

Axe & Sledge ELBOW GREASE: Combat Joint Pain

written by Mike Roberto | June 22, 2020



Protect your joints with Elbow Grease from Axe & Sledge!

If you truly consider yourself to be the *hardest worker in the room*, then you've probably experienced your fair share of *aches* and *pains*. One of the key aspects to training hard day in and day out, is being able to *properly recover*. That seems like a no brainer, however we're not just talking about sore muscles – your connective tissues, such as tendons and ligaments, need to be strong and stable in order to allow the muscle to fully contract.

The skeletal and muscular systems are closely intertwined and both must be taken care of, especially when you're taking things to the next level. When it comes to lifting weights, we tend to do the same movement patterns over and over again. Although that's crucial for developing strength and size, your tendons, ligaments, and joints can start to take a beating. Repetitive motions are notorious for causing inflammation within the tendons, commonly known as

tendinitis.

Tendons connect the muscle to the bone, allowing the muscle to pull the bone in order to perform a certain motion. They are made up of dense connective tissue, known as collagen, and are incredibly strong. Due to various reasons, a large percentage of people will end up developing serious chronic health conditions, including osteoarthritis, osteoporosis, and other injuries.

Elbow Grease: Optimize Your Joint Health

There are several things you can do to keep your joints running strong, and one of them is adding in a *well formulated joint health supplement* into your stack. However, with so many options to choose from, how do you know which one to go with? Well, some key things we like to look for in any supplement is *clinically studied ingredients, efficacious dosages, transparent labels, and a brand who has a trustworthy reputation*. Fortunately, we did the hunting for you and found **Elbow Grease** from *Axe & Sledge!*

After briefly looking at Elbow Grease's formula, you can clearly see that it checks all of the boxes of a complete joint health product. If that doesn't convince you to try it out then keep reading, because the research on each ingredient will! Before we go any further, sign up for *Axe & Sledge news and deal alerts* to get the best price on supplements formulated for the *hardest workers in the room!*

Axe & Sledge Elbow Grease – Deals and Price Drop Alerts

Get Price Alerts

Get Elbow Grease Price Alerts Get Axe & Sledge alerts Get Joint Supplements price drops

Also get hot deal alerts

No spam, no scams.

Disclosure: PricePlow relies on pricing from stores with which we have a business relationship. We work hard to keep pricing current, but you may find a better offer.

Posts are sponsored in part by the retailers and/or brands listed on this page.

Axe & Sledge Elbow Grease Ingredient Explanation

Axe & Sledge is known for having very *comprehensive* products and Elbow Grease is no different. It features over *10 ingredients* to give you everything you need to *support bone, joint, cartilage, ligament, and tendon health*. This is a capsule based product, thus making it easy to add on to any supplement stack.

Axe & Sledge recommends consuming *four capsules per day with meals* – you could even do split dosing and take two capsules with breakfast and two capsules with dinner. One of the keys to getting the most out of any joint health product is being *consistent* and taking them daily, so just find something that you can stick to!

Here's what one serving (*four capsules*) of Elbow Grease provides:

- **Vitamin C (as ascorbic acid) – 150mg (250% DV)**

Supplement Facts		
Serving Size: 4 Vcaps		
Servings Per Container: 30		
	Amount Per Serving	%DV*
Vitamin C (as ascorbic acid)	150mg	250%
Vitamin D3 (as cholecalciferol)	20IU	5%
Zinc (as zinc bisglycinate chelate (TRAACS®))	5mg	33%
Manganese (as manganese bisglycinate chelate (TRAACS®))	10mg	500%
D-Glucosamine Sulfate Potassium (shellfish free)	1500mg	**
Chondroitin Sulfate	500mg	**
Cetyl Myristoleate Complex (yielding 20% cetyl myristoleate)	300mg	**
Methylsulfonylmethane (OptiMSM®)	300mg	**
BioCell Collagen® (Chicken Sternal Cartilage Extract)	200mg	**
Boron (as Boron Glycinate Complex)	5mg	**
Bioperine® (Piper nigrum)(fruit)(Black Pepper Extract)	5mg	**

*Percent Daily Values are based on a 2,000 calorie diet
**Daily Value not established

Elbow Grease features several vitamins, minerals, and trademarked ingredients to give you complete joint support!

The first ingredient in Elbow Grease is a solid dose of **vitamin C**, the *potent antioxidant* that's often found in the majority of immune support supplements. It turns out that this *water soluble* vitamin's benefits goes beyond fighting off free radicals and giving your immune system a boost.

Although vitamin C deficiency is very rare nowadays, hundreds of years ago, it was one of the main causes of *scurvy*, a medical condition characterized by *bone pain, lethargy, impaired wound healing and bone growth, gingivitis, and myalgia*. [1]

Assists with collagen production

There's a growing body of literature showing that vitamin C is a crucial *cofactor* in the synthesis of *collagen*. [1] Collagen is the primary structural protein found in connective tissues. It's present in various parts of the

human body such as bone, skin, tendons, ligaments, cartilage, and muscles.

Research shows that ascorbic acid influences *prolyl hydroxylase domain protein (PHD)*, which is responsible for *hydroxylating prolines used in collagen production*.^[1] Ascorbic acid also plays a key role in wound repair and collagen synthesis.^[1] Vitamin C is heavily involved in the expression of *connective tissue proteins, vascular remodeling, maintenance of vascular cell integrity, and smooth muscle cell differentiation*.^[1]

Regarding bone and cartilage health, ascorbic acid promotes the *differentiation of chondrocytes and osteoblast proliferation*.^[1] Chondrocytes are cells that help maintain cartilage tissue and osteoblasts are responsible for bone formation.^[1]

We could go on and on about the benefits of vitamin C, just know that it's an essential nutrient and Elbow Grease has you covered with *150mg!*

- **Vitamin D3 (as cholecalciferol) – 20 IU (5%)**

The second vitamin included in elbow grease is a small supplementary amount of **vitamin D3** as *cholecalciferol*. Just like with vitamin C, vitamin D is an essential nutrient that's involved in several physiological functions. There are three main ways you can obtain vitamin D – *sunlight, diet, and supplementation*.

If you don't get a sufficient amount of sunlight and fail to consume an adequate amount of vitamin D rich foods, which are typically dairy products, then supplementing with vitamin D is highly recommended. It's important to note that vitamin D is *fat soluble*, meaning it's stored within the liver, muscles, and adipose tissue. Thus, there's a potential risk of taking too much vitamin D, however for most people, that's not a concern.

Enhancing calcium absorption



If you're suffering from joint discomfort,
then try out Elbow Grease!

Regarding bone health, vitamin D *enhances the absorption of calcium*, a mineral that significantly increases bone strength and structure.[2] Without enough vitamin D, then a larger portion of the calcium you consume will be excreted instead of absorbed and utilized.[2] Research shows that *vitamin D deficiency* can lead to *bone mineral loss*, increasing the risk of *osteoporosis*, which is a condition characterized by weak and brittle bones.[2]

Furthermore, a lower vitamin D intake decreases the absorption of calcium, which exacerbates the demineralization of bones.[2] To no surprise, multiple studies have found that vitamin D supplementation can reduce the risk of fractures.[2] Lastly, vitamin D by itself and in combination with calcium have a positive impact on bone mass density, a key measurement of bone strength.[2]

As you can see, *20 IUs* isn't a crazy amount, however most joint health products are stacked with a multivitamin, which will also contain vitamin D.

- **Zinc (as zinc bisglycinate chelate (TRAACS)) – 5mg (33% DV)**

The first mineral on our list for Elbow Grease is none other than **zinc** and of course, Axe & Sledge is using the *most bioavailable* form on the market!

Whenever we see *zinc bisglycinate chelate* on a label, it lets us know that the company is taking an extra step to ensure that the consumer is getting the most out of the product. We're excited to see brands using zinc bisglycinate chelate over other, cheaper, forms such as *zinc oxide* or *zinc gluconate* because of its *superior absorption*.[3]



If you want to continue to work hard in the gym, you have to take care of your joints!

It's well established that the body has an extremely hard time absorbing several minerals, therefore a large portion of them end up going to waste. Fortunately, **Albion Minerals** developed a system called **TRAACS**, which stands for "*the real amino acid chelate system*".[4] Not only does this allow Albion to test their ingredients for *purity, safety, potency, and quality*, it's a phenomenal way to *enhance absorption*![4]

As the name suggests, zinc bisglycinate chelate consists of zinc bound to an amino acid called *glycine*. This process essentially solves the bioavailability issues, because glycine is readily absorbed by the small intestine and takes zinc along for the ride! You'll see in the next section that Axe & Sledge does the same thing but with *manganese*!

Now, let's move on to what zinc does for joint and bone health!

Zinc's Health Boosting Benefits

Zinc, along with vitamin C, are two major nutrients involved in the immune system, which is why you'll often see them appear in nearly every immune boosting supplement. Studies show that just a mild zinc deficiency can *significantly delay injury healing, suppress the immune system, negatively affect testosterone levels, and reduce lean body mass*. [5]

It's well known that the immune system is heavily involved in fighting off foreign pathogens and preventing illness, however several of the cells which belong to the immune system, also help in *tissue repair*. Taking in an adequate amount of zinc helps facilitate the stimulation of immune cells, such as *natural killer cells, macrophages, neutrophils, and monocytes*. [5,6]



If you're looking to maximize your efforts in the gym, consider adding GDA+ and Man Power to your stack!

Macrophages and neutrophils are some of the first ones to arrive onto the scene where muscular damage occurs. They work to clean up the debris and set the stage for healing. Thus, if you want to properly recover from your workouts, getting in a sufficient amount of zinc is crucial.

In addition, research has discovered a correlation between *low levels of zinc and the development of rheumatoid arthritis (RA)*.^[6] This is a chronic inflammatory disease that involves inflammation of the synovial membrane which surrounds the joint, and deterioration of articular cartilage and bone.^[6] The researchers speculate that because RA is a systemic autoimmune disease, having a poorly functioning immune system due to zinc deficiency, is likely a major component to progression of the condition.^[6]

In summary, there are various benefits to supplementing with zinc, and we're glad to see it included in the formula.

- **Manganese (as manganese bisglycinate chelate (TRAACS)) – 10mg (500% DV)**

The next ingredient included in Elbow Grease is the most bioavailable form of **manganese** – *manganese bisglycinate chelate*. Manganese doesn't seem to get the spotlight very much in the sports supplement industry, but it definitely deserves some recognition!



Don't let joint pain stop you from being the hardest worker in the room!

In case you're not familiar, manganese is classified as an *essential trace mineral* that's naturally occurring in several foods, such as *whole grains, sea food, legumes, nuts, and vegetables*.^[7,8] A trace mineral means that the body doesn't need a large amount of it to fulfill its physiological requirements, which is why only *10mg* equates to *500%* of your daily value!

Manganese serves as an important *cofactor* for various enzymes involved in *energy substrate metabolism, bone formation, reactive oxygen species scavenging, and immune response*. It's also involved in hemostasis and the formation of blood clots in conjunction with *vitamin K*.^[7] The body actually stores between *10-20mg* of manganese in various tissues, but more importantly, about *60%* is found in bone.^[7,8]

A greater amount of research is starting to recognize the importance of manganese for overall bone health.^[8] Studies show that manganese deficiency contributes to the development of *osteoporosis* and an adequate amount of manganese consumption is positively associated with *improved bone mass density*.^[8] The research suggests that manganese deficiency can negatively affect bone health by direct and indirect pathways.^[8]

- **D-Glucosamine Sulfate Potassium (shellfish free) – 1500mg**

One of the most common ingredients in joint support supplements is none other than *glucosamine*! Elbow Grease includes *1500mg* of it in the form of **D-Glucosamine Sulfate Potassium** and it's *shellfish free*!



Make sure your joints are recovering just as well as your muscles!

Glucosamine is naturally formed in the body by combining *glucose and glutamine*. It's primarily used to make a macromolecule involved in cartilage repair and formation known as *glycosaminoglycan*.^[9] Glucosamine is classified as a *water-soluble amino monosaccharide* and is one of the most abundant monosaccharides in the body with a high concentration found in *articular cartilage*.^[10] Cartilage is a flexible connective tissue that provides cushioning for your joints.

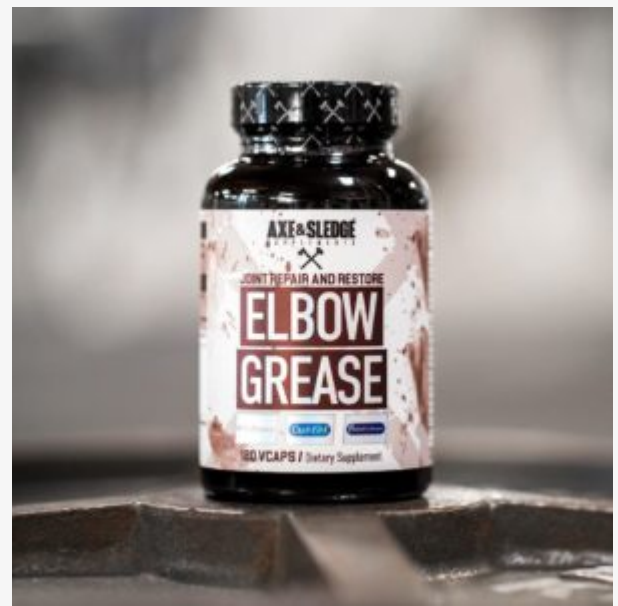
Research shows that glucosamine *promotes the proliferation of osteoblasts (cells that help form bone), inhibit catabolic intermediates, and expresses both anti-inflammatory and pro-anabolic properties*.^[9] A meta-analysis from 2015 concluded that the combination of *glucosamine and chondroitin*, which we will cover next, shows a *synergistic effect* for anti-inflammatory and anti-catabolic effects compared to either alone.^[9]

Furthermore, the researchers noted that chondroitin plus glucosamine is effective in reducing pain and function in patients with *knee osteoarthritis*.^[9] Another meta-analysis conducted in 2018 reported that glucosamine *significantly improves joint stiffness* and *chondroitin relieves pain and improves physical function*.^[10] It's fairly clear that both glucosamine and chondroitin have beneficial effects for joint health!

- **Chondroitin Sulfate – 500mg**

Chondroitin sulfate (CS) is a *sulfated glycosaminoglycan* that's a major component of the extracellular matrix found in tendons, ligaments, bone, cartilage, and skin.^[11] CS plays an important role in the *biomechanical properties of cartilage*, such as *elasticity and resistance*.^[11] This means that CS allows the cartilage to withstand pressure during various angles of

loading.[11]



If you want to be in this for the long run then Elbow Grease is here to make sure you keep running on all cylinders.

Research shows that lower levels of chondroitin are found in patients with osteoarthritis and suggests that supplementing with CS may be an effective way to repair damaged cartilage.[11] Studies have found that CS expresses *anti-inflammatory, anti catabolic, antioxidant, anti-apoptotic, and anabolic properties*. [11]

Most notably, chondroitin is capable of *enhancing type II collagen and proteoglycan (PG) production in human chondrocytes*. [11] Multiple clinical trials have reported decreased pain and increased function in patients with osteoarthritis who were supplementing with CS. [11] Preliminary research suggests that CS carries out its positive effects via *cell signaling, decreasing oxidative stress, and modulating both inflammatory and catabolic pathways*. [11]

As you can see, chondroitin has some profound benefits on it's own and in combination with glucosamine, you may see even more positive results!

- **Cetyl Myristoleate Complex (yielding 20% cetyl myristoleate) – 300mg**

Cetyl Myristoleate Complex (CMO) is a naturally occurring *fatty acid* that's commonly used to treat joint pain. [12] The literature suggests that CMO is capable of *reducing joint pain, decreasing joint inflammation, and preventing further joint damage*. [12]



Not only does Axe & Sledge make premium supplements, they make phenomenal weight lifting gear and apparel!

CMO's primary mechanism of action is the inhibition of two pathways involved in *arachidonic acid metabolism: cyclooxygenase (COX) and lipoxygenase (LOX)*.^[12] CMO also decreases the production of *pain mediators, including prostaglandins and leukotrienes*.^[12] CMO expresses antiarthritic and anti-inflammatory properties via the stabilization of cell membranes, inhibition of 5-lipoxygenase activity and inflammatory mediators, along with protection against oxidative stress.^[12]

In a landmark study from 2017, researchers recruited 28 participants with mild arthritic knee joint pain and divided them into 4 groups.^[12] One group was given a placebo tablet, while the other groups were provided with CMO that had varying concentrations of fatty acids and CMO (*100%, 80%, and 62.5%*).^[12] The study included a 7-day baseline assessment, 12 week ingestion period, and 4 week follow-up safety assessment.^[12] They also implemented a randomized controlled, double-blind study design to reduce biases.

After 12 weeks, the researchers concluded that **CMO was effective across all concentrations for reducing knee joint pain**.^[12] And after the 4 week safety assessment, the participants reported *no significant adverse effects*.^[12] According to the dosages used in this study, Axe & Sledge is giving you an efficacious dose of cetyl myristoleate, with *300mg yielding approximately 60mg of CMO content!*^[12]

- **Methylsulfonylmethane (OptiMSM) – 300mg**

The first *trademarked* ingredient in Elbow Grease is **OptiMSM** from *Bergstrom Nutrition*. *Methylsulfonylmethane (MSM)* is composed of approximately 34% sulfur – a mineral that plays a key role in the maintenance of healthy tendons, joints, ligaments, and various other connective tissue.[13]

There are several forms of MSM on the market, but what makes OptiMSM stand out from the rest of its competitors is its *quality and purity* – and it's manufactured in America! Not only is OptiMSM one of the most potent forms of MSM on the market, it has multiple clinical trials showing its effectiveness and safety.[13-15] Some of the key benefits of MSM include *joint health support, improved joint recovery time, prevention of chronic joint issues, and protection of cartilage from excessive destruction*. [13,14]

MSM made in America!



Never miss a workout because of joint pain.

As of writing this article, there's one study showing that MSM improves skin appearance, eight human clinical trials reporting that MSM enhances exercise recovery, reduces oxidative stress and markers of muscle damage, along with four clinical trials showing that MSM reduces overall joint pain and increases physical movement.[14,15]

It's clear that MSM offers several health benefits, especially when it comes to repairing and restoring damaged tissue. Similarly to glucosamine and chondroitin, one study found that there's a synergistic effect of glucosamine and MSM for pain relief and reducing inflammation.[15]

The story gets better, since Bergstrom Nutrition manufactures OptiMSM in America, after seeing deficiencies and poor yields in the international MSM market. You can learn more in our main MSM supplement analysis.

BioCell Collagen (Chicken Sternal Cartilage Extract) – 200mg

What's a well-rounded joint health supplement without a great form of *type II collagen*? For Elbow Grease, Axe & Sledge wanted to ensure they were getting the highest quality form of collagen by going with a trademarked form known as **BioCell Collagen**.

BioCell Collagen consists of a combination of *naturally-occurring type II collagen peptides, chondroitin sulfate, and hyaluronic acid*.^[16] It was developed by a well respected ingredient supplier called *Biocell Technology*. What's unique about BioCell Collagen is that it's not a blend of three individual ingredients, thus there seems to be a synergistic effect between each of Biocell Collagen's components that offer greater benefits.^[16]



Prevent joint issues with Elbow Grease from Axe & Sledge.

As we discussed previously, collagen is a major structural protein that's found in various tissues throughout the body. Supplementing with collagen is normally marketed for hair, skin, and nail care, however it also significantly benefits joints, bones, ligaments, and tendons.

One study found that BioCell Collagen supplementation resulted in *increased mobility, enhanced physical activity, and reduced pain*.^[17-19] Another clinical trial revealed that daily consumption of BioCell Collagen *significantly improves joint comfort*.^[17,19] One more study showed that BioCell Collagen was capable of *enhancing recovery time from a resistance training bout and had a positive effect on tendon and ligament biomarkers*.^[18,19]

- Lastly, a study published in 2019 noted that a *novel hydrolyzed chicken sternal cartilage extract improved facial epidermis and connective tissue in*

healthy adult females.[20] The researchers noted that the extract supported *type I-III collagen synthesis* within the skin.[20] Thus, you may get the added benefit of better skin care with this ingredient!

- **Boron (as Boron Glycinate Complex) – 5mg**

Although boron is not considered *essential*, the health benefits it offers will make you wonder why it's not. One landmark review paper from 2015 gathered nearly every study conducted on boron's effects to highlight just how important it is for several physiological processes.[21]



The hardest workers in the gym need extra support to prevent joint pain.

The lead author *Lara Pizzorno* reported that boron is *crucial for growth and maintenance of bone, vitamin D, estrogen, and testosterone utilization, magnesium absorption, reduction of inflammation, antioxidant activity, and optimal brain cognitive performance, activity, and memory.* She also notes that boron demonstrated *anticancer effects.*[21]

One study included in the review paper showed that boron is a key regulator of the expression of extracellular matrix proteins, such as *collagen type I, osteopontin, bone sialoprotein, and osteocalcin.*[21] The upregulation of these extracellular matrix proteins results in *enhanced osteoblast proliferation, viability, and morphology, along with enhanced mineralization of bone cells.*[21]

Furthermore, boron boosts *mRNA expression in bone morphogenetic proteins (BMPs)*, which are responsible for inducing new cartilage and bone formation.[21] We could keep going on and on about the benefits of boron, but we will save you some time! Just realize that it provides several health

benefits – especially regarding joining and bone health!

- **BioPerine (Piper nigrum)(fruit)(Black Pepper Extract) – 5mg**

It wouldn't be an Axe & Sledge product if they didn't include something extra to help you absorb all the ingredients! If you're a hard working M'Fer then you want your supplements to work as hard as you do, but unfortunately some ingredients don't get absorbed very well by the small intestine.



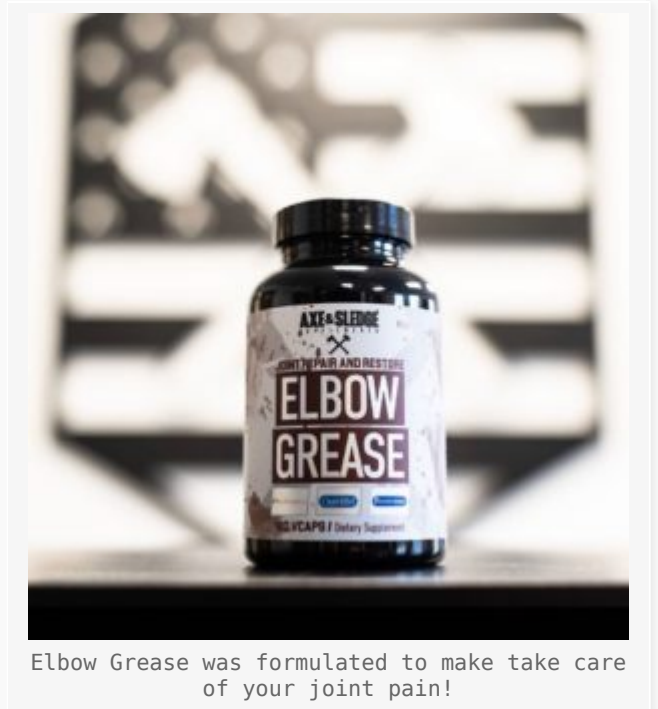
Luckily, *Patrick Williams*, the mastermind behind Axe & Sledge products, understands this issue. Which it's why you'll commonly see **BioPerine** on their ingredient lists since it significantly improves the bioavailability and uptake of a wide variety of nutrients.[22,23]

BioPerine is a trademark of *Sabinsa Corporation* and it consists of *black pepper extract* standardized to contain at least 95% of the main bioactive constituent, *piperine*. [22] More research is needed to determine its exact mechanism of action, but researchers theorize that piperine is capable of *modulating efflux metabolism enzymes and efflux mechanisms, while enhancing thermogenesis*. [23]

One of the leading hypotheses is that piperine *inhibits P-Glycoprotein*, which is responsible for altering intestinal absorption of several nutrients. [23] Lastly, BioPerine is GRAS-affirmed, meaning that it's generally recognized as safe! [24] We always like to see an ingredient included in a formula to help boost uptake, especially with minerals.

Axe & Sledge Keeps You Running On All Cylinders

Although we all like to think that our form is perfect whether we're performing a squat or bench press, even a slight deviation in movement can wreak havoc on various structures over time.



Elbow Grease was formulated to make take care of your joint pain!

Axe & Sledge is all about giving you the tools you need to keep running on all cylinders, day in and day out. No matter how good your sleep, recovery, or nutrition is – being the hardest worker in the room can take a major toll on your body, including muscles, joints, tendons, and ligaments.

Undoubtedly, the thing we tend to ignore the most is joint health, until it becomes a major issue later on in life. If you can address those nagging aches and pains right away, then they're less likely to develop into a much bigger problem. Therefore, taking a comprehensive joint health formula can be one way you can be preventative and take action.

But, in case you're reading this article and you already suffer from joint pain, then Elbow Grease may be used to help speed up the recovery process. No matter what your physical status is, supplementing with Elbow Grease can be very beneficial. And if you don't believe us, try it out for yourself and see what happens! With that formula, we're confident that you won't be disappointed! If it can keep Seth Feroce going then it will work wonders for you, because there's very few people out there that workout harder than he does.

If there's one thing we know for sure it's that Axe & Sledge has some incredible new products and formulas on the way! You can stay up to date with everything they have going on by subscribing down below.

Axe & Sledge Elbow Grease – Deals and Price Drop Alerts

Get Price Alerts

Get Elbow Grease Price Alerts
Get Axe & Sledge alerts
Get Joint Supplements price drops
 Also get hot deal alerts

No spam, no scams.

Disclosure: PricePLOW relies on pricing from stores with which we have a business relationship. We work hard to keep pricing current, but you may find a better offer.

Posts are sponsored in part by the retailers and/or brands listed on this page.

References

1. Aghajanian, P. et al.; "The Roles and Mechanisms of Actions of Vitamin C in Bone: New Developments."; *Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research* vol. 30,11 (2015): 1945-55. doi:10.1002/jbmr.2709; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4833003/>
2. Laird, Eamon et al.; "Vitamin D and bone health: potential mechanisms."; *Nutrients* vol. 2,7 (2010): 693-724. doi:10.3390/nu2070693; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3257679/>
3. Gandia, P. et al; "A bioavailability study comparing two oral formulations containing zinc (Zn bis-glycinate vs. Zn gluconate) after a single administration to twelve healthy female volunteers"; *Int J Vitam Nutr Res.* 2007 Jul;77(4):243-8; <https://pubmed.ncbi.nlm.nih.gov/18271278>
4. Albion Human Nutrition; TRAACS-IF-IR Information; 2020; <https://www.albionminerals.com/human-nutrition/products-trade/quality/traacs-ft-ir>
5. Prasad AS; "Zinc in human health: effect of zinc on immune cells;" *Mol Med.* 2008;14(5-6):353-357; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2277319/>
6. Xin L, Yang X, Cai G, et al.; "Serum Levels of Copper and Zinc in Patients with Rheumatoid Arthritis: a Meta-analysis."; *Biol Trace Elem Res.* 2015;168(1):1-10. doi:10.1007/s12011-015-0325-4; <https://link.springer.com/article/10.1007/s12011-015-0325-4>
7. Office of Dietary Supplements; Manganese – Fact Sheet For Health Professionals; National Institutes of Health; 2020; <https://ods.od.nih.gov/factsheets/Manganese-HealthProfessional/>
8. Pepa, GD et al.; "Microelements for bone boost: the last but not the least."; *Clinical cases in mineral and bone metabolism : the official journal of the Italian Society of Osteoporosis, Mineral Metabolism, and Skeletal Diseases* vol. 13,3 (2016): 181-185. doi:10.11138/ccmbm/2016.13.3.181; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5318168/>
9. Zeng, Chao et al.; "Effectiveness and safety of Glucosamine, chondroitin, the two in combination, or celecoxib in the treatment of osteoarthritis of the knee."; *Scientific reports* vol. 5 16827. 18 Nov. 2015, doi:10.1038/srep16827; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4649492/>
10. Zhu, Xiaoyue et al.; "Effectiveness and safety of glucosamine and chondroitin for the treatment of osteoarthritis: a meta-analysis of randomized controlled trials."; *Journal of orthopaedic surgery and research* vol. 13,1 170. 6 Jul. 2018, doi:10.1186/s13018-018-0871-5; <https://pubmed.ncbi.nlm.nih.gov/29980200/>
11. Henrotin, Yves et al.; "Chondroitin sulfate in the treatment of osteoarthritis: from in vitro studies to clinical recommendations."; *Therapeutic advances in musculoskeletal disease* vol. 2,6 (2010): 335-48. doi:10.1177/1759720X10383076; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3383492/>
12. Lee, Sang Chul et al.; "The minimal effective dose of cis-9-cetylmyristoleate (CMO) in persons presenting with knee joint pain: A double-blind, randomized, placebo-controlled trial."; *Medicine* vol. 96,9 (2017): e6149. doi:10.1097/MD.00000000000006149; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5340442/>
13. Bergstrom Nutrition; OptiMSM Benefits; 2020; <https://optimism.com/benefits/joint-health/>
14. Bergstrom Nutrition; OptiMSM Efficacy Studies; 2020; <https://www.optimism.com/wp-content/uploads/efficacy-studies.pdf>
15. Usha PR, Naidu MU.; "Randomised, Double-Blind, Parallel, Placebo-Controlled Study of Oral Glucosamine, Methylsulfonylmethane and their Combination in Osteoarthritis."; *Clin Drug Investig.* 2004;24(6):353-363. doi:10.2165/00044011-200424060-00005; <https://pubmed.ncbi.nlm.nih.gov/17516722/>
16. Biocell Technology; Biocell Collagen Benefits; 2020; https://www.biocellcollagen.com/benefits?qt-quicktab_biocell_collagen_bene_t=0#qt-quicktab_

biocell_collagen_bene_t

17. Schauss, AG. et al.; "Effect of the Novel Low Molecular Weight Hydrolyzed Chicken Sternal Cartilage Extract, BioCell Collagen, on Improving Osteoarthritis-Related Symptoms: A Randomized, Double-Blind, Placebo-Controlled Trial."; *J. Agric. Food Chem.* 2012, 60, 16, 4096–4101; <https://pubs.acs.org/doi/10.1021/jf205295u>
18. Biocell Technology; *BioCell Collagen Human Clinical Trials*; 2020; <https://www.biocellcollagen.com/biocell-collagen-supplement-clinical-trials>
19. Lopez, H.L., Habowski, S., Sandrock, J. et al.; "Effects of BioCell Collagen on connective tissue protection and functional recovery from exercise in healthy adults: a pilot study."; *J Int Soc Sports Nutr* 11, P48 (2014); <https://jissn.biomedcentral.com/articles/10.1186/1550-2783-11-S1-P48>
20. Schwartz SR, Hammon KA, Gafner A, et al.; "Novel Hydrolyzed Chicken Sternal Cartilage Extract Improves Facial Epidermis and Connective Tissue in Healthy Adult Females: A Randomized, Double-Blind, Placebo-Controlled Trial."; *Altern Ther Health Med.* 2019;25(5):12-29; <https://pubmed.ncbi.nlm.nih.gov/31221944/>
21. Pizzorno, Lara. "Nothing Boring About Boron."; *Integrative medicine (Encinitas, Calif.)* vol. 14,4 (2015): 35-48; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4712861/>
22. Sabinsa Corp; *BioPerine Research Information*; 2020; <https://www.bioperine.com/index.php/researchhighlight>
23. Sabinsa Corp; *BioPerine Mechanisms of Action*; 2020; <https://www.bioperine.com/index.php/mechanismsofactions>
24. Sabinsa Corp; *BioPerine GRAS-affirmed*; 2020; <https://www.bioperine.com/index.php/gras-affirmed>