



This is why you feel sore
– and this is how you prevent it

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You have probably tried it: feeling completely sore all over your body after a hard training session or race. The next 3-4 days it hurts to get out of bed, you need to descend the stairs backwards because your legs ache and you can barely put your shirt over your head. You probably have DOMS.

Don't worry – it is not as bad as it feels, and it is not a disease, even though it sounds like one. The soreness occurs when the muscles are used in different way than they are used to or at a higher intensity for a longer time than they are used to.

Muscle soreness

Many think that muscle soreness the day after the hard or unaccustomed training is caused by lactic acid, but that is not the case. This condition is called DOMS (Delayed Onset Muscle Soreness) and arises as a result of exertion-induced muscle damage. It is not dangerous and very common, even though it means muscle damage.

There are two types of muscle soreness: acute and delayed

Acute muscle soreness

Most athletes have experienced lactate build up and feel acute muscle soreness during and immediately after training. The muscle soreness is caused by a buildup of chemical waste products that occur when the muscles get fatigued when working hard on an anaerobic level. To put it simply, you build up lactate and the muscles are not working very effectively.

Delayed muscle soreness - DOMS

DOMS gets gradually worse within the first 24-72 hours after the hard or unusual exercise. The soreness disappears step by step in the next 3-7 days. The soreness can occur -of your fitness level- after strenuous, unaccustomed training. The extent of the soreness depends on the

intensity of the training, duration, number of repetitions – and highly of the type of training that you had.

Eccentric muscle contractions seem to cause the worst DOMS. Eccentric movements cause the muscle to forcefully contract while it lengthens. Examples include going downstairs, running downhill, lowering weights and the downward motion of squats and push-ups. DOMS describes muscle soreness, muscle



stiffness (not in the joints), reduced power output of the muscles as well as a reduced coordination. In addition, it is characterised by swollen muscles (edema), enhanced muscle enzyme concentration (creatin kinase – CK and lactate dehydrogenase - LDH) in the blood, light inflammation as well as small muscle fiber damages.

This is why it hurts

The mechanisms behind DOMS are not completely clear yet, despite of many years of

research, but it appears to be several factors that play an important role.

Pressure on the muscle fibres

It is very probable that the damage of the muscle fibre has a decisive meaning for DOMS. When you train, the mechanical load of the tissue causes micro-damages in the muscle fibre and probably also in the membrane around it. When you stretch a muscle fibre and at the same time develop strength (eccentric contraction), the load is unevenly divided over the whole fibre and that is why some parts of the fibre are more stretched than others. The more you are used to a certain movement, the better the load will be divided over the muscle. This is probably the reason why new movements often result in DOMS, as the new movements cause uneven strength and stretch distribution. The same applies to untrained muscles.

Biochemical factors

Research shows that the content of muscle enzymes in the blood rises 2-10 times during hard training. This is a sign that the muscle cell membranes burst during exercise, and it is exactly this that happens under eccentric exercise, where one experiences heavier loads on a relatively small part of the muscle fibre. Research has also shown an increased production of reactive oxygen molecules (ROS) as well as a changed intramuscular calcium regulation (Ca²⁺), which contributes to the damage of the muscle fibres.

Inflammation and edema

As a result of the muscle damage an inflammation arises, or at any rate the preliminary phases of such an inflammation,

which leads to edema in and around the muscle. It is important to point out that this inflammation is not a negative effect, but a natural and useful process. The process helps healing the damaged muscle tissue. When having an inflammation, the concentration of hormones and hormone-like substances, like histamine, serotonin and prostaglandins, increases. These substances affect specific nerves in the muscles (nociceptors), which leads to pain stimulation. This is therefore the cause for the "pain" itself. Moreover, the previously mentioned edema can also stimulate the nociceptors and also cause pain. You could say that the pain threshold is lowered in the concerned areas.

How to treat DOMS

What do you do, when you actually are sore? Unfortunately, there is not one final answer and the debates regarding treatment possibilities of DOMS will probably continue for a while. On the other hand, there is lots of good advice which can help when the soreness is at its worst. And do remember that DOMS often lasts 3-7 days, which is why it is sensible to stay active to treat/reduce the pain as good as possible. Luckily you can easily train other parts of the body, than those who suffer from DOMS.

Restitution training and rest are very good treatments. Restitution training means that you do a "light" version of the training that caused DOMS. For example a jogging tour, spinning without anaerobic work or light strength training with many repeats and little weight. This type of low-intensity exercise results in transport of the accumulated fluid out of the muscle and that the muscle regains its normal function. Also the nerve tissue returns to its optimal condition.

Some studies show that the **RICE** method can be useful.

Rest: rest, rest and even more rest for the affected area

Ice: provide cold to the injured area.

Remember to put a cloth between the ice bag and your skin.

Compression: wrap a tight bandage around the affected area (not too tight so it starts to throb), this limits swelling.

Elevation: try to raise the affected muscle – if possible above the level of the heart.

Research has shown that massage and ultrasound can relieve the DOMS, but there is not an actual treatment that can remove the physiological causes behind it. Stretching has always been recommended after hard training, but there is no documented research that shows that it relieves DOMS. However, many feel that the pain diminishes a little after stretching.

What you eat influences how fast your body recuperates, but food cannot prevent DOMS. The glycogen reserves in your body are influenced by hard training and it can take up to 10 days to fuel up those stocks again. It is therefore very important to eat a

Maxim Whey 100 Protein Drink - if you feed your muscles with proteins immediately after exercise you help them regain strength quickly. Whey 100 works best if taken immediately after exercise when the proteins will be absorbed more efficiently.



carbohydrate-rich diet and lots of proteins after exercise.

In the overview below you can examples of high-protein, low-fat foods.

Protein supplements

You can supply with protein supplements, which makes it easier to get the right amounts of protein at the right time – e.g. before and after strength training. You can for example use Maxim Recovery Drink after exercise for an optimal restitution of your muscle mass.

You could also choose a product with higher protein content, e.g. Maxim Whey 100 Protein Drink to use during the day, to increase your daily protein intake.

Last but certainly not least, it is of great importance to warm up properly for your next training session, if you feel any soreness.

Examples of high-protein, low-fat foods

| | Protein (g/100 g) | Carbohydrates (g/100 g) | Fat (g/100 g) |
|------------------------|-------------------|-------------------------|---------------|
| Chicken | 21 g | 1 | 2 |
| Beef | 21,8 | 1 | 3,9 |
| Tunafish | 27,5 | 1 | 1 |
| Skimmed milk | 3,5 | 4,7 | 0,3 |
| Maxim Recovery Drink | 30,2 | 56,2 | 2,1 |
| Maxim Whey 100 Protein | 80,1 | 5,1 | 2,0 |

If the soreness lasts longer than a week, you should seek some professional help! The best advice for DOMS is to avoid it!

The lesson is thus: learn of your mistake – prevent it next time!

Prevent DOMS

Fortunately it is possible to prevent – or at least minimise – the soreness, by following some general advice.

1. Build up your training slowly and continuously. Start at a low intensity and high frequency (many bouts). A rule of thumb is that you should not increase your training volume with more than 10% per month.
2. When participating in endurance training, prioritise cycling, swimming and rowing, where the eccentric movements are at a minimum. The advantage is that you can train harder in the starting phase and recuperate faster with a minimum of muscle soreness. On the opposite, you can reduce running, which contains a lot of eccentric work for the thighs.
3. Vary your training. When you run, use both flat and hilly terrain, as well as different types of surface, like tarmac, gravel and treadmill.
4. Always warm up properly and remember to cool down after training.
5. When doing new strength training exercises, start with low weights and many repetitions (12). Increase the weight slowly in the weeks after.
6. Remember that all unaccustomed training will cause soreness in the beginning, and that this is a sign that your muscles are being used. uger.

Conclusion

It is important to point out that DOMS is a normal and often appropriate response after

training – especially when new exercises and/or a higher intensity than normal are involved. Inflammation and other processes involved in DOMS are necessary for the muscle to heal and get stronger. Usually, there will only be a few training sessions, until the body has adapted to the unaccustomed exercises,

This knowledge is especially useful for those who start new sports and activities. You will get sore in the beginning, but it is a natural process and it will disappear after 2-3 weeks of training. Keep on going!

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