



Here's What Happens to Your Body When You Get Hurt – And What You Can Do About It

By Dr. Delia Roberts

Whether it's a bruise, bump or break, pretty much everyone gets injured at some point. And when it does happen it can bring you to a halt, or at least slow you down. Injuries get in the way of everything from daily activities to earning a living. But if you understand what's going on in the injured area, you can shorten recovery time and even help prevent long-term pain and disability.

Getting Inflammation Right

When the stresses exerted on any structure exceed the strength of the materials damage begins to occur. Whether it's a catastrophic failure (like a ligament rupture or bone breaking) or a frequent small overload (like a repetitive muscle strain or tendon/joint irritation), damaged cells release chemical messengers that initiate the processes we call inflammation. The result is an increase in blood flow to deliver needed nutrients and remove wastes, and the blood vessels themselves become leaky so that white blood cells and larger molecules can enter and exit the area. The white blood cells work to digest away damaged tissues and kill any invading bacteria or viruses that might have entered through a wound. Meanwhile, the flow of fluid (that also causes swelling) washes away wastes and delivers building blocks to rebuild new structures.

Getting the level of inflammation right is important for fast and effective healing. Too much and normal tissues located near the injured cells can be damaged while the white blood cells clear out the area and swelling raises the pressure within the tissue. But too little inflammation and you don't get the signals and materials for healing to begin. Thus, the old standard of ice and anti-inflammatory drugs to reduce inflammation immediately following an injury might not be the best approach, because they block the same signals that get the whole healing process going. Other medications like acetaminophen are also effective at reducing pain without the danger of impairing healing, or the risks of addiction that occur with opiate based pain medications. They might be a better choice

if you need pain management *in the first few days* following an injury. After four days or so when inflammation is well under way, switching to ibuprofen or naproxen, along with ice and elevation, can limit excessive swelling and control excess inflammation.

Rest / Immobilization

In the case of a broken bone or a tear in muscle tendon or ligament, it's important that the damaged bits are lined up and/or still connected, which is why broken bones, and full tears often require surgery with some kind of fixation like a plate and screws, cast, or brace. Unfortunately, while this period of rest is needed to form a scaffold for the tissue to knit together, there are also some real negative effects to immobilization. This is why if at all possible, every effort should be made to maintain even a small amount of movement.

When a joint or muscle is prevented from moving there is a near immediate loss of muscle. As a tissue, muscle makes up a huge store of protein that is expensive in energy and material to maintain. Under normal use there is a constant turnover within muscle, but a balance is maintained between the amount of muscle being broken down to release protein, and the amount of new tissue being made to renew the structure. Following an injury, when the muscle isn't being used, protein breakdown accelerates while synthesis is reduced, resulting in a net loss. Most of the change in muscle mass occurs within the first two weeks of immobilization – but thankfully, there are ways to fool your body into thinking that the muscle still needed. These techniques won't stop the loss of muscle and other tissues completely, but they will save enough to make rebuilding after the injury heals much easier.

The Role of Nerves and Muscle Contractions

Many scientists consider the two-way communication between nerve and muscle to be the most important for maintaining muscle mass. Even if you can't move the muscle to lift or carry a weight, if you can

get the muscle to contract or even just get the nerves to fire there is less loss of muscle³. An easy way to encourage an injured muscle to activate/wake up is to tap it with your fingers while contracting/tightening the muscle. You don't need to move the limb, just tighten the muscle. The sensation of touching the muscle helps it respond to the nerve signal. Completing just 10 contractions per day has been shown to help reduce the loss of quad muscle following immobilization of the leg.

Another approach is to use the kind of muscle stimulator that physiotherapists use. These devices send a small electrical charge into the muscle that mimics the actions of nerves, so can help get the muscle contracting - and in return, the contracting muscle maintains nerve function. Keeping the nerve active also seems to help recovery for another reason. Following an injury, the nerves to the injured area are inhibited, perhaps to reduce movement and thereby protect the injured area⁴. Keeping the nerve active during the immobilization period can thus improve recovery in two ways; first, some nerve stimulation helps keep the balance of muscle turnover more favorable for maintaining muscle mass; and second, it helps to keep the nerve from being as severely inhibited, so normal movement is restored faster.

If you can't contract the muscles of the injured area at all, even just imagining the movement while doing the action on the other side of the body can help maintain muscle mass. Watching the moving limb (use a mirror) while doing this helps. Surprisingly, your brain can convert this image and movement of the other side of your body into a nerve impulse in the injured area.

More recently, blood flow restriction has also been used to preserve muscle in athletes following an injury. A pressurized cuff is used to prevent blood from exiting the injured muscle while performing gentle contractions. Doing so causes waste products to build up in the injured tissue, which provide the chemical signals that the muscle is being used and needs to be maintained. This technique should only be used if supervised as it can easily overshoot and harm the muscle.

Continued on page 25...

Continued from page 24...

Movement Preserves Other Tissues Besides Muscle

Besides the loss of muscle, other tissues also lose capacity when immobilized. Tendons, ligaments and cartilage thin and become less elastic. If there have been tears in the tendons or ligaments, gentle movement helps newly formed collagen fibers to be laid down in an organized fashion during healing. Without movement collagen tends to form scars that are not as strong. Fat pads provide cushioning in joints and places like the bottom of the feet. They can also thin out when unweighted, as all these tissues require mechanical load to signal that they are needed and should be maintained. Any small amount of movement that can be tolerated while not loading the broken bone or torn tissue too much will help prevent some of this loss. Once weight bearing is resumed, all these tissues will need to be built back up to withstand normal forces, so there's a real advantage to preserving as much function as possible.

Some examples of this type of approach would be to do gentle range of motion work in the injured area, as well as strength training several times a week for the parts of the body that are not immobilized; upper body and core workouts for a leg or foot injury; or leg and core workouts for an upper body injury, and easy limb workouts for a core injury. With a bit of creativity it is possible to exercise uninjured muscles and joints without unduly loading the area that is healing. A kinesiologist or physiotherapist can help design a progressive program that is creative and fun, and will radically speed up recovery.

Just like any other muscle, the heart requires exercise to stay healthy. Maintaining some form of activity that can raise heart rate and breathing is also important because this alone will improve healing by speeding up the delivery of nutrients, removal of wastes, and encouraging good sleep patterns. But when movement is limited by an injury it can be difficult to find ways to limit how much fitness is lost. While walking is possible for upper body injuries, it doesn't work when a leg or foot is in the non-weight bearing stage of recovery. There are specialized devices that are like a stationary bike for your arms, but they aren't something you'll find at the local gym. Instead, a sling can be set up to support the injured leg on a stationary bicycle to allow for one-legged cycling using the good leg. And once any wounds have closed, water based workouts are great ways to get your heart and lungs working while body weight is supported.

Good Nutrition and Hydration is Essential

Another way to speed up healing is to make sure that the body has a good supply of energy, nutrients and materials needed to repair the damaged tissues. Without the load of normal daily activities the demand for energy may go down during the immobilization period, but healing tissues need vitamins, minerals and the building blocks for proteins and other tissues. This means that some attention needs to be paid to the diet, choosing higher protein and nutrient dense foods. Fruits and vegetables provide vitamins and minerals, dairy products the calcium needed for bone healing. In Canada, milk is fortified with vitamin D, but if you limit milk intake and are not getting sun exposure while the injury is healing, consider a vitamin D supplement in order to ensure that the calcium in your diet is absorbed. Animal products are good sources of protein, but you can also meet your protein needs with a vegan or vegetarian diet. Consider exploring some new plant based recipes if your injury has kept you from work and you have some extra time available.

Staying hydrated is also important for an injury to heal well. It may feel less obvious when immobility prevents you from working hard physically, but your body is still processing all the chemical reactions required to build new tissues. It may also be less convenient to stay hydrated when it's hard to get up and down to refill a water bottle or visit the washroom – but having a reason to move around is helpful in itself as it gets the blood circulating and helps prevent all your muscles and joints from stiffening up.

Smoking and Alcohol will Impair Healing

Other critical behaviors that can truly cause problems with healing are smoking and alcohol consumption. Both have been shown to lead to longer healing times, more frequent infections and increased complications following surgery including non-union of bone fractures and the failure of wounds to close. Both are also very addictive, and it is a real challenge to break the habit of their use. However, if you have suffered a serious injury, getting some help to stop smoking and reduce your alcohol consumption can go a long way to getting you back to health, work and all the activities that you love. In fact, it's essential for successful recovery.

Get Enough Rest

Finally, put making sure to get a minimum of eight hours of sleep on your list of must do items while recovering from an injury. Healing takes a lot of work, cells are rebuilding, and new proteins and other structures are being built. Get enough rest to make sure that your body has the best chance of completing this important work as quickly as possible.

Following an injury that requires immobilization, all the routines of a normal life are changed. It's easy to get disappointed, bored or bitter, and worried about whether you'll be able to regain strength and mobility. But there are things that you can do to help speed up healing, and making the choice to take an active role in your health can go a long way to keeping the challenges of an injury from turning life sour. Take the time to get some help through your primary care provider, including working with a knowledgeable movement specialist and looking after your mental and emotional health and you'll turn your injury into growth. 🍏

