare HGH with a placebo in 50 men, ages 18 to 35 years, who have had a recent ACL tear, but no previous major knee injuries.

Participants will inject themselves with HGH or a placebo twice daily, starting a week before surgery and continuing until five weeks after surgery. The investigators will use magnetic resonance imaging and muscle strength tests to compare both knees during the course of therapy and up to six months after surgery, and will collect patients’ experiences with the supplement. Women are excluded from the study because of concerns about HGH’s effect on a developing fetus.




DURING EXERCISE FORCES ARE TRANSMITTED THROUGH THE MUSCLES. IF THE MUSCLES ARE WEAK, THOSE FORCES WILL INSTEAD TRAVEL THROUGH THE BONES, HITTING THE CARTILAGE THAT CONNECTS THE BONE TO THE JOINTS. THE IDEA IS THAT BY ADMINISTERING GROWTH HORMONE IN THAT EARLY TIME PHASE AFTER THE ACL TEAR, WE CAN PREVENT SOME OF THE LOSS IN MUSCLE MASS.



“Once muscle is lost, it’s really hard to get that strength all the way back,” Mendias says. “The idea is that by administering growth hormone in that early time phase after the ACL tear, we can prevent some of the loss in muscle mass. Then patients will have a stronger base to work on during rehabilitation following surgery.”

HGH, which stimulates cell growth and cell regeneration, is available only by prescription for a small list of approved uses, such as childhood growth disorders and wasting disease. But, it has been shown to protect against muscle weakness in some basic science studies.

HGH has been banned by some professional sports organizations, but Mendias says that while the hormone does shrink fat and cause muscle tissue to absorb water and improve definition, it does not enhance athletic performance, so there are no doping effects on otherwise healthy muscle.

Mendias and Bedi received approval from the U.S. Food and Drug Administration to conduct the two-year study. If the study is successful by its completion in late 2017, Mendias will approach the FDA about expanding the study to more patients in additional locations. 

For more information or to refer a patient, contact

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## IMPORTANCE OF BONE HEALTH IN FEMALE ATHLETES

Although exercise is essential for building and maintaining bone mass, in some cases, it can potentially take a negative toll on bone health.

“Young female athletes are at risk for Female Athlete Triad, or relative energy deficiency in sports syndrome [RED-S],” says J. Lindsay Quade, M.D. (left), instructor in internal medicine and primary care physician specializing in sports medicine. “We need to watch for this syndrome in men, too, but it is more commonly seen in women. Women who suffer from this aren’t having their menstrual periods and, therefore, they’re not getting the benefits of estrogen, which is important for bone health.”

Female Athlete Triad was first recognized in 1997 by the American College of Sports Medicine as a syndrome with three components: energy availability, menstruation and bone health (*J Acad Nutr Diet* 2016;116:74). Men also are susceptible to the effects of insufficient energy availability. In 2014, the International Olympic Committee introduced an alternative term, RED-S, to encompass symptoms related to energy deficiency that can occur in all athletes, including men. Women, however, have the compounded effects of abnormal menstruation.

“In female athletes who push themselves too much or who do not have sufficient caloric intake to match energy expenditure, there can be a lack of periods because of low body weight,” says Rebecca Northway, M.D., instructor in internal medicine and primary care physician specializing in sports medicine. “Therefore, it’s really important to screen young female athletes to see if they’re at risk. In addition, we often think about bone health in older patients because there is an emphasis on osteoporosis in elderly women, but it’s also important to focus on bone health in younger women.”

Quade adds, “I make it a point to talk about exercise and bone health with all of my patients who come in for their annual visits, just as much as we talk about mammograms, Pap smears and colonoscopies.”

For young women in high school or college who are set to join an athletic team, pre-participation physical examinations and questionnaires can be used to screen for potential risk factors related to Female Athlete Triad.

Female Athlete Triad affects:

- 1 ENERGY AVAILABILITY
- 2 MENSTRUATION
- 3 BONE HEALTH

# BONE HEALTH

“These tools look at menstrual periods and the history around them, such as the age when they started and how often they occur,” Northway (left) says. The risk assessment also includes measuring the athlete’s body mass index and asking her whether she worries about her body image or weight.

Northway adds, “Looking at if these women have ever had, or are dealing with, an eating disorder or if they have a medically necessary dietary restriction, or an absorption problem, such as celiac disease or inflammatory bowel disease are also important.”

Finally, asking athletes about past or current stress fractures is an indicator of potential risk.



“Once we have identified an athlete at risk, we risk stratify to see if we need to have them on provisional clearance for sports, restrict them from a certain aspect of their sport, or—the worst-case scenario—prohibit them from participation in their sport entirely,” Northway says. “For any athlete—and I speak from personal experience as an athlete who’s been injured—it’s very difficult to sit on the sidelines.”

Restricting physical activity or participation in sports in someone who does not have a physical injury can be even more challenging.

“We need to get buy-in from the athlete,” Northway says.

Quade and Northway have an array of multidisciplinary resources available to aid in the diagnosis and treatment of these patients. Nutritionists and behavioral health specialists are essential in managing the spectrum of symptoms, as well as the University of Michigan Fragility Fracture Clinic, part of the University of Michigan Comprehensive Musculoskeletal Center.


The clinic helps patients with bone fractures that fracture from a low energy or ground level fall. If Quade and Northway feel a patient they are seeing may have bone fragility, they work with Karen Cummings, PA-C (right), physician assistant in orthopaedic surgery and fragility fracture program coordinator, and team, to have the patient seen in the clinic.

“Most female athletes scheduled in our clinic have had running-related stress fractures,” Cummings says. “Not all patients have a bone density deficit, eating problem or menstrual disruption. But, these issues need to be ruled out. Sometimes it is possible that the sheer amount of training, and biomechanics of the individual, may be contributors to a fracture.”

Quade and Northway explain helping patients with bone health requires time from both the patient and physician, but is a rewarding process.

“I see my role in helping patients maintain bone health as twofold,” Quade says. “One, as a primary care doctor, because of the importance of preventive health care, and also from a sports medicine perspective, in terms of being comfortable with making exercise recommendations.”

Even with the most supportive resources, treatment can be tough, but helping patients achieve and maintain optimum bone health is a fundamental part of their clinical practices.

“It’s not an easy, quick visit when you’re discussing these things,” Northway says. “It takes a lot of time and a good relationship between the patient and the physician.” 



# HAND AND UPPER EXTREMITY INJURIES IN MUSICIANS

Musicians and others with high-demand occupations may suffer from a host of repetitive strain injuries, including tennis elbow, golfer's elbow, wrist tendonitis, rotator cuff impingement or trigger finger. They are also susceptible to nerve entrapments such as carpal tunnel syndrome or ulnar neuropathy at the elbow.

"Musicians are at risk for repetitive strain injuries when there is a sudden increase in playing time or intensity," says Scott Homer, M.D. (left), a nonsurgical hand specialist and clinical instructor in physical medicine and rehabilitation, who often treats musicians and others suffering from hand and arm injuries caused by repetitive use. "It may happen when preparing for a recital or performance, or in the transition from summer break back to the demands of music school."

Homer, along with colleagues Kevin Chung, M.D. (right), chief of hand surgery and professor of plastic surgery and orthopaedic surgery, and Jeffrey Lawton, M.D., service chief of hand and upper extremity surgery, is part of the University of Michigan Hand Program, which includes non-operative hand specialists, orthopaedic and plastic hand surgeons, physician assistants and hand therapists, all of which treat University of Michigan Comprehensive Musculoskeletal Center patients.

Homer and team will sit down with a patient and solicit details regarding occupation, changes in physical activity and ergonomics, as well as pain, numbness, or weakness. They will then perform a physical examination, which includes assessment for tenderness or pain with stress of the associated areas. Additional testing may include ultrasounds for nerve or tendon issues, and electromyography testing for nerve damage.

When it comes to treatment of the hand injury, hand physiatrists and surgeons aim not only to relieve the pain, but also to resolve the underlying condition causing the injury.

"If a performer's posture or technique is suboptimal, there may be an increased susceptibility to muscle fatigue and tension, predisposing to injury," Homer says. "It's very important to fix issues with posture and technique for a sustainable outcome."

Lawton adds, "Often many musicians are not interested in cutting their two to four-hour practice sessions shorter, but they can do the same total time in 45 minute increments, which tends to be less stressful on the injury."

Additionally, hand specialists often encourage relative rest with associated intermittent splinting of the injured area, ice, anti-inflammatories and a trial of topical nitroglycerin patches for tendonitis. Homer adds that steroid injections can be appropriate in certain cases, but discouraged in others, such as for treating tennis elbow.

Chung adds that hand problems in the musician patient group should not be equated to surgery.

"Musicians do not have structural problems with their hands," Chung says. "They have overuse problems, including muscle soreness and perhaps developing incorrect posture. We don't want to operate on this patient group when we instead can understand their motivations for playing and intensity levels, and help them adjust their schedule. This in turn allows treatment of their injury to be more effective."

The various members of the U-M Hand Program frequently confer on overlapping cases, such as carpal tunnel syndrome, ulnar neuropathy, thumb arthritis, trigger finger, and tendon and ligament injuries. In addition to musicians, they treat a wide-variety of hand and upper extremity conditions in various patient groups.

"We have an excellent team and infrastructure here at the U-M Hand Program to treat complex and major trauma injuries, such as farming accidents, motorcycle injuries and industrial injuries," Chung says.

*"Our program strives to help patients along the hand and upper extremity injury spectrum, from rehabilitation treatments with musicians to reconstructive surgery for trauma patients."* 

MUSICIANS ARE AT RISK FOR REPETITIVE STRAIN INJURIES WHEN THERE IS A SUDDEN INCREASE IN PLAYING TIME OR INTENSITY



# TREATING PAIN WITH NON-OPIOID MEDICATIONS



According to the National Institutes of Health, pain is the most common reason why people seek medical care.

"The prevalence of chronic pain in the U.S. is difficult to estimate, but its impact is profound," says Daniel Berland, M.D. (left), clinical assistant professor of anesthesiology. "One hundred million Americans suffer daily pain symptoms and chronic pain is the leading cause of long-term disability in our country. These numbers will only increase as our population ages, amplifying the need for effective, accessible interventions to manage chronic pain and preserve function."

One common treatment for pain is the use of opioid medications, but these come at the cost of some patients becoming dependent or addicted, and sometimes opioids may be doing more harm than good.

"There are a number of patients who have opioid induced hyperalgesia," says Ronald Wasserman, M.D. (right), assistant professor of anesthesiology, service chief for pain medicine and director of the University of Michigan Back and Pain Center. "This is a patient group that is on a higher dose of opioids, but not responding. Additionally, we are finding that these patients tend to have more wide-spread pain and the opioids are actually causing the increase and spreading of pain to happen."

He adds, "Clearly we have an opioid epidemic in this country, so for this particular patient group, and others, the goal is to ease the patients' pain and help get them off these high-dose opioids that could actually be causing them more pain." He states that it is also important to note that the evidence showing opioids to be effective in the treatment of chronic pain is lacking, yet there are numerous studies showing the significant risks associated with opioids.

**100** MILLION AMERICANS,  
OR **43%** OF THE  
U.S. POPULATION SUFFERS  
SOME SORT OF DAILY PAIN.

**CHRONIC PAIN IS THE LEADING CAUSE OF LONG-TERM DISABILITY IN OUR COUNTRY.**

Wasserman and Berland work together at the U-M Back and Pain Center, which is part of the U-M Comprehensive Musculoskeletal Center. They utilize intervention techniques that do not include prescribing opioids, that can help ease pain for patients.

Berland explains that pain can often be effectively managed through non-opioid medications, as well as treatments such as injection therapy or other interventional procedures, surgery, physical therapy or psychological counseling, depending on the patient's specific pain concerns and history.

"Pain is often a multidisciplinary problem that requires a multidisciplinary approach," Berland says.

When Berland meets with new patients, he asks them how disabling their pain is, what they think brought on their pain and what has, and has not worked, in the past to manage it. He explains that by taking the time to talk with the patient, it's not uncommon to discover underlying psychological sources for some of their pain.

"Several patients have had things happen to them in life that make them react abnormally to the pain they seem to have in their bodies," he says. "It's not because they're crazy or they want disability, but instead, their brains have been altered by their lives."

Wasserman agrees, "Patients take opioids for different reasons and we continually take part in research to better understand why certain patients do better on these medications than others."

Wasserman says there are current conversations happening at U-M about establishing a multidisciplinary opioid detox clinic that would be dedicated to treating patients who are on high-dose opioids, either chronically or pre- and post-op, and would work to wean these patients down or off of opioids. Such a clinic would include physicians, such as Berland, with expertise in the treatment of addiction and opioid dependence, as well as psychologists and a social worker.

Even if patients still need medications, a number of non-opioid options are available. Acetaminophen, such as Tylenol, and nonsteroidal anti-inflammatory drugs are commonly used for pain, although patients should continue to be monitored by a physician, as excessive doses can cause liver or other gastrointestinal problems.

Berland says additional adjuvant medications can be used alone or in combination with other pain relievers. For example, several classes of antidepressants and anticonvulsant medications have proven to be effective for some types of pain, while also potentially benefiting mood and sleep.

He adds that for pain specific to one area, pain relievers can sometimes be delivered locally to a particular location through patches, injections or ointments. Some patients, paradoxically, do better once they are weaned from existing pain medications. Although they are not covered by insurance, mindfulness techniques such as meditation have been shown in some studies to help control pain response, moods and sleeplessness.

It's important for patients, working with their care providers, to set realistic treatment goals for functional improvement.

"While complete pain relief may not be possible, effective therapy should control pain in order to improve a person's functioning at work, home, in social situations and while pursuing preferred activities," Berland says. **M**



## MEET BEVERLY

In 2003, Beverly Burchi was doing aerobic exercises in her local swimming pool when something in her back just didn't feel right.

"My back became extremely, extremely painful," Burchi says. "I knew something was going on so I started looking for a spine clinic near me."

Burchi and her husband, Bob, were staying at their winter home in Florida and found a clinic nearby. After several months of visits, physicians weren't sure where Burchi's pain was coming from or how to relieve it.

"They tried everything," she says. "CAT scans, MRIs, narcotics, Botox, just all kinds of things. But nothing seemed to help find out where I was injured."

The pain became so great over those months that Burchi could not sit down, and instead could only lie down flat or walk.

"Our lifestyle was completely shut off," she says. "It was unbelievable. We couldn't do anything. We were confined to our home."

Bob began researching physicians and hospitals back in their home state of Michigan and found the Department of Neurosurgery at the University of Michigan. Burchi came in for her first appointment and the team referred her to Ronald Wasserman, M.D., assistant professor of anesthesiology, service chief for pain medicine and director of the University of Michigan

Back and Pain Center, part of the University of Michigan Comprehensive Musculoskeletal Center.

Wasserman thoroughly examined Burchi to find out the root of her pain and discomfort.

"There was absolute care and thoughtfulness in that visit," Burchi says. "I was in such agony and they wanted to help me. We were just astonished. We had never been to a doctor's office that has the team approach U-M has."

Wasserman determined that Burchi was experiencing pain from her sacroiliac joint, where the spine and pelvis meet. Pain in that joint can lead to lower back, buttock and thigh pain.

Wasserman prescribed a few different injections, versus the opioids that Burchi had been prescribed previously, to help relieve her pain. This included one specifically for her sacroiliac, and a steroid injection performed under X-ray guidance.

"He gave me that first injection and said he wanted to see me in two weeks," Burchi says. "When I came in two weeks later, I was sitting up and he was ecstatic for me. I hugged him because it was just a miracle. He has just changed our lives."

Burchi has regular appointments with Wasserman for injections, and now walks across her local swimming pool four to five times a week.

## MANAGING

# OVERALL HEALTH IN PATIENTS WITH CEREBRAL PALSY

For patients with cerebral palsy, managing overall health and well-being can be a day-to-day challenge.

The pediatric neurodevelopmental disorder caused by damage to the brain, generally before or around the time of birth, results in a wide range of physical and developmental problems such as altered muscle tone, loss of control of movements, decreased strength and balance, and problems with walking or sitting, in addition to a wide-range of medical and cognitive difficulties such as swallowing, seizures and orthopedic abnormalities. As a father of a child with cerebral palsy, Mark Peterson, Ph.D., M.S., FACS, assistant professor of physical medicine and rehabilitation, has dedicated his career to improving the scientific evidence and clinical care of individuals with cerebral palsy.

Peterson is among a small group of international researchers working to increase awareness of long-term health concerns in the growing population.

He explains that traditionally research in patients with cerebral palsy has been mainly focused on pediatrics patients, but these individuals can and do live long lives, and there hasn't been as much research as to how the disorder affects them once they reach adulthood.

Peterson and colleague, Edward Hurvitz, M.D. (right), professor and chair of physical medicine and rehabilitation, published two recent papers highlighting new aspects of managing overall health in patients with cerebral palsy.

## SEDENTARY BEHAVIOR PUTS INDIVIDUALS AT RISK.







# EXERCISING WITH CEREBRAL PALSY

## TYPES OF EXERCISE

## TIPS TO GET STARTED

## EXERCISE/TOOLS

### MUSCLE

Boosting strength and endurance



Think about building muscle strength and working on muscle endurance.

Gradually increase weight used to increase muscle strength.

Gradually up the time or repetitions you do an exercise to help endurance.

Rest your muscles in between exercise days.

Resistance bands

Free weights

Arm exercises, especially if you have a hard time using your legs

Water exercise

Yoga fitness class

### CARDIO

Raising your heart rate during extended exercise



Work on exercising at your target rate (talk to your doctor about yours).

Exercise for a duration (recommended minimum is 10 minutes) to keep the heart beating at an increased level.

Gradually build volume instead of pushing yourself to the limit right away.

Stationary bike

Regular bike or adapted tricycle

Climbing stairs

Water exercise/swimming

Cardio fitness class

### FLEXIBILITY

Keeping the bones and joints in motion



Incorporate stretching and flexibility into normal resistance exercises.

Always stretch before and after exercising.

Work on full range of motion stretches.

Switch up your exercise routine to keep your bones and joints guessing.

Stretches

Resistance bands

Yoga fitness class

Dance fitness class

In a study published Dec. 2015 in *JAMA* (*JAMA* 2015;314:2303-2305), the two researchers and their colleagues measured the prevalence of eight lifestyle-related chronic health conditions in both adults with cerebral palsy and those without. They determined adults with cerebral palsy were between two and five times more likely to have secondary chronic health conditions, such as diabetes and high blood pressure, than adults without cerebral palsy.

The findings raised questions about how to prevent or reduce the conditions among the high-risk population.

“Because cerebral palsy results in accelerated losses of mobility with age, individuals tend to experience more fatigue and have greater muscle and joint pain over time. We found physical inactivity and immobility were strongly associated with these chronic health conditions,” Peterson (*right*) says. “Therefore, we need to strongly consider how these health complications could further impact this population, and how we can prevent or reduce these conditions among individuals with cerebral palsy through their lifespan.”

Peterson and colleagues have also been working to address physical inactivity and immobility in patients with cerebral palsy. In fact, they recently published the first paper (*Dev Med Child Neurol* 2016;58:798-808) to describe cerebral palsy-specific exercises and physical activity recommendations.

“Before this paper, exercise in this population was founded on what we would think of as physical therapy in children,” Peterson says. “Some types of exercises or physical activities were thought to potentially exacerbate symptoms in patients with cerebral palsy, but that’s all but been disproved at this point.”

The paper is a framework for fellow clinicians to use as a reference point for recommending exercises and physical activity for patients with cerebral palsy.

Peterson adds that many adults with cerebral palsy do not meet exercise guidelines and spend significant amounts of time being sedentary. That sedentary behavior puts individuals—not only those with cerebral palsy—at risk for metabolic and cardiovascular diseases.

“The first step towards being healthy is just simply reducing excess sedentary behavior,” he says.

In the future, Peterson hopes to expand the boundaries of research for patients with cerebral palsy beyond the University of Michigan.

“We’re trying hard to move towards having an international consortium of experts who can collect data, increase sample sizes and write papers together, in an effort to improve the state of research and infrastructure for individuals with cerebral palsy,” he says. **M**



# MICHIGAN INTEGRATIVE MUSCULOSKELETAL HEALTH CORE CENTER ACCELERATES **CROSS-DISCIPLINARY RESEARCH**

The University of Michigan Comprehensive Musculoskeletal Center is focused on bringing multi-disciplinary care to patients every day. That care relies on cross-disciplinary research that provides clinicians with the latest information and novel approaches to treating chronic conditions.

In August 2016, U-M was awarded a \$3.9 million Center of Excellence P30 grant from the National Institutes of Health to strengthen its existing musculoskeletal health research program by accelerating new cross-disciplinary research throughout the university.

"The University of Michigan has an exceptional group of faculty studying musculoskeletal diseases and treatments who will be able to accelerate their research as a result of this award," says James E. Carpenter, M.D. (left), chair of orthopaedic surgery.


The cross-disciplinary research will happen through the new Michigan Integrative Musculoskeletal Health Core Center (MiMHC).

"The MiMHC was structured to accelerate science and innovation at U-M around understanding mechanisms of musculoskeletal health, injury and disease across the lifespan," says Karl Jepsen, Ph.D. (right), professor and associate chair of research of orthopaedic surgery, principal investigator for the grant and director for the MiMHC.

Three main research cores within the MiMHC will focus on histological assessment, structural and compositional assessment, and functional assessment. The cores move from molecular mechanisms through functional outcomes.

"These cores will enable us to turbocharge bench to bedside research," Jepsen says. "We are very excited to see how new findings influence future therapies, recommendations and training programs."

Examples of cross-disciplinary research within the MiMHC include investigators in obstetrics and gynecology collaborating with an orthopaedics researcher to understand muscle stretch and function of the pelvic floor during vaginal birth, as well as investigators in orthopaedics, anatomy, anthropology and engineering collaborating together to understand anterior cruciate ligament (ACL) injuries.

"This is an exciting time for those of us in musculoskeletal research," Jepsen says. "Greater interactions between basic scientists and clinicians are important to the future of medicine and the care we will be able to provide to patients in the years to come." 

Main research cores within the MiMHC will focus on:

- 1 HISTOLOGICAL ASSESSMENT**
- 2 STRUCTURAL AND COMPOSITIONAL ASSESSMENT**
- 3 FUNCTIONAL ASSESSMENT**

The cores move from molecular mechanisms through functional outcomes.

# ADVANCED TREATMENT OPTION FOR TENDINOPATHY: PLATELET-RICH PLASMA INJECTIONS



For patients presenting to their physician's office with persistent tendon pain, a chronic strain can usually be to blame for the patient's discomfort.

"When tendons are overloaded, whether through repetitive or a sudden increase in activity, it causes the tendon to weaken and makes it more susceptible to injury and the development of pain," says Troy Henning, D.O. (left), assistant professor of physical medicine and rehabilitation.

Henning, colleague Daniel Lueders, M.D. (right), assistant professor of physical medicine and rehabilitation, and primary care sports medicine colleagues, offer patients both non-surgical and minimally invasive treatment options for treating their tendinopathy. One promising non-surgical therapy is the use of platelet-rich plasma (PRP) injections, where a portion of the patient's blood that has a high concentration level of platelets is used to inject back into the diseased portion of the tendon.

"Traditional approaches have most often involved anti-inflammatory therapies, such as an injection of cortisone, but there is a growing body of evidence that these injuries don't involve as much inflammation as had once been thought, and such an approach may be unhelpful for healing and counterproductive as steroids can further weaken tendons," Lueders says.

Interest in PRP has grown because of the potential for platelets to stimulate and accelerate tissue healing. As the platelets are injected and exposed to collagen in the tendon, the platelets become slowly activated and release growth factors and proteins.

"These factors lead to tissue regeneration through stimulation of angiogenesis, extracellular matrix production and collagen synthesis," Henning says. "This in theory normalizes the structural make of the tendon tissue."


Lueders says the benefits of PRP are still being examined, and may vary at different tendon sites. Although there is increasing evidence that PRP is effective in tennis elbow, which is one of the most common tendinopathies, the value of PRP for accelerating tissue repair at other sites, such as the Achilles tendon, plantar fascia and rotator cuff, is the subject of investigation and ongoing research.

Although there is much that is still unknown about PRP, the new therapy option showcases the understanding U-M musculoskeletal specialists have of the underlying molecular processes of healing.

"One of the advantages of our team is that we are taking an objective approach to understanding where PRP fits with other treatment options," Lueders says.

He cautions that PRP might not be the answer for every patient with a tendon injury, and that studies are still underway to establish optimal dosing and timing.

However, it is an example of an innovative option available for individualizing care.

"We know that structured rehabilitation has the best evidence for therapeutic benefit in patients with tendinopathies, but full recovery can be slow or incomplete," Lueders explains. "Platelet-rich plasma affords us a safe and effective addition to our options for treating challenging tendon injuries. Our team has expertise in a broad array of treatments, which allows us to individualize therapy appropriately." 



## U-M MUSCULOSKELETAL SPECIALISTS USE A VARIETY OF TREATMENTS FOR TENDINOPATHIES:

### ► Exercise

"Most of the time, it just takes some focused exercises directed at the injured tendon to help restore its normal health and function," Henning says. "In general, 80 percent of patients will respond to an exercise intervention alone."

"I generally have a patient perform three sets of 15 repetitions, where the last five repetitions of each set cause some mild discomfort to the injured tendon," he says. "When the exercise is no longer painful, the intensity should be increased by adding to the load or resistance."

### ► Nonsurgical interventions

"We prescribe nitroglycerin patches to patients who seem to be having moderate to severe pain that is interfering with their ability to use the tendon," Henning says. "The patch helps to normalize the function of the tendon cells. This in turn helps to reduce pain and may help heal the tendon."

Around the elbow, Henning says to avoid corticosteroid injections, a common anti-inflammatory treatment to address pain.

"There are multiple studies showing these injections may actually make the injury worse over time," he says.

### ► Minimally invasive procedures

When exercise and nonsurgical options aren't enough, Henning discusses tenotomy, or removing the diseased portion of the injured tendon, with his patients.

"We perform an office-based, ultrasound-guided tenotomy procedure with a Tenex [TX1 or TX2] device," he says. "The procedure helps to remove some of the diseased tissue and stimulates healing within the tendon. Most patients experience a reduction in pain and improvement in function within six to eight weeks."

## INVESTIGATING THE DISPARITY BETWEEN

# IDENTIFIABLE DAMAGE AND CHRONIC PAIN

In order to better understand the disparity between identifiable damage and chronic pain, the National Institutes of Health has awarded \$7.5 million over five years to physician-scientists at the University of Michigan Fibromyalgia Center of Research Translation.


According to the National Academy of Medicine, an estimated 100 million Americans struggle with chronic pain, yet many individuals fail to respond to commonly used therapies such as anti-inflammatory drugs, opioids, injections and surgery.

"We want to increase understanding of how peripheral damage or inflammation, and central nervous system factors, interact to cause acute and chronic pain," says co-principal investigator Daniel Clauw, M.D. (right), professor of anesthesiology, psychiatry and rheumatology, and director of U-M's Chronic Pain and Fatigue Research Center.

U-M investigators have been accumulating evidence suggesting these treatments may fail in part because they target underlying damage or inflammation in the region of the body that hurts, discounting the involvement of the central nervous system.

Clauw says, for those with fibromyalgia, it's like the brain turns up the volume control on pain processing. That higher volume is often the underlying problem, more than damage or inflammation in the region of the body that hurts.

The team will investigate whether, like fibromyalgia, a portion of the patients with other chronic pain conditions would also respond better to drug and non-drug therapies aimed at the brain than to the standard anti-inflammatory drugs, opioids, injections and surgery.

"We hope to demonstrate similarities in neuroimaging among those who suffer from high levels of chronic pain, including signs of centralized pain," says Chad Brummett, M.D. (left), co-principal investigator, associate professor of anesthesiology and pain management, and director of the Department of Anesthesiology's Division of Pain Research. 

**"WE WANT TO INCREASE UNDERSTANDING OF HOW PERIPHERAL DAMAGE OR INFLAMMATION, AND CENTRAL NERVOUS SYSTEM FACTORS, INTERACT TO CAUSE ACUTE AND CHRONIC PAIN."**

—DANIEL CLAUW, M.D.

# RESEARCH

# GET TO KNOW THE UNIVERSITY OF MICHIGAN COMPREHENSIVE MUSCULOSKELETAL CENTER

Most Americans will be affected by an injury or condition of the muscles, bones or joints during their lifetime. As the American population ages, musculoskeletal issues are becoming more common reasons to seek medical care.

The University of Michigan Comprehensive Musculoskeletal Center offers a multidisciplinary approach to provide the best care possible for patients. Our collaborative effort addresses the musculoskeletal system as a whole using a full array of diagnostic and therapeutic techniques.

At the U-M CMC, orthopaedists, physiatrists, anesthesia pain specialists, neurosurgeons, sports medicine specialists, radiologists and rheumatologists work to provide the best outcomes for the high-level athlete, weekend warrior and active senior.



**10**  
SPECIALTIES




**50+**  
PATIENT CARE  
CLINICS



**22**  
FACILITIES  
ACROSS 9 COMMUNITIES



**250+**  
PHYSICIANS



**300,000+**  
OUTPATIENT  
VISITS, SURGERIES AND  
MEDICAL PROCEDURES  
ANNUALLY