Be A Savvy Consumer: Do Your Homework!!!

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Contributions to this ebook

Forward: "Re"-Search Leads to "Me"-Search

Applying Research to Your Life

Figure 1. "Re"-search is like a compass, it points us in the general direction. In contrast, "Me"-search is the GPS that zeroes things in for us.(1)

I'd like to discuss a general overview of incorporating science into practice. If you've read a few of my articles, you're well aware of the emphasis I put on science backed practice. Both of my degrees are based in science (Kinesiology and Nutritional Science) and I do enjoy surfing PubMed **(Appendix 1, pg 31)**, etc.

That said, **I realize the limitations of scientific research; namely the results of any study, regardless of if it's human or animal based in nature, are specific ONLY to the participants in the study at THAT specific moment in time.** Thus, I try not to make knee jerk reactions based solely off the results of one study. Rather, I delve deeper into the topic to see if there are any other studies that support these initial results. This is what I refer to as the **"Re"-search** process.

If I find that there is a general consensus showing a positive effect of variable "X" in the reviewed studies, I may decide to add it into my daily nutrition/exercise routine to see if I experience similar results. This is what I like to call the **"Me"-search** phase of the process; that is, I will see if "ME" experiences the same positive benefits as those in the study by taking/doing something similar to what they did. (And yes, I realize I used bad English there by saying "me experiences…" in that last line, but sometimes you need to step outside the boundaries to get a point across!). I stress this point of "Me"-search, because until one does it themselves, one is only taking an educated guess as to if it will benefit them. It's for this reason that I like to say……

"Re"-Search Leads to "Me"-Search

An Analogy: A Compass & GPS

The "Re"-search vs. "Me"-search way of thinking is analogous to a compass and a GPS. A good compass will point you in the general direction of where you want to go. However, a GPS will give you the exact destination point. Similarly "Re"-search will give you an idea of what diet/supplements/exercise strategies may lead to optimal health and performance gains. Yet, it is your own personal "Me"-search that will tell you if the incorporation of any of these diets/supplements/exercises was beneficial or not.

The Scientist = The Coach = The Nutritionist = The Researcher

At the end of the day, there is one thing I can't stress enough — The best researchers in the physical preparation field are the ones actually working with the athletes; not the guys/gals wearing the white coats in a lab. As I once heard someone say (unfortunately I don't recall the source of this comment), **research has a tendency to play catch-up to what the best coaches have already experienced with their athletes.** Am I saying that I think sport science research is a waste? Of course not, that would be foolish on my part; I just lean towards the thoughts/advice of those great coaches who have been successfully working with athletes day in & day out for many years (I discussed this much more thoroughly in my article, Oh, The People You'll Meet).

And if you think about it, this makes perfect sense. In essence, what are coaches? They're scientists who are constantly performing experiments. Let's review the key steps of the scientific process……

Observe a **Problem** → **Review** Previous Research → Form a **Hypothesis** → **Test** a Hypothesis → Study **results are reviewed /analyzed** → **Form New Conclusions** that lead to **future research**

This is 100% analogous to what the best coaches, from both a training and nutrition standpoint, are doing on a daily basis….

Coach has a **PROBLEM** to address (Joe/Susie wants to increase sport performance) → **COACH REVIEWS** through his/her knowledge and experiences when dealing with similar situations (personal experience + that of others + science) → Coach forms a **HYPOTHESIS** (ie- training cycle) that he/she thinks will produce the desired outcome → Athlete/coach **TEST HYPOTHESIS** (ie – complete training cycle) —> Athlete's post training cycle **RESULTS ARE ANALYZED** → Coach & Athlete **FORM NEWOPINIONS** of the effectiveness of training strategy and use the results to **GUIDE FUTURE TRAINING SESSIONS**.

Don't Prematurely End the "Me"-search Process & Miss Out On Benefits

There is one caution I must make when advising you on the importance of the "me"-search process – DON'T give up too quickly!!! **Let the variable run its full cycle as intended and ask for help if you're not seeing results before prematurely abandoning it.** For instance, although some products will give you results almost immediately (think creatine), others need to build up in your system to exert its effect (think beta alanine). If one stops taking beta alanine after 5-6 days because they're not feeling any benefit, they may miss out on the benefits they would have received by weeks 5-6. Likewise various training techniques won't instantly turn you into a fire breathing machine by day 10, especially if you're doing the exercises with bad form or not taking care of other variables in your life! As Phil Stevens discussed in his article I'm a Lifer, one has to make their training/nutrition a part of their life if they want to see results.

If you're not seeing the results that you were expecting based of your initial "re"-search, **seek the advice of others** who have experience in the field; See where your shortcomings are with respect the implementation of a given variable in your life. It's not until all of the above is in place, that one can truly evaluate the results of your "me"-search.

Bottom Line

"Re"-search Leads to "Me"-Search is an important concept that we must all remember. By using this process, **we all turn into scientist, forming a hypothesis on what may/may not work and testing it out.**

Some scientific studies produce unfavorable results. Likewise some of our training/nutrition strategies may not produce the desired results. Yet in other instances, the results of both can turn

out to be magnificent. Regardless of how things turn out, the completion of research, whether done in the lab or on the training floor, increases our knowledge and directs work for the future.

And always remember, **the most important studies are those in which N=1, with that 1 being YOU!**

References

1 Image taken by Nicolas Kaiser. This file is licensed under the Creative Commons Attribution-Share Alike 2.0 Generic license. Accessed August 21, 2010 from: http://commons.wikimedia.org/wiki/File:Liquid_filled_compass.jpg

Many Supplement Forums and Retail Sites Contain Misinformation

Quick Hit Summary

The internet can provide an endless supply of quality learning material. However, it can also drop you into a bottomless pit of misinformation and bad advice. Be careful when treading the water of internet forums and retail sites.

The dot.com World

One of the most significant technological advances in my generation has been the rollout of the World Wide Web (internet). Information, products and services are now available to us with a few clicks of a keyboard and mouse. The internet can provide an endless supply of quality learning material but can also drop you into a bottomless pit of misinformation and bad advice.

Internet Forums – Home to the Worst Offenders

If you can think of a topic then chances are good that there are internet forums designed to chat about it. Unfortunately, chances are also good that you might find better advice and information by talking to your neighbor's cat. While that is indeed a joke, so are the many forums that some people tend to get most of their knowledge from.

So why are forums generally a breeding ground for junk-information? Forums are usually open to the public and that means basically anyone can join in on the discussions. Finding expert advice on these forums can be extremely rare. Unfortunately, it can sometimes be difficult to differentiate good information with the bad unless you have a strong knowledge on the topic yourself.

Figure 1. How good is the advice you're getting off of the internet?

While some forum members may talk a good game, often times they are simply relaying misinformation they've read or heard somewhere else. Have you ever played that game in school where one person will whisper to another person a quick story? The recipient of the story will whisper their version of that same story to another person and this process continues down the line until the last person (usually about the 20th person) tells everyone aloud the story they were told. This final version of the story is always completely different than the original story, sometimes with many added parts! Well, this unfortunately is a pretty good analogy of what happens with the distribution of research information in the nutritional industry. This altered information is scattered all over the internet ESPECIALLY on internet forums.

I only recommend visiting health & fitness (especially nutritional supplement) forum boards for **entertainment purposes** only.

Retail Websites with Product Ratings, Reviews and Awards

I've been in the health & fitness retail industry for over a decade and I've seen the many sales tactics used by retailers and manufacturers to evoke a sale. While some sales tactics are harmless ways to enhance a product's visibility, some are extremely misleading and irresponsible.

Customers often approach me about a product they read about on a forum (yikes) or website. They might mention that it "won" a particular product award or that it received a high rating

from either the retailer or people on a forum. Most notorious internet nutritional supplement "awards" (and sometimes "ratings") are simply based on sales, hype or both. The truth **is a product's sales rate can have little to do with the actual functional substance of the product itself.** Some might argue that if Product A outsells Product B, then Product A is a better product. Wrong. Product A might outsell Product B for a few reasons but usually it's because Product A was advertised more effectively than Product B. That's business-101 and the consumer can waste a lot of money if they judge a product by its cover rather than by its substance.

Internet **nutritional supplement "ratings" and "reviews" are usually fueled mainly by general consumers**. This typically translates into poorly constructed feedback and oftentimes a strong misrepresentation of the product's functional substance. A product's functional substance simply refers to the actual ingredients in the product that deliver true scientifically-tested results. Feedback can have a general underlying theme but unless you are a perfect genetic clone of the individual who left the review/rating and also followed that person's exact daily routine, then you will not have that same result. Plus, after over a decade of interacting with nutritional supplement consumers, I can positively tell you that the "instant gratification" effect is alive and well:

> **"Instant gratification"** refers to a products ability to induce a feeling or visual enhancement in a very short amount of time. Pre-workout drinks can be a perfect example of this. Some heavily advertised brands are nothing more than a central nervous system stimulator packed with caffeine and other similar stimulants. They pack in a few buzz word ingredients and act like they have the best blood-pumping pre-workout drink ever. The consumer takes it and feels like they can lift for 10-hours. Unfortunately, the instant gratification of that product is some ultra-cheap caffeine with a hefty price tag. The consumer could have taken a 200 mg caffeine pill for much less money and probably had the same effect.

Many consumers are rating products and providing reviews based mainly on instant gratification. This is far from scientific and rarely beneficial from a nutritional standpoint. So, I continually help educate consumers (part of the reason for this blog) about diet, supplements, and the research behind the ingredients.

Where to find better information

I realize I may have offended some readers who've been getting their "knowledge" from forum boards and retailer sites. They're probably yelling at their computer screen,

"Ok smart-@$$, where should I get my information from ?!?!"

Simple, get it direct from the source. As you'll notice in subsequent sections of this book, many of our statements **include** cited research references. This allows you to view where we sourced

information for a particular section of our article. This research information is **direct** from research and NOT from the 20th person down the line. Did you know you have access to one of the world's largest research databases? Well you do! This database is called **PubMed** and it comprises of more than 19 million citations for biomedical articles from MEDLINE and life science journals.

Try it out by going to Pubmed.gov and typing in the name of an ingredient in your nutritional supplement. For example, type "green tea" (with the quotes) into the search box. Grab a strong cup of coffee, sit back and be prepared to learn. For assistance in understanding research on pubmed check out the appendices at the end of this book (Pubmed for Dummies, pg 31)

Evaluating Dietary Supplements

Quick Hit Summary

There are 1000's of nutritional supplements on the market today. Unfortunately, a portion of these are nothing more than fool's gold. In order to determine if the product being peddled to you is legit or snake oil, one must know how to conduct scientific research. The first step is figuring out what the product is made of and the claims made by the manufacturer. This is the ONLY TIME you should use a search engine like Google or yahoo. Upon learning the ingredients of the product, research them on pubmed.gov to see if there is any supporting evidence to back up the claims made by the manufacturer. Also, if the manufacturer provides a list of references, be sure to check out the source of them… are they coming from peer reviewed scientific research journals or general magazines and websites? Are they completed in animals or humans? Although this may seem intimidating at first, I highly encourage you to use this process when evaluating supplements. Doing so will assist you separate the gold from the fool's gold!

Separating the Gold from the Fool's Gold

Figure 1 Are you starting to get overwhelmed by all these miracle supplements?[10]

Regardless of if I'm watching TV or reading various publications, I feel as if I'm constantly bombarded with advertisements for the next great miracle supplement. Sometimes I'll flip the page/channel without thinking much of it. Other times, the claims are so outrageous, I can't help

myself and will watch the entire advertisement. After viewing these ads, I'm shocked that we're not all living to ripe age of 100 years while maintaining the virility and physical prowess of our 20's!

As a consumer, it can be difficult to separate supplements with valid health and performance benefits vs. those which are worthless. In order to prevent yourself from having supplements peddled to you by a "snake oil salesman", it's important to critically evaluate new products.

Recently, one of my good friends asked me about a product called Gluconic® DMG (manufactured by DaVinci Laboratories of Vermont)[1] that was recommended to some of her athletes by a doctor they were seeing. I had never heard of the product, so did what I do best —> I researched it! I'd like to take you along for the ride and using this product as an example, demonstrate how one should evaluate dietary supplements and claims.

Step 1: Figuring Out What the Supplement Is Made Of

The first step in researching any supplement is figuring out what ingredients are contained within the product. Not being familiar with Gluconic® DMG, I did some background searching on it via google.com. I must emphasize, the **ONLY TIME I USE GOOGLE.COM (OR SIMILAR SEARCH ENGINE) TO RESEARCH A SUPPLEMENT** is when I'm completely unfamiliar with the product and its supposed health/performance benefits. In other words, google.com is a good source to figure out what a product contains, and health benefits claimed by the manufacturer. However, as discussed in the previous section of this book (Supplement Forums and Retail Sites Contain Misinformation) **google.com is generally useless in terms of finding out if a product is useful or supported by research** as discussed in the article

Doing my google search, I came across 2 URL links that I felt were pertinent; the first being the manufacturers website for Gluconic® DMG [1]. The second worthwhile URL was a PDF file put out by Davinci Laboratories of Vermont that listed the ingredients found within the supplement and references supporting its usage[2]. (I highly encourage you to pull up this PDF File before continuing with this article)According to these sources, the only ingredient found within the supplement is N,N-dimethylglicine (DMG)[2] and it supposedly supports physical performance in athletes by:

- Assisting with oxygen utilization
- Decreasing lactic acid build-up
- Speeding up post-exercise recovery time

It then goes on to say:

> **"**The evidence that DMG can enhance the performance of athletes is quite strong. The research, along with actual field evaluation, shows that DMG is beneficial to endurance athletes (runners, team sports) as well as short-timed events (weight lifters, sprinters).**"**[2]

This statement quickly caught my attention and I scrolled down the PDF until I found the reference section that listed the research supporting these claims (I strongly suggest you pull up the URL address that is listed at the end of this article in the reference section for this PDF before continuing on with this article). In their athletic performance section, I found **14 references** listed. At first glance this seemed pretty impressive. However, quality of references is of much greater importance than quantity when evaluating a product. As I quickly analyzed the reference list, I found the following information:

- Of the 14 references, **9 were completed on animals** (6 horses, 1 rats, 1 canines, 1 "animals"- type not specified). Of these 9 sources, 2 were from peer reviewed scientific journals, 3 were from non-peer reviewed journals (ie- general "trade" magazines such as *The Blood Horse*, etc) and 5 of the references were never published (ie- information presented at conferences/symposiums, non published research, etc).

- Of the references, **2 were from non- peer reviewed sources** (*Gallary*, *Health Foods Business*) and discussed the sexual enhancing properties of products containing the ingredient N,N-dimethylglicine. Does anyone besides me find it rather humorous that a company tries to legitimize its product by listing sexual enhancement articles under their Athletic Performance section?

- 3 references were completed on athletes, **only 2 of which appeared in scientific journals**. The remaining reference was a private report that was never published in any scientific journal article.

- All of the references, **outside of 1** (which happened to be an article discussing the sexual enhancing properties of N,N-dimethylglicine), **all were completed prior to 1990**.

How do I interpret all of this?

First Thought…

My first reaction was, "***Wow, that's a lot of animal studies with minimal human studies.***" However, I realize that animal studies must be completed before human studies, so I can somewhat rationalize this predominance. On the other hand, I'm also aware that the physiology of horses, canines, etc differs from that of humans. Thus, one cannot necessarily expect humans to react the same way that animals do to a given treatment. (See Appendix III, pg 52**)**

Second Thought…

My second thought was, "***I'm surprised at how old these references are with respect to when published/presented.***" I'm somewhat hesitant to accept the results obtained from studies completed prior to 1990 **IF** there hasn't been any additional published research to support them during the past ~15 years. Am I implying that old studies are bad? Of course not; I simply realize that advances in technology have occurred during the past 20 years that enable researchers to better understand if/how supplements work in the human body. Additionally, the lack of studies on the product, with respect to athletic performance, since 1990 also sets off a second alarm… We live in a human performance driven society!!! **If there was a safe, effective ingredient that could improve physical capabilities, I would think that there would have been at least a few studies done on them during the past 15 years**. When individuals see supplements that support athletic ability, they immediately think of athletes. However, these same supplements are commonly used by military, police/firefighters, physical laborers, etc. With the potential to be applied to such populations, I'd tend to believe that funding for such studies would be available if the scientific community felt it would be of assistance. I'm not saying 100's of peer reviewed studies (on active individuals), but at least 1-3 during the past 15-20 years.

Figure 2. I'm sure we've all measured out a little creatine in our day.[11]

To best illustrate everything I mentioned in the preceding paragraph, **I'd like you to consider creatine.** Many individuals believe that creatine has only been around since the early to mid 1990's. However, the physiological role of creatine has been studied as far back as the 1930's in Ukraine[3]. Furthermore, the Soviet Union (USSR) began studying creatine's potential ergogenic (performance enhancing) role during the 1970's and 80's. With evidence indicating a potential ergogenic role for creatine, research boomed on it during the 1990's. For example, if one types in the search words *creatine* and *ergogenic* at pubmed.gov, 128 peer reviewed scientific papers

show up. Now lets compare that to N,N-dimethylglicine…When I type in the search terms *N,N-dimethylglicine* and *ergogenic* no results are found. If I modify the search terms and write *N,N-dimethylglicine* and *athletes*, only 3 peer reviewed articles show up at pubmed.gov. As an FYI, these searchers were completed on January 13, 2010. These results will change as more studies are published.

Final Thought…

My third and MOST IMPORTANT THOUGHT regarding the reference list was, "***I can't believe how few peer reviewed scientific journal articles are listed in their reference section.***" Of the 14 references, only 4 appeared in peer reviewed scientific journal articles. In terms of evaluating dietary supplements, **peer reviewed scientific journals are the GOLD STANDARD**. Before any paper is published in one of these journals, a panel of peers (ie- experts in the field such as PhD's, etc) carefully scrutinizes the quality of the report. If the research article does not meet their standards, it will not be published. Although poor quality studies may still be published in peer reviewed journals, it's far fewer than non-peer reviewed scientific journals or magazines. For instance, one of the references for Gluconic® DMG appeared in *Gallary*. Obviously, the primary purpose of articles appearing in this type of a publication is to catch the public's eye and sell subscriptions; not present scientific data supporting the use of a product. Which publication would you probably put greater faith in: *Gallary* or scientific journals such as Journal of Applied Physiology and Medicine and Science in Sport and Exercise?

A few of the other references were just presented at conferences/symposiums or private reports vs. appearing in peer reviewed scientific literature. In general, I have no problem with information presented at these types of gatherings. Commonly, the latest research is presented in conferences, prior to being published in a scientific journal. As Dr. Jamie Cooper discussed in her interview (Interview With The Expert- Dr. Jamie Cooper, PhD found at CasePerformance.com) many months commonly pass between the completion of a research study and it actually being published in a peer reviewed scientific journal. Thus, if you want to be on the cutting edge of the science field, I would highly encourage you to attend these conferences/symposiums (for more info on attending a national conference, simply go onto a given organizations (ACSM, etc) and look under tabs/headings such as "education").

My concern with the symposium/conference references used in the Gluconic® DMG PDF is that there's no indication that the data presented at the conferences/symposiums was later published in peer reviewed scientific journals. For many individuals, especially researchers working in the university setting, they must publish "X" amount of papers in peer reviewed journals to maintain their positions. For those working in the private sector, there is a definite financial motivation to get their work published. Other individuals who commonly publish research articles are those completing a PhD or MS graduate program. In some instances, a journal article must be published in order earn a graduate degree. Thus, for both financial and notoriety purposes I tend to believe that those presenting at the conferences would have substantial motivation to publish any research that they presented. I wonder if the reason as to why these individuals didn't publish anything in peer reviewed literature had to do with their scientific evidence not meeting the quality standards set by various scientific journals. I want to emphasize that the previous sentence is merely my speculation as I have no hard core evidence to back it up. Maybe I'm

wrong and publication bias prevented them from being accepted (assuming something was submitted).

Despite the three aforementioned problems with regards to their references, I try to keep an open mind regarding the scientific evidence supporting the use of the product. Each one of the aforementioned caveats does not necessarily mean a product is bad. However, when all three are present, I'm simply more hesitant to accept claims made by a manufacturer.

All this being said, what should one do if they shouldn't use google.com to determine the effectiveness of a product? I suggest using the free, peer reviewed, scientific database known as Pubmed. For a quick tutorial on how to use Pubmed, please check out Appendix 1.

Step 2: Researching the Ingredients of Gluconic® DMG using Pubmed

Now that we've figured that DMG is the only ingredient present within the supplement and what its recommended uses are, Pubmed is the next destination. I first researched the specific peer reviewed journal article that was referenced in the aforementioned PDF. This study examined the effects of taking 135 mg of DMG or a placebo 5 minutes prior to a exhaustive treadmill test in endurance trained athletes (3 males, 13 females; mean age- 27)[5]. Each athlete completed 2 separate treadmill test (one with placebo prior to test & one with DMG prior to test). Analysis of the data obtained indicated that DMG had no effect on maximum ventilation, VO2max (oxygen uptake), heart rate or total run time. Also, at submax levels, VO2 and ratings of perceived exertion were not significantly different. WOW… **I'm really shocked and actually kind of disgusted by the fact that DaVinci Laboratories of Vermont reference a study to promote its product that actually showed no benefit by taking DMG.** Talk about misleading the consumer and hoping that one never actually check out their references!!! No results were found when I typed the name of their other peer reviewed reference into the Pubmed search engine[6]. As a result, I can't really comment on that one at all.

After looking at the peer reviewed journal article mentioned on the PDF bulletin put out by Davinci Laboratories of Vermont, I researched DMG on Pubmed using various search terms. Overall, I had great difficulty finding any articles that related to potential ergogenic benefits of DMG outside of the previously mentioned study. To my knowledge, there has been no peer reviewed study published and posted on Pubmed which has looked at the long term effect of taking DMG with respect to athletic performance.

There have been a few studies looking at the substance pangamic acid which consists of calcium gluconate and DMG[7]. In a study involving 16 college aged male track athletes, it was found that taking 300 mg/day of pangamic acid (vs. placebo) for 21 days had no significant effect on blood lactate or time to exhaustion while running[8]. In another study, participants completed 2 submax bicycle ergometer tests[9]. Preceding each test, individuals took 2.4 grams of pangamic acid or nothing (for control testing purposes) for 2 weeks prior to completing a cycle ergometer test. Final results indicated that taking 2.4 grams of pangamic acid had no significant effect on

submax heart rate or VO2 (oxygen consumption). On the other hand, there have been some studies completed in the former Soviet Union that indicated that pangamic acid may be of benefit to endurance athletes[8]. However, as pointed out by Gray and Titlow, many potentially confounding variables were present within the studies, making it harder to judge the validity of their results.

It should be noted that I also could not find any peer reviewed research to support that claim that DMG, "…is beneficial to … short-timed events (weight lifters, sprinters)."[2]

Step 3: Interpretation of the Research

After all the research has been gathered, one must interpret and determine if there is enough evidence to support the use of a given product. **Based off the sparse peer reviewed research I found on DMG, I am not convinced that it would have a significant ergogenic benefit when consumed by athletes**. I'm not saying that it *couldn't* be beneficial; I'm just saying that current peer reviewed research conducted on athletes does not support its use. Another factor to consider when deciding if the supplement is worth buying is the price. Considering the recommended dosage for athletic purposes (Sports Practice and Fitness 375-1000mg; Endurance Sports 1000-2500mg) and the cost of the Gluconic® DMG, which I'll let you research on your own, this supplement can get pretty costly when taken over a long period of time[2]. If you're a world class athlete, looking to gain the extra inch and money isn't a factor, I could see where you may experiment with the supplement. However, if finances are tighter, peer reviewed research simply doesn't justify the purchase of this product.

So what would I do if an athlete came to me claiming that Gluconic® DMG has dramatically helped their performance? I'd probably say something along the lines of, "*Interesting… Most of the research I've seen on it does not support its use. If it were me, I probably wouldn't pay for it, but if you feel that that it's really helping you, go ahead and take it*." I say this as the studies I looked at indicated that pure DMG (ie- not the pangamic acid) did not pose any health risk. I feel that it's my job to make the athlete aware of the research and give them my opinion. Ultimately though, I leave the decision to take it or not up to them; assuming that the supplement doesn't pose any health risks or illegal in the athlete's respective sport. Maybe there is some legitimacy to the given product if the athlete is benefitting from taking it that has yet to be captured by formal scientific studies. On the other hand, maybe the benefit they're getting is related to a placebo effect (see pg 24) more so than the actual ingredients of the product.

Bottom Line

As I hope this article demonstrates, in order to determine if a supplement is fact or fiction, it's important that one takes it upon themselves to do a little background check on it. Unless you're finding out what ingredients are present within the supplement, this search should not be done on google, yahoo, etc. Rather, it should be done in peer reviewed journals such as those found at pubmed.gov.

On a final note, I'd like to dedicate this article to one of my college professors, Dr. Kelli Koltyn who taught me the importance of critically evaluating scientific literature.

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Propriety Blends: Deception or Protection

Quick Hit Summary

Propriety blends are extremely popular in the supplement industry. Although they may seem like a good thing at first glance, they may consist of nothing more than cheap fillers. While there's no easy, quick solution to determine if a company's proprietary blend is deceptive, there are indicators to watch for as discussed in this article.

What's a Proprietary Blend?

Proprietary blends are "bundled" ingredients in which the dosage amounts of all ingredients in the blend are stated as only one cumulative number. In the absence of individual ingredient amounts, FDA requires that the dietary ingredients in a proprietary blend are to be listed in order of predominance by weight (**Figure 1**).

Serving Size 2 Capsules
Servings Per Container 60

	Amount Per Serving	% Daily Value
Vitamin A (as mixed carotenoids)	1,000 IU	20%
Vitamin C (as ascorbic acid)	30 mg	50%
Vitamin E (as d-alpha tocopherol succinate)	30 IU	100%
Vitamin B_6 (as pyridoxine hydrochloride)	2 mg	100%
Folic Acid	400 mcg	100%
Vitamin B_{12} (as cyanocobalamin)	6 mcg	100%
Pantothenic Acid (as d-calcium pantothenate)	10 mg	100%
Magnesium (as magnesium aspartate)	5 mg	1%
Chromium (as chromium GTF polynicotinate)	120 mcg	100%
Proprietary Diet Boost Blend**	1,418 mg	†

Guarana Extract *(Paullinia cupana)* (seed) (30% caffeine), Green Tea Extract *(Camellia sinensis L.)* (leaf) (20% EGCG/22% caffeine), Phase 2® brand white kidney bean extract *(Phaseolus vulgaris)*, Yerba Mate *(Ilex paraguayensis)* (leaf) (20% caffeine), Kola Nut Extract *(Cola acuminata)* (fruit) (20% caffeine), Metabromine-G™ (cocoa/guarana extract) (5% caffeine/5% theobromine), Ginger Powder (root), Cayenne Powder (fruit), dl-Methionine, Dandelion Powder (root), White Willow Powder (bark), dl-Phenylalanine***, DMAE (2-Dimethylaminoethanol), L-Tyrosine, Grape Seed Extract *(Vitis vinifera L.)* (seed) (95%polyphenols), Acetyl-L-Tyrosine.

† Daily Value not established.

OTHER INGREDIENTS: Gelatin, Magnesium, Stearate, Silica, Stearic Acid.

** THIS PRODUCT CONTAINS 250 MG OF CAFFEINE PER SERVING (2 CAPSULES).
***PHENYLKETONURICS-CONTAINS PHENYLALANINE.

Figure 1. The nutritional supplement label above contains a proprietary blend (Proprietary Diet Boost Blend) in which the ingredients contain a stated cumulative amount of 1418 milligrams (mg).

As you can see from the label above (pg 19), the ingredient named Guarana Extract is the most abundant ingredient in the blend. Acetyl-L-Tyrosine is the least abundant ingredient in the blend. Unfortunately, it's nearly impossible to review this product based on clinical efficacy doses (effectiveness to produce desired result) since the label doesn't state the individual ingredient amounts used in this proprietary blend.

The label below could have used a proprietary blend but instead states every ingredient along with the amount of each ingredient in the product (Figure 2).

SUPPLEMENT FACTS

Serving Size: 1 capsules / Servings Per Container: 90

Amount Per Serving		%DV
Vitamin B1 (Thiamine HCL)	15mg	1000%
Vitamin B2 (Riboflavin)	15mg	885%
Niacinamide (Inositol Hexanicotinate)	15mg	750%
Vitamin B6 (Pyridoxal Phosphate)	15mg	375%
Vitamn B12 (Methylcobalamin)	500mcg	8333%
Vitamin B-5 (D-calcium Pantothenate)	15mg	150%
Biotin	20mcg	40%
Folic Acid	150mcg	40%
L-Tyrosine AKG	250mg	**
Fucoxanthin (10%) (From Undaria Pinnatifida)	150mg	**
3b-Acetoxyandrost-5-ene-7, 17-dione (7-OXO DHEA)	100mg	**
Ashwagandha Root	100mg	**
Ginger Root (5% Gingerols)	75mg	**
Cayenne (Capsaicin)	50mg	**
Cinnamon Extract	20mg	**
PABA	20mg	**
Choline	10mg	**

**Daily Value not established.

Figure 2: The nutritional supplement label above contains no proprietary blend and therefore allows better review of the product based on ingredient clinical efficacy doses.

Why do Companies use Proprietary Blends?

Proprietary blends exist for a few specific reasons:

Reason #1

- **DECEPTION** – When a company wants to hide a low-dose ingredient(s), they will typically use a proprietary blend. Remember, if the amount of an ingredient in a product is lower than the **clinical efficacy dose** then the effectiveness of the product will not produce the results shown in clinical trials.

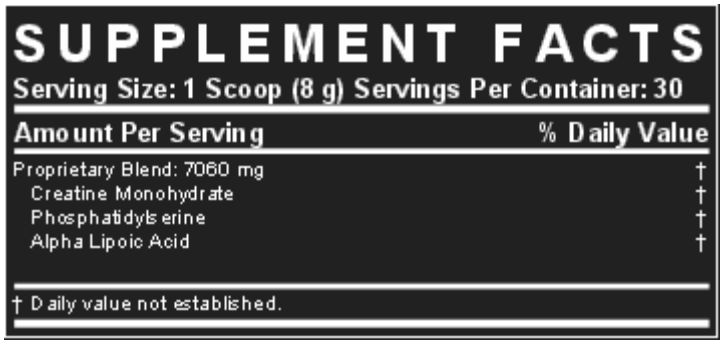

Figure 3. Brand X's nutritional supplement label above contains a proprietary blend of three ingredients, which are listed in order of dose weight. The total weight of the three ingredients is 7,060 milligrams (mg).

In the chart below is a side-by-side comparison of both the **Clinical Efficacy Dose** (produced a desired result in clinical trials), and the amount that **Brand X** (Figure 3) put in their proprietary blend:

Ingredient	**Clinical Efficacy Dose**	**Brand X's Dose**
Creatine Monohydrate	5000 mg	7000 mg
Phosphatidylserine	750 mg	50 mg
Alpha Lipoic Acid	100 mg	10 mg

As you can see from the chart above, **Brand X** has used an ultra-cheap ingredient (Creatine Monohydrate) to mask the ultra-low ingredient contents of both the *expensive* **Phosphatidylserine** and the *mid-expensive* **Alpha Lipoic Acid**.

To make matters worse, **Brand X** has priced this product at **$59.99** while advertising how effective Phosphatidylserine is for muscle recovery! They justify their high price because of the Phosphatidylserine content, which we actually know isn't even close to being an effective dose.

Brand X has produced a product that will offer almost no additional benefit in comparison to consuming straight creatine monohydrate, which could be purchased at about 1/15 the cost of **Brand X**'s product. Unfortunately, this deceptive business practice is happening every day, and sometimes with seemingly legitimate companies.

Reason #2

- **PROTECTION** – While some companies may use proprietary blends to **protect their deception**, other's are using proprietary blends to **protect their investment**.

Let's say **Brand X** used the following ingredient doses in their product:

Ingredient	**Clinical Efficacy Dose**	**Brand X's Dose**
Creatine Monohydrate	5000 mg	6160 mg
Phosphatidylserine	750 mg	800 mg
Alpha Lipoic Acid	100 mg	100 mg

In this case **Brand-X** feels the need to protect their proprietary blend in order to remain competitive in the market. Sometimes a company spends tens-of-thousands of dollars to invest in research and human trials of a proprietary blend. With this type of financial investment, these companies cannot afford a cut-throat copycat of their product to enter the marketplace. So, to mask their ingredient doses, they create a proprietary blend. Oftentimes these companies can easily prove their legitimacy and will acknowledge their strict use of clinical efficacy doses in their proprietary blends.

Discovering the Deception

While there's no easy, quick solution to determine if a company's proprietary blend is deceptive, there are indicators to watch for:

- The company's website or media advertisements are excessively *flashy*, oftentimes with images of oversized bodybuilders, popular sports figures, or even celebrities.
- The company's advertisements indicate that a particular high-profile athlete used their product to achieve the advertised results, or "gained x-amount of size by using product-x".
- The company promises or guarantees that you'll "gain x-amount of size in just x-amount of days", or some other outrageous claim.
- The company uses **"Before-and-After"** images to promote a product.
- The company advertises that "product-x has been backed by years of research", yet they never actually list any supporting research or anything substantial to backup their claim. Remember, research isn't normally conducted on a particular product, but rather the individual ingredients. (Read Evaluating Dietary Supplements on page 11).

This list isn't conclusive for every situation but it should help you decipher which companies are pushing snake-oil versus those who could have a legitimate product. Remember, marketers know how to push your buttons, but now you are armed with the insider-knowledge that many companies don't want you to know! Choose your supplements wisely and you'll experience the benefits of productive choices.

The Almighty Placebo Effect

Quick Hit Summary

A placebo is a phony substance that is given to someone who believes it to be the real thing. A placebo effect occurs when a phony substance gives the user the same results one would expect from the "true" substance. Clever marketing campaigns increase the likelihood of a placebo. Many worthless supplements provide amazing results simply due to the placebo effect. Not everyone will respond to the placebo effect; 2 individuals can take the same "shady" product and only one may benefit.

The Placebo Effect

In previous articles, I've discussed the importance of researching nutritional supplements prior to buying them. When scrutinized by the savvy eye, many supplements fail to live up to their marketing hype. Heck, even products that contain legitimate ingredients can be a cause for concern when packaged as part of a propriety blend (see page 19). I know all the readers here are well educated and would never fall for any of these tricks! However, maybe one of your workout partners is less informed.

Figure 1 Are you scratching your head over the amazing results obtained by a friend after taking a bogus supplement?

Let's pretend that you've been lifting with Jack/Jill since you were in your mid 20's. You're now approaching your upper 30's. Things are still going well for the both of you, albeit your training intensity and max strength levels have taken a bit of a hit. One day, Jack/Jill walks into the weight room and boasts about a new supplement he/she's taking. Not thinking much of it, you nonchalantly say "cool" and continue your workout. However, over the course of the next two weeks, Jack/Jill lifts with the vigor of someone still in their 20's. Like any inquiring mind, you ask, "What is the name of that product you're taking?"

Jack/Jill replies, "Ultra-Jacked Muscle Extreme. I saw an advertisement for it while reading the most recent issue of *Muscle Mania Express*. You should see the before and after photos of those who've already used the supplement. The strength gains and body composition changes made by those promoting the product was incredible! After seeing the ad, I bought a 2.5 lb container for $55. It has done wonders for both my energy levels and ability to recover between workouts."

{Please note that Ultra-Jacked Muscle Extreme and Muscle Mania Express are both fictitious names that I created for this article}

Sounds impressive but you've never heard of it before. Upon returning home, you make use of the skills learned in one of your favorite CasePerformance articles (Evaluating Dietary Supplements) and research the ingredients of Ultra-Jacked Muscle Extreme. Upon careful review, you realize that many of the ingredients included in the supplement are not supported by scientific literature. The product does contain creatine monohydrate. However, upon looking at the supplement label a little closer you notice that the recommended daily serving contains only

1.5 grams of creatine monohydrate, far less than the amount used in supportive scientific research studies. You say to yourself, "This supplement is complete CRAP! How the heck is Jack/Jill training with such intensity? Is Ultra-Jacked Muscle Extreme secretly laced with steroids?"

I'll let you in on a little secret to help you understand what is probably going on in your friend's case. He/she is likely to be experiencing the placebo effect. What the heck is this you ask? Read on and find out!

The Placebo Effect and Nutritional Supplements

A **placebo** is a phony substance that is given to someone who believes it to be the real thing. For instance, let's say I gave you 2 pills and informed you that they were both caffeine energy pills, even though one was simply filled with indigestible fiber. The capsule containing fiber would be the placebo. Now if you took the fiber pill (thinking it was a "true" energy pill) and experienced a great boost in energy, you'd be a victim of the **placebo effect.** In other words, despite taking a phony pill, you got the same physical and perceptual response that you were expecting to receive from the energy pill. Placebos can be extremely powerful, mimicking the physical effects of a true substance all the way down to the hormonal level[1]. Talk about the power of thought taking over the body! Don't believe me? Take a look at these research studies:

Study #1

In a study completed Pollo et al., 22 recreationally active college men had the work output of their quadriceps (front thigh muscles) measured on 2 separate occasions[2]. During the first session, participants completed leg extensions (intensity set at 60% of 1 rep max) until failure. 3 days later, the procedure was repeated. However, 11 of the participants were given a placebo caffeine supplement. Additionally researchers suggested to those receiving the placebo caffeine that it would enhance performance. At the end of the trial, it was found that **those who thought they were receiving the high dose caffeine experienced an 11% greater work output** during the 2nd session. In contrast, no significant differences in work output were noted between sessions amongst those who failed to receive the placebo caffeine pills.

Study #2

The affects of steroid placebos on muscle strength levels in 11 national level power lifters was assessed by Maganaris et al[3]. In their study, athletes were given what they thought were "fast acting" steroids prior to performing the traditional power lifts on 2 separate occasions. Compared to baseline measurements, which were obtained 1 week prior to the first trial, maximum lifts increased as follows:

- Bench Press- 3.5%
- Dead Lift- 4.2%
- Squat- 5.2%

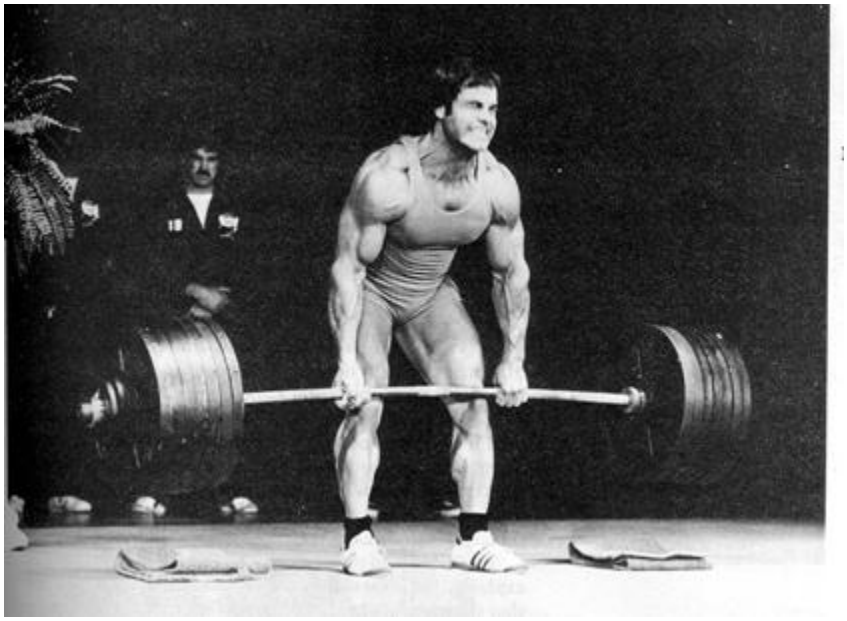

Figure 2. Increase this guy's max deadlift by 4.2%. You're probably looking at a strength gain of 35+ lbs. Pretty impressive gains for a "fake" pill.[9]

All participants received the placebo steroids again prior to a 2nd testing session, which was completed 1 week following the 1st. However, just prior to the start of the 2nd session, 6 participants were informed that they had received placebo steroid pills the entire time. During the ensuing max rep tests their bench, dead lift and squat performance all returned to baseline levels. On the other hand, **the group who still thought that they were receiving true steroids maintained their strength** gains.

The above studies are only a small sampling of the current research demonstrating the presence of a placebo effect[45]. I could pull up 100 similar peer reviewed journal articles demonstrating similar results.

Tricks Manufactures Use to Take Advantage of the Placebo Effect

As seen above, many companies take advantage of the placebo effect. Rather than provide legit, research backed supplements, they sell products consisting of nothing more than questionable ingredients. Don't get me wrong, **the "magical" blend** may contain a couple quality ingredients (ie- creatine monohydrate, etc). This inclusion will often be noted on their product labels with phrases such as, "*Containing Superior Forms of Creatine*" or similar sales pitch lines. Yet, unbeknownst to the consumer, the amount may fall well below the scientifically proven effective daily dose. Unfortunately, sell happy distributors take advantage of this naivety, perpetuating the myth of the product's effectiveness. Thus, the stage is set for the placebo effect to take hold simply due to consumer expectations.

Another trick commonly used to encourage a placebo effect are **"miracle" before and after photos**. Here's little secret… most of these "miracle" photos have been digitally altered to enhance muscle definition, etc. Besides digitally altering the photos, it's common to have the "before" photos shot in poor lighting whereas "after" photos usually have great lighting. These same advertisements also give the false impression that the supplement alone caused the magnificent body transformations. Yet, quite often, the users are taking a large medley of supplements. In particular, I know of a popular fat burning supplement that was routinely advertised in popular magazines 3-5 years ago. As it turns out, the endorsing model took multiple supplements (including steroids) to help him achieve his amazing body transformation.

Manufacturers also increase the likelihood of the placebo effect taking hold by **adding a little CNS stimulant** (caffeine, etc) to a product to give users a buzz/high. I've seen this in various pre-workout "shooters" that are promoted for their ability to enhance the ensuing training session. Individuals feel the effects of caffeine and believe that it's a sign that their $50 supplement must be working. Don't get me wrong, I'm not trying to knock caffeine. There is plenty of research out there supporting its ergogenic (performance enhancing) benefits[6]. However, rather than taking a $50 supplement, one could have gotten the same effect by taking a much cheaper caffeine product. Ok, Ok, this is not necessarily a placebo effect, since the caffeine is truly working. However, it's a shady trick manufactures use that I feel is worth mentioning.

So what's the big deal about experiencing placebo effects?

If they increase physical performance, equal to the real stuff, what's the big deal? The bottom line is all that matters, right? I have two issues with this line of thinking:

1) **The placebo effect does not work in everyone.**[5] In other words you have "responders" and "non-responders." Additionally, just because the placebo effect occurs for you while taking one junk supplement (unknowingly of course), it does not mean that it will occur while taking another product. Thus, you can spend $50+ on a given item without experiencing any sort of training/physique improvement.

2) The ethics/integrity of any manufacturer, who puts out shady products, crossing their fingers on a placebo effect, has to be questioned.

A Potential Upside in the Placebo Research

There is an upside to the placebo research. **Studies examining this effect clearly demonstrate the power of the mind**. In order to experience such drastic improvements in performance, despite taking phony substances, individuals apparently hold an untapped reservoir for extreme physical performances. How can we dip into this pool to enhance our training sessions? One way is via mental strategies such as visual imagery[6] or simply "psyching up"[7] prior to competition.

Great Supplements Do Exist!

Up to this point, I've painted a somewhat gloomy picture of the supplement industry. Please realize, I'm not a cynical, jaded individual who is doing my best Michael Moore impersonation. **MANY GREAT SUPPLEMENTS DO EXIST!** I'm a fan of various ones myself. Currently I take fish oil, a multi mineral-vitamin complex, vitamin-D, calcium and protein shakes on a daily basis. Their are numerous others (creatine, green tea extract, etc) that also have scientifically proven clinical and/or performance enhancing benefits. **I just want to stress the importance of doing your homework** on a particular supplement or purchasing it from someone who has already done the leg work. Again, I'd like to refer you back to the Evaluating Dietary Supplements section of this eBook (pg 11) if you need help on evaluating products yourself.

Bottom Line

Many supplement manufacturers, with questionable integrity, take advantage of the placebo effect by selling questionable supplements solely through clever marketing campaigns. Despite scientific evidence clearly refuting the supplement's efficacy, many elite and recreational athletes will swear by it. Don't misunderstand the point of this article. Many great supplements do exist. One just has to be willing to do a little homework to figure out which ones are supported by science.

There is a positive upside for an athlete that has come from research studying the placebo effect. It's clear that an amazing capacity of physical strength/performance is locked within everyone's head. Take advantage of this via mental imagery, psyching up, etc.

As this article comes to a close, I'll leave you by simply saying:

The placebo effect is alive and well in the supplement industry. Don't be a victim, do your homework!

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[3] Maganaris et al. (2000) summary. Obtained from pg 318-319 of: Beedie CJ, Foad AJ. The placebo effect in sports performance: a brief review. Sports Med. 2009;39(4):313-29.

[4] Beedie CJ, Foad AJ. The placebo effect in sports performance: a brief review.Sports Med. 2009;39(4):313-29.

[5] Enck P, Benedetti F, Schedlowski M. New insights into the placebo and nocebo responses. Neuron. 2008 Jul 31;59(2):195-206.

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[6] Yue G, Cole KJ. Strength increases from the motor program: comparison of training with maximal voluntary and imagined muscle contractions. J Neurophysiol. 1992 May;67(5):1114-23.

[7] Tod DA, Iredale KF, McGuigan MR, Strange DE, Gill N. "Psyching-up" enhances force production during the bench press exercise. J Strength Cond Res. 2005 Aug;19(3):599-603.

[8] Created by Ilyushka88. Accessed June 15, 2010 from:http://commons.wikimedia.org/wiki/File:Q5.png

[9] Created by Rhodney Carter. Accessed September 18, 2010 from: http://commons.wikimedia.org/wiki/File:Bar_bending.jpg

Appendix 1: Pubmed for Dummies

Quick Hit Summary

When deciding if a nutritional supplement is right for you, go straight to the research; not some random forum or worse yet, a manufacturer's website. An excellent resource to research a nutritional supplement (or physiology related inquiry) is Pubmed.gov which contains > 19 million peer reviewed scientific journal articles. If you've never used it before, Pubmed can be quite intimidating. However, I've created a little tutorial, Pubmed 101 that will hopefully assist you as you make this journey for the first time. One quick warning, do not make a decision based off 1 study alone; rather, base your decision.

Pubmed: A Hotbed for Scientific Research

In previous portions of this book (Why Many Supplement Forums and Retail Sites Contain Misinformation), we detailed how internet forums & manufacturer websites are **NOT** the best place to go when deciding if a supplement will improve performance. Rather, we encouraged you to go straight to the source and research the ingredients of a given supplement at **Pubmed**. I understand that using Pubmed may seem intimidating at first. However, I hope that the tutorial below will help you get past any sort of fear and allow you to enjoy the use of Pubmed. Enjoy!

Pubmed 101

When you first go to pubmed.gov, the figure below (figure 1 pg 32) will come up on your computer screen. At the top is the entry box to write in whatever you want to search. I strongly advise you not to research a specific supplement by name (ie- don't type in Nytric-EFX™ or CGT10™). Very few peer reviewed research studies exist using specific supplements. Rather look at the ingredient list for the supplement and **research the specific components of the product**. For example, if you're looking at Nytric-EFX™ research L-arginine, L-arginine AKG. In the case of CGT10™ research creatine monohydrate, L-glutamine and taurine.

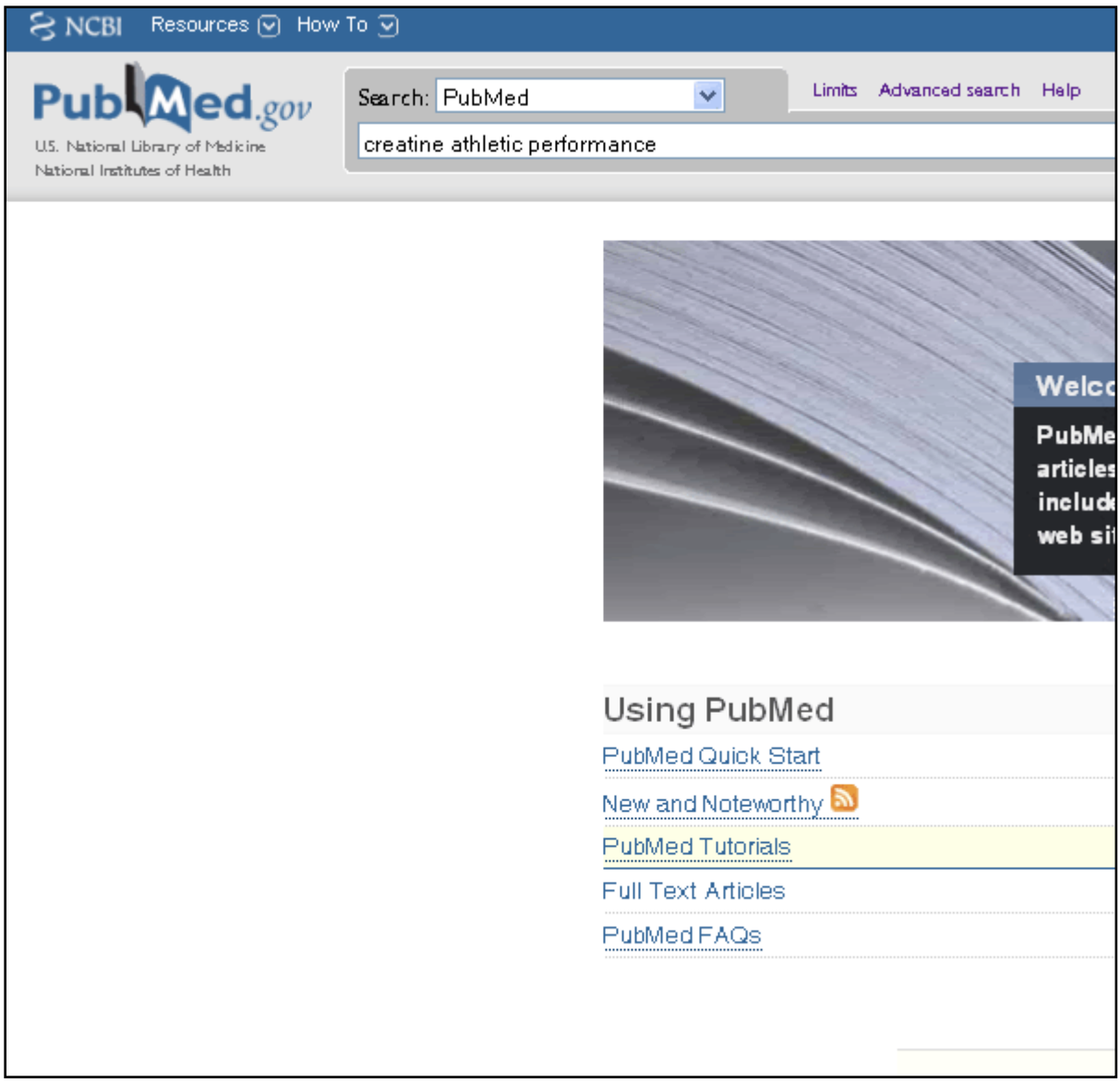

Figure 1 Pubmed's homepage. For the rest of this tutorial, I'll be using the search terms "creatine athletic performance." Hence those words are in the search box.

If you are a first time user, and learn better via visual demonstrations, I HIGHLY recommend clicking on Pubmed Tutorials. This is listed under the "Using Pubmed" section that can be seen in the bottom right hand quadrant in the above figure. In **Figure 1**, I have it highlighted a light beige color. Clicking on that section will take you to an area where you can see video demonstrations. You may find the "Searching Pubmed" videos particularly useful.

Once you've typed in the search terms "*creatine athletic performance*", as seen above in **Figure 1**, hit "search". The next screen that comes up should be pretty similar to that seen below in **Figure 2 (**pg 33**)**. Please note that the images for this article were taken on January 13, 2010. New research is always being published, with the most recent studies being listed at the top of

the search results. Thus, the image present in Figure 2 may differ from what you see when you type the same search terms into the box and hit "search".

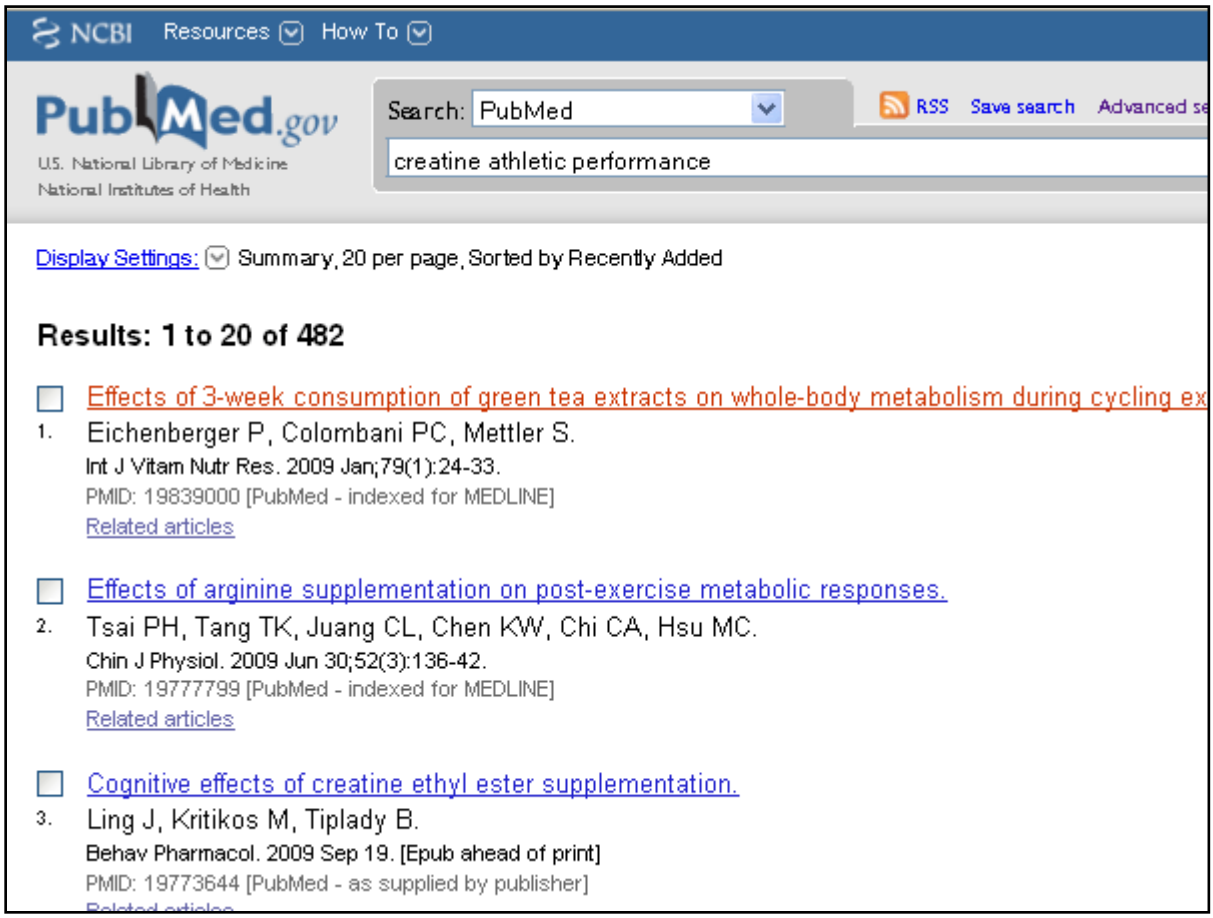

Figure 2 Pubmed Search Results.

As you can see in **Figure 2**, using the search terms "creatine athletic performance" brought up 482 peer reviewed studies/articles. Similar to using google.com (or similar type of search engines), you may have to fine tune your search terminology to narrow down results. If you click on any individual study, the next screen that comes up will summarize the study/article (see Figure 6, pg 37**)**. For reference, in the scientific community, **the summary of a study/article is referred to as an *Abstract***. In general, the abstract will tell you the purpose of the study, briefly describe the study's participants, the treatment (ie- taking creatine, etc), results of the study (usually described statistically), and the conclusions drawn by the researchers of the study. If it's a review of previous studies, the abstract will be more general.

If you're interested in reading the full study, there will be a link towards the top right hand corner of the screen (just above the *Related Articles* heading) as seen in **Figure 3** .

Figure 3 Link for Reading Full Journal Article/Study

I must inform you, some journals require you to be a subscribing member to read the full article. If you're getting tired of only being able to read the abstract of a study vs. the entire study, click on Limits which can be found at the top of the screen, just above where you type in your search terms. Once you've clicked on this, a screen similar to **Figure 4 (**pg 35**)** will show up.

PLEASE NOTE: The above figure (Figure 3) is a slightly out of date image. Now to the left of the "Advanced search" tab, you will now see a "Limits" tab. Look at **Figure 1** to see what I'm referring to with respect to the "Limits" tab.

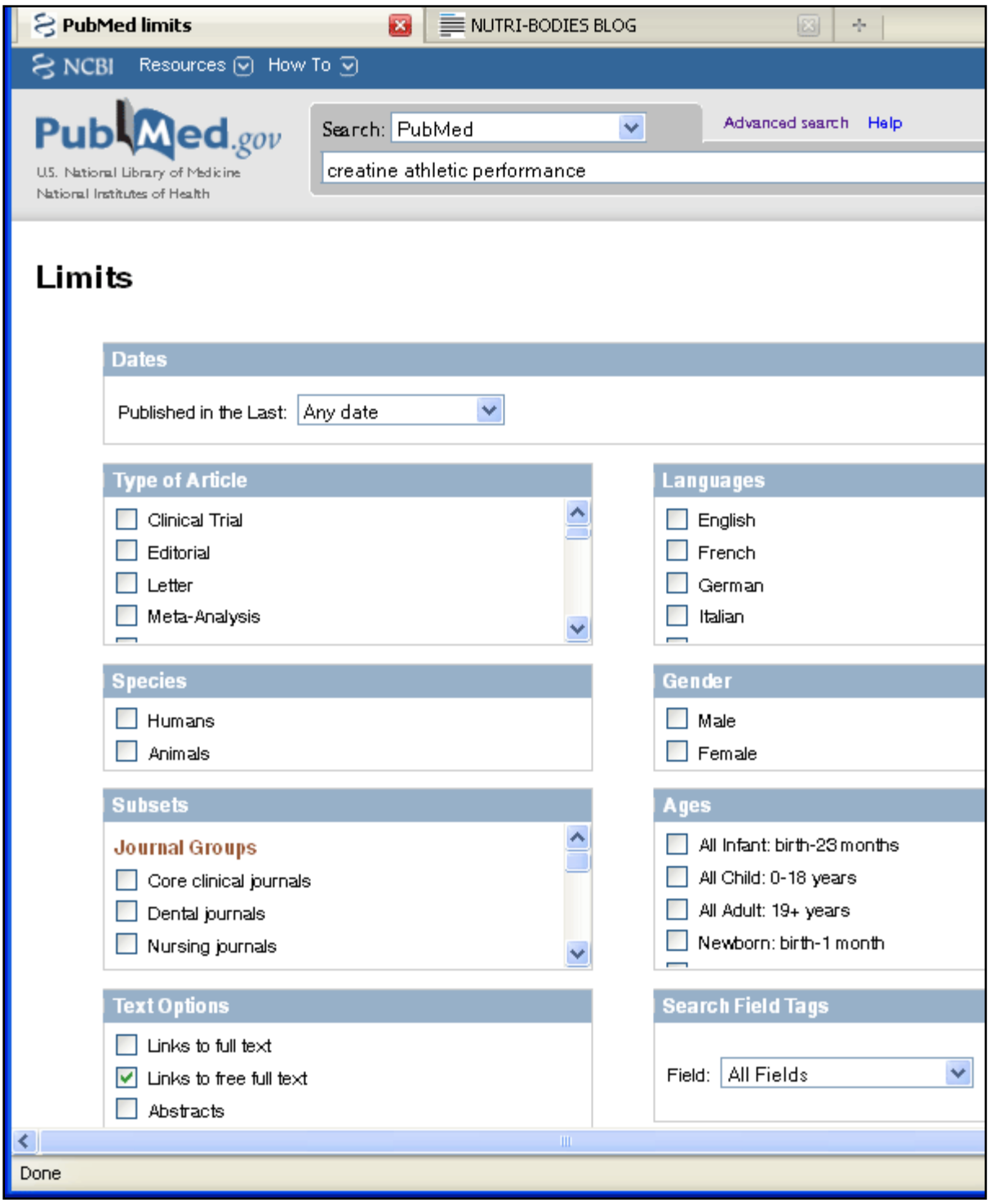

Figure 4. Limits Search Option Screen

As you can see there are many options that can assist you with your search. Under the heading, "Text Options" you can select if you want only free full text articles. Also, notice that you can click on if you want animal based studies or research completed on only humans (which you can also subdivide into male and female). If we click on free full text, and do a search with "creatine

athletic performance" in the subject line, a screen similar to **Figure 5** should appear. As aforementioned, this is the current screen for this search as of January 13, 2010.

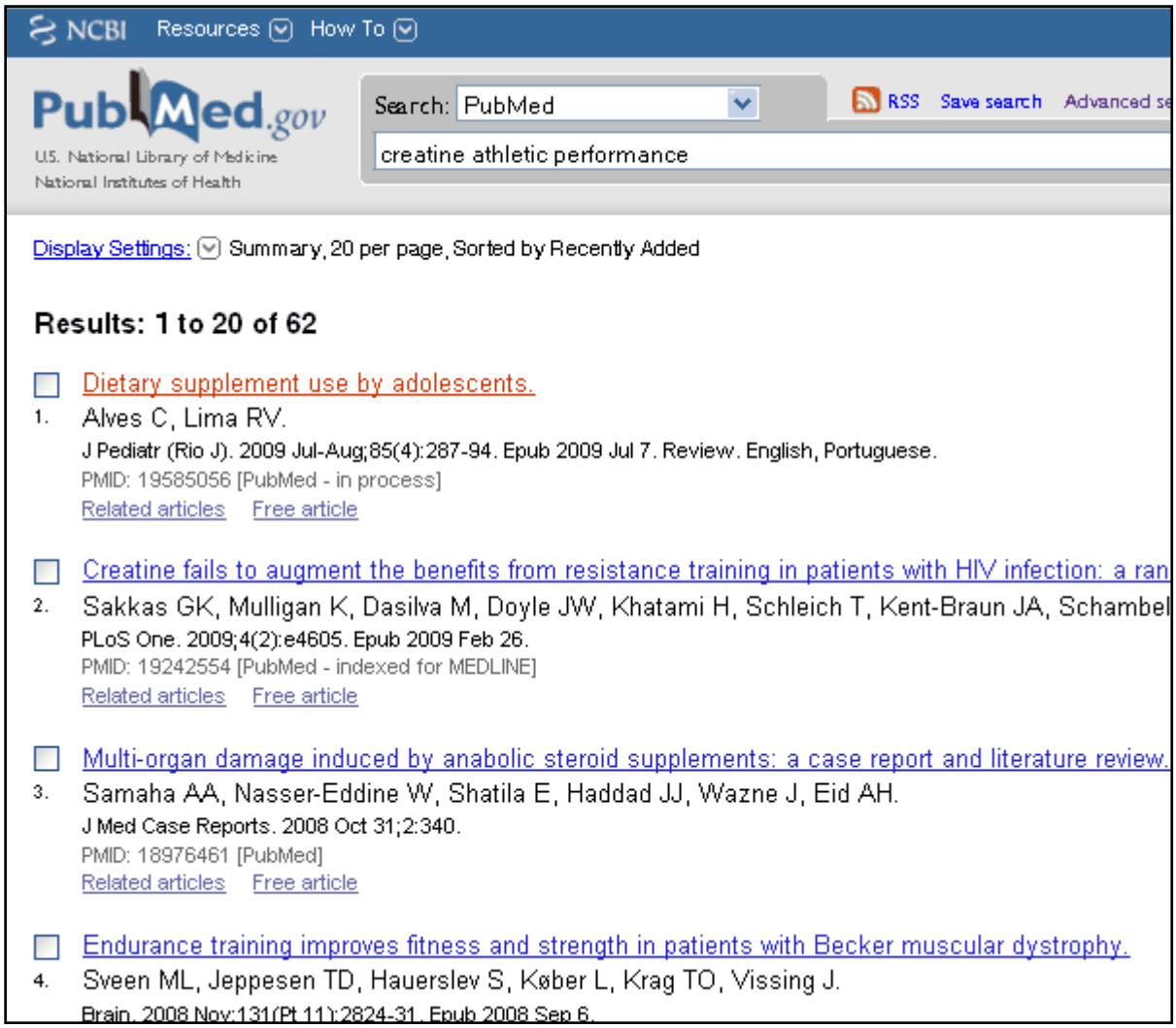

Figure 5 Advanced Search Results when Only Using Free Full Text Articles

On one hand using this advanced search limit (free full text) is nice because you have access to read the entire journal article. On the other hand, there are far fewer journal articles that you can view when you limit yourself to free text only. Since one is able to read the study summary when limits are not used, **I recommend looking at BOTH free full text articles AND abstracts of research articles that require a paid subscription** (to read entire article).

As a FYI, many important study details are obviously missing from abstracts. Therefore, don't form solid conclusions based off reading only 1-2 abstracts. As far as that goes, in general, **one shouldn't make broad conclusions based off a single study either. Rather, a collection of studies are needed to fully understand if/how a supplement works.**

The first journal article that comes up doing this search is *Dietary supplement use by adolescents*[4]. If you click on the journal title, it will take you to a page displaying an abstract as seen in **Figure 6**.

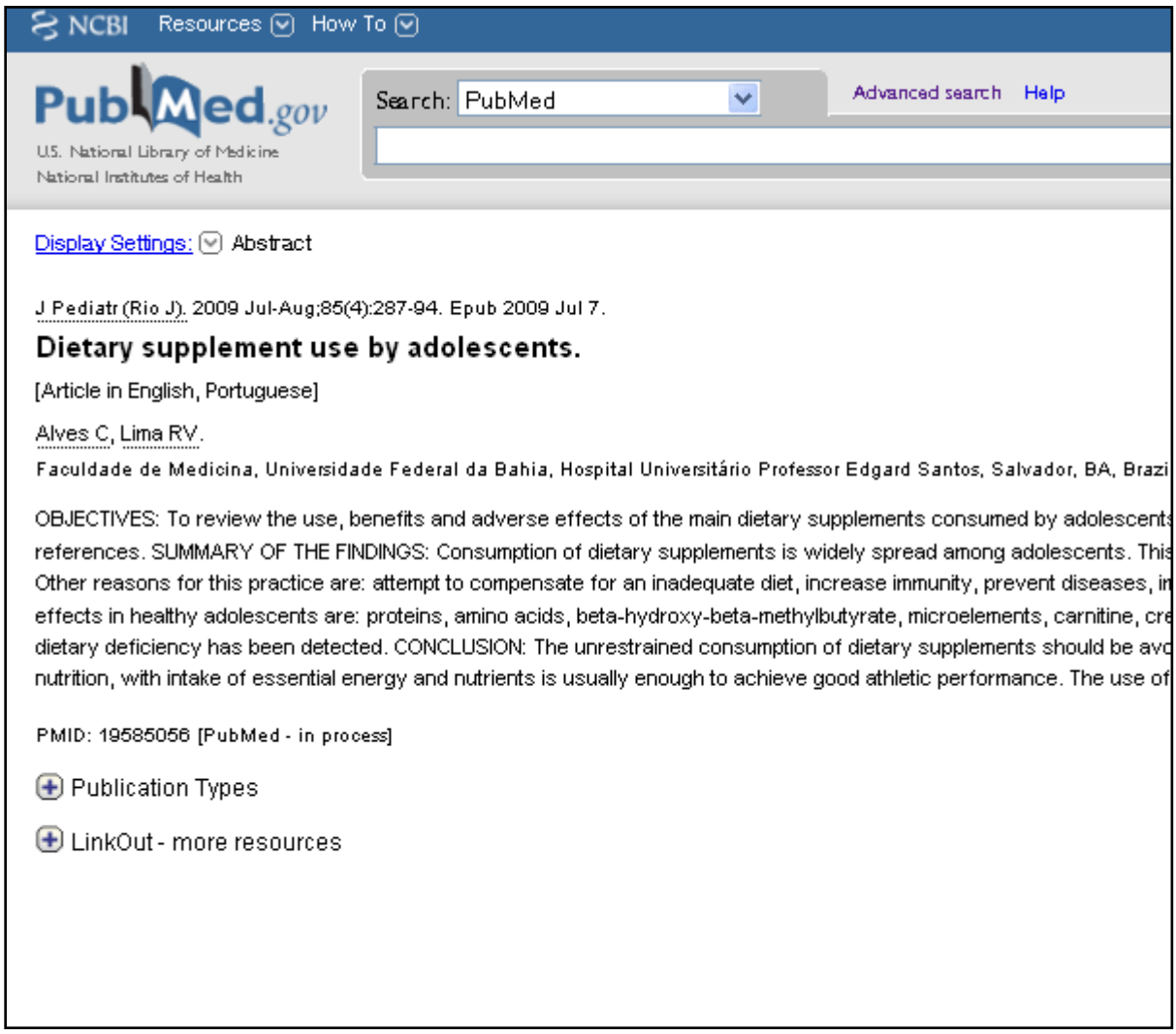

Figure 6 Abstract of the journal article *Dietary supplement use by adolescents*.

I've already pointed out what you have to do to access the full length article (**Figure 4**). However, I'd like to direct your attention to the Related articles section which is found on the right hand side of the screen just below the full length article section (**Figure 7**). As its name implies, listed within this box are similar types of studies.

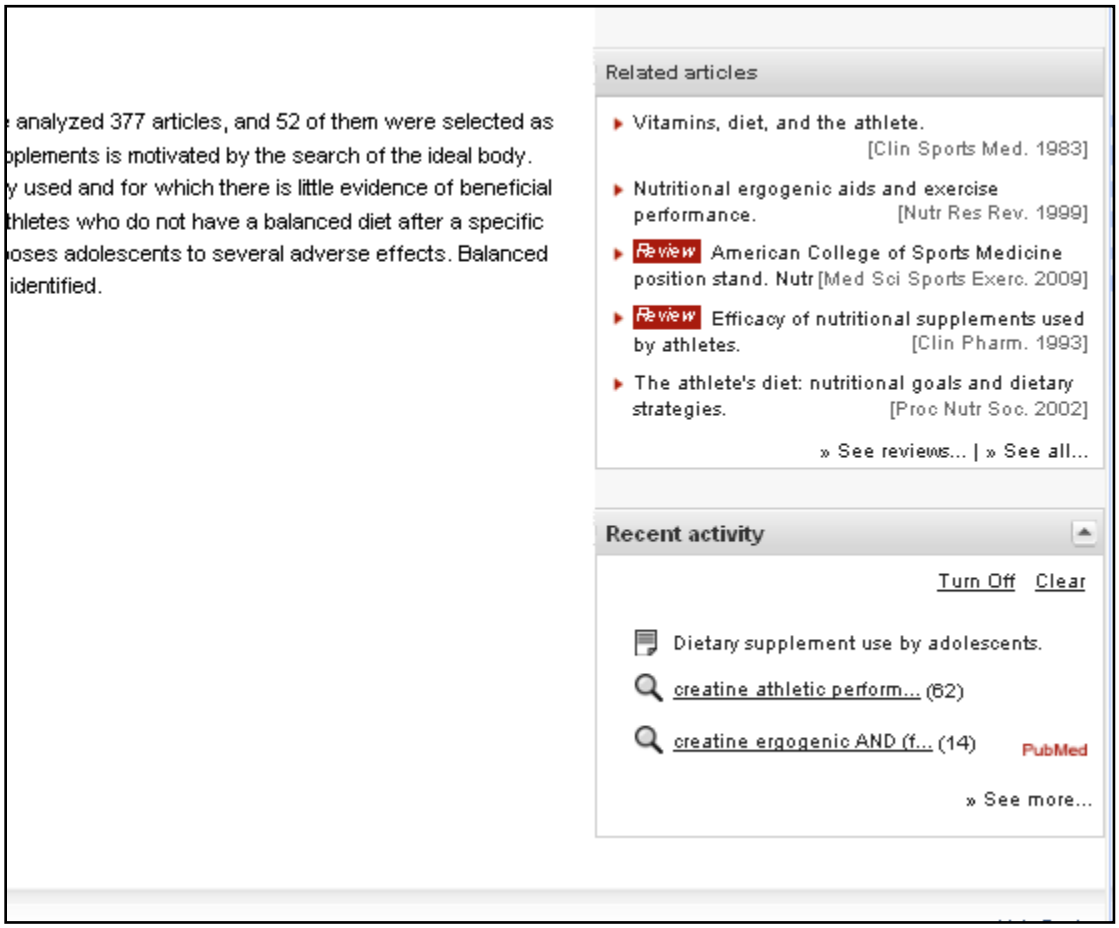

Figure 7 Related Articles Box

The last thing worth mentioning regarding Pubmed is that you can make a personal account and save any studies that you find interesting. Along the top of the pubmed.gov website there is a blue bar that runs the entire length of the screen. On the right hand side of this blue line are the words "My NCBI" (Please see **Figure 8**). To start your free Pubmed account, click here. There is also a online video tutorial that cam be accessed on the previously mentioned Pubmed Tutorial section. Look for the videos underneath the "My NCBI Quick Tour."

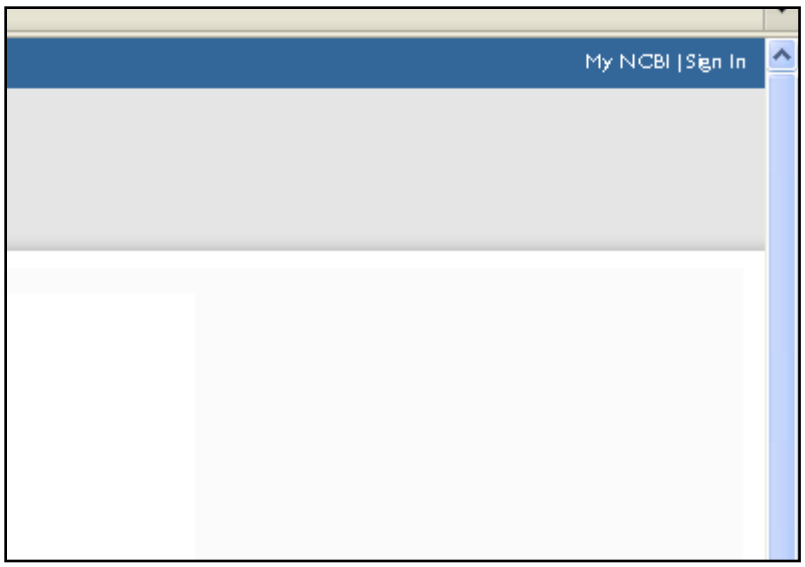

Figure 8 Account Sign Up Site for Pubmed

Bottom Line

Do not waste your time reading internet forums or manufacturer websites if you want to see if a product works. Rather, focus on the peer reviewed scientific research when deciding if a supplement is right for you. Luckily, one can access this information at Pubmed.

Hopefully the above tutorial will help you navigate your way through Pubmed. I realize this process can be a pretty intimidating at first. However, get these steps down and you'll have Pubmed mastered. Let your researching career begin!!!

Appendix II: Research 101

Quick Hit Summary

Although it's not the most exciting topic, the ability to understand research is critical to understanding the claims made by popular newspapers/magazines, supplement manufactures, etc. There are two main types of scientific studies: epidemiological and experimental. Epidemiological studies look at ASSOCIATIONS between 2 variables; they do not show a cause and effect relationship. An example would be a study showing that stronger individuals eat more protein in their diet. In contrast, experimental studies show CAUSE AND EFFECT relationships. An example of this study design would be that ingesting 30 grams of protein increases muscle protein synthesis in 20 study participants. Other key issues to keep in mind when evaluating a study include… Did the study include a large number of participants or only 5-10? Are the characteristics of the participants (age, gender, possibility of a disease such as type II diabetes etc) similar to your own? If the answers to these questions are "yes", than the results are more likely to apply to your life.

The Importance of Research

I realize that research terminology isn't exactly the most exciting topic of conversation. In fact most people probably find it downright BORING. While completing undergraduate studies, I had numerous research based lectures that broke down the nitty-gritty nuances of one study design vs. another. These were definitely the days where my pre-lecture preparation required a double shot of espresso if I wanted to stand any chance staying awake! As tough as those lectures were to stay awake for, I've found them vital to my ability to properly interpret information that I read both in scientific journals as well as magazines (Muscle & Fitness, Men's Health, etc).

I draw a parallel between this article and the movie Gladiator. I fondly recall my thoughts from watching this movie for the first time. As the movie started, I was completely blown away while the Romans went into battle with the Barbarians. During the next 45 minutes, the film struggled to keep my interest as the plot unfolded between Maximus (Russell Crowe) and the new emperor Commodus (Joaquin Phoenix). An hour into the film, things start to heat up again and ~ 3 hrs after the film started, I had a new favorite movie. However, without the 45 minutes of "mind numbing" plot development slipped in there, this would have just been another action film, without any distinction from all the previous ones I've seen.

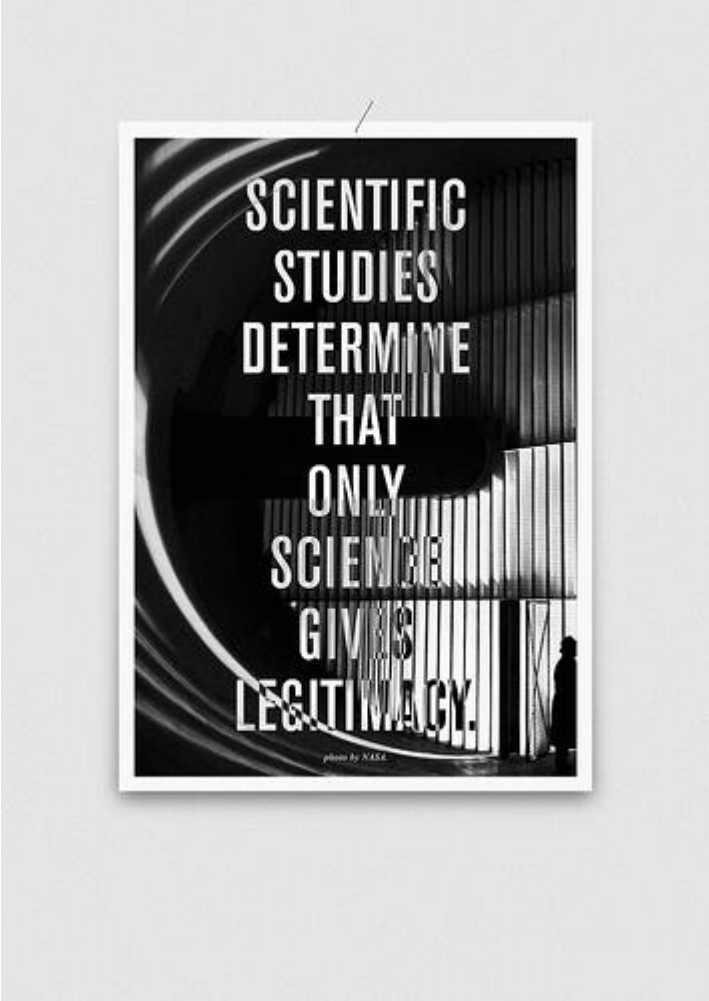

Figure 1 Scientific Studies Determine That Only Science Gives Legitimacy[2]

Now back to research terminology… Similar to the middle part of Gladiator, it's not the most exiting topic. However, just as this part was crucial for appreciating the depth of the Maximus's plight, understanding research terminology is critical for recognizing the true value of a given study's results. Although my intention is not for you to memorize all the information presented here, I hope that you'll bookmark it and use for reference purposes.

So without further adieu I bring you:

Research Study Design 101

I'm going to list the different types of studies that one may come across in descending order; starting with the weakest and finishing with the strongest study designs[1]. There are 2 broad types of study designs, epidemiological and experimental; both of which can be broken down into further subcategories. To make things a little easier, give the same basic example for all of the

studies, but tweak it a little to fit the study design. Also, I'll give strengths and weaknesses of each study type.

STUDY DESIGN TYPE 1: EPIDEMIOLOGY STUDIES

Epidemiology studies: Study design that looks at ASSOCIATIONS between 2 variables. It CANNOT PROVE CAUSE AND EFFECT.

1a. Case Studies:

Definition:

- Anecdotal evidence based off one person's experience.

Example:

- I lift heavier weights during my workouts when I drink an energy drink vs. plain water.

Strengths:

- Provides ideas for further research.

Weaknesses:

- Based off the results obtained by a single individual. Results cannot be generalized over to other individuals

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1b. Cross Sectional (prevalence) Study:

Definition:

- A study looking at the relationship between a given population and a specific characteristic/variable. Only looks at one specific instance in time.

Example:

- At the USA Powerlifting championships each 1st place lifter is asked if they're CURRENTLY taking a post workout protein shake.

Strengths:

- Quick and easy method to find association between populations and a given variable.

Weaknesses:

- No time relevance/directionality is present in study. Thus, can't say what caused what; kind of like the chicken or the egg debate. One can only say that a relationship exists between 2 variables.

1c. Case Control (retrospective study) Study:

Definition:

- Upon completion of an event, researchers look at those who were and were not exposed to a given element prior to a certain event. Results obtained by each group are then compared.

Example:

- UPON THE COMPLETION of the USA Powerlifting Championships each lifter is asked if they took a post workout protein & carbohydrate shake during the three months leading up to the event. Researchers then examine if those who took the post workout protein shake were more likely to be champions than those who didn't take a post workout shake.

Strengths:

- Stronger than cross sectional study because a time element is involved. Thus, one can determine the order that the events occurred (ie- using our example, one now knows that some individuals were taking shakes prior to the day of the event.)

Weaknesses:

- Several confounding variables are involved. In particular is recall bias which occurs when an individual inaccurately reports if they had been exposed to a variable prior to the event. This may be as simple as forgetting if they took a given supplement on a consistent basis (ie- did they take a general protein blend recovery drink or was it a whey protein). Inaccurate recall also occurs when the variable they were exposed to is frowned upon by the general public. For example weightlifting champions are asked if they took steroids prior to the Olympics. If the individual did take steroids, it's unlikely that they'll tell the truth for fear of public scorn.

1d. Cohort (prospective) Study:

Definition:

- The reverse of a case control study. Researchers record differences between individuals prior to a given event. This study design is considered stronger than a case control study.

Example:

- 3 MONTHS PRIOR to the USA Powerlifting Championships, researchers ask lifters if they plan to take daily post workout whey protein & carbohydrate shakes leading up to the championships. After the completion of the championships, they compare the results of those who took the shakes vs. those who did not take the shakes.

Strengths:

- Eliminates recall bias. Provides time element.

Weaknesses:

- Still does not prove direct evidence of cause & effect.

STUDY DESIGN TYPE 2: EXPERIMENTAL STUDIES

Experimental Studies:

- Study design that looks at how 1 variable directly influences another variable. Only type of study providing evidence of direct CAUSE AND EFFECT relationship.

2a. Randomized Controlled Laboratory Study:

Definition:

- Individuals are randomly assigned to either a *control group* (receives sham/placebo treatment) or *treatment group* (receives unique treatment that study is studying). However, rather than living in their normal environment, everyone lives in the same controlled environment to ensure that they are exposed to the same elements. Often, these studies are done on animals rather than humans.

Example:

- Researchers examine the effect post workout protein and carbohydrate supplementation has on muscle gain when taken over the course of 3 months. Rats receive the same exercise routine and take their respective supplement (placebo or protein powder) after running on a mousewheel. Over the course of the day, each rat is given to the same diet, exercise routine and sunlight exposure. Muscle dimensions are taken at the start and end of the study. After 5 weeks of following this protocol. researchers compare gains made by each group to see if protein & carbohydrate supplementation resulted in bigger muscle gains.

Strengths:

- Researchers are able to limit factors that may affect the studies outcome (such as diet, etc).

Weaknesses:

- Humans don't live in a controlled environment, making it difficult to say with certainty that the results from these study's can be applied to us.

2b. Randomized Clinical Control Trials:

Definition

- This is considered the GOLD STANDARD with respect to study design. Individuals are randomly assigned to either a *control group* (receives sham/placebo treatment) or *treatment group* (receives unique treatment that study is studying). Each group then goes back to their normal every day routine, while completing the specified treatment assigned to them.

Example:

- Researchers are studying the effects that post workout protein & carbohydrate supplementation has on muscle gain when taken over the course of 3 months. Participants of similar physical fitness capabilities complete the same exercise routine, take supplements (placebo or protein powder) as part of their normal every day life. Muscle dimensions are taken at the start and end of the study. After 3 months of this routine, researchers compare gains made by each group to see if protein supplementation resulted in bigger muscle gains.

Strengths:

- Attempts to prove if research results obtained from a laboratory can be reproduced in a "real world" environment.

Weaknesses:

- Unable to rule out all factors that could confound study results. (eg- control group could show bigger muscle gains simply by eating an overall healthier diet that group receiving protein).

Other Issues #1: In-vitro vs. In-vivo tests

In vitro

Definition:

- Research conducted on NON-LIVING organisms. Studies are often conducted in test-tubes or petrie-dishes.

Example:

- Researchers measure the effects of lactic acid on muscle fatigue in muscle tissue obtained from a frog

Strengths:

- Direct results are easy to obtain. In vitro tests often serve as the foundation for later testing.

Weaknesses:

- It's a large leap to apply research obtained in vitro directly to living organisms.

In-vivo:

Definition:

- Research conducted on LIVING organisms.

Example:

- Researchers measure the rate of protein synthesis in muscle tissue 30 minutes after participants complete an intense lifting session

Strengths:

- Results obtained in living organisms can easily be applied

Weaknesses:

- No weaknesses present. Weaknesses only exist in how one applies a study's results.

Other issues #2: Validity

Validity:

Considered to be a measure of the amount of faith we can put in the findings of a study. In other words, how "true" are a study's results. In the end, the strength of the study is determined by its validity.The 2 types of validity that we are generally concerned with are internal and external validity

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1. Internal Validity:

- This type of validity examines how well a study is designed. For instance, were valid measurement tools used? Were enough participants used? Were participants of similar backgrounds? Were participants "blinded" with respect to which treatment they received (ie- supplement or placebo)?

Examples:

Good internal validity:

- Researchers study the effects of a post workout shake on body composition changes. Baseline levels of fat mass and fat free mass (ie- muscle, bones, etc) were obtained using DEXA, a tool clinically proven to determine body composition. 20 individuals of similar backgrounds (female, 20-25 years old, 3 years of lifting experience) were randomly assigned to receive either a placebo or the true supplement post workout. All participants completed the same workout. Additionally, drinks were consumed prior to leaving the training/testing facility, in front of supervisors to ensure compliance. After 3 months of training, researchers compared changes in body composition between the groups

Bad internal validity:

- Researchers study the effects of a post workout shake on body composition changes. Baseline levels of fat mass and fat free mass (ie- muscle, bones, etc) were obtained using skin calipers, a tool clinically proven to be less accurate than DEXA at assessing body composition. 20 individuals of differing backgrounds (female, 20-45 years old, 0-5 years of training experience) were assigned to receive either a placebo or the true supplement post workout. Participants completed a resistance training routine based off their preferences. Upon completing their workouts, each lady grabbed their shakes as they headed out the door. After 3 months of training, researchers compared changes in body composition between the groups

2. External Validity:

- The measure of how well the results obtained from a study populations apply to the general population. Results from a study should only be applied to those who have characteristics similar to the population the research was conducted on. Due to physiological differences between men & women, trained vs. untrained individuals, etc, one cannot expect results obtained by one specific study population to be reproduced in another group of individuals.

Examples:

Good external validity:

- Overweight men, ages 25-30 years old, with no prior resistance training experience, take post workout protein and carbohydrate supplementation after workouts for 3 months. Final results show that those who took the protein and carbohydrate shakes have significant increases in muscle size vs. those who received the placebo. Researchers conclude that overweight men, between the ages 25-30, with no prior resistance training experience can expect gains in muscle size when taking post workout protein & carbohydrate shakes.

Bad external validity:

- Overweight Men, ages 25-30 years old, with no prior resistance training experience, take post workout protein and carbohydrate supplementation after workouts for 3 months. Final results show that those who took the protein and carbohydrate shakes have significant increases in muscle size vs. those who received the placebo. Researchers conclude individuals can expect increases in muscle size when consuming post workout shakes …..***Notice how this study merely said “individuals” vs. naming a specific population. A middle aged female with 12% body fat and 4 years of training experience should not assume that she would obtain body composition changes similar to what was observed in the men included in the study.

One has to be VERY CAREFUL with external validity issues; especially when reading advertisements. Numerous times I've seen supplement companies promote a product with research conducted on one population (eg- inactive obese individuals) and then advertise the product to individuals with completely different backgrounds (eg- highly active, lean athletes). Similarly, certain supplements have staked their claim based solely off in-vitro studies!

Other issues #3: Sample Size

Sample Size: Sample size should actually fall under the "Validity" section. As one would naturally guess, sample size is simply the number of people that participate in the study. However, I feel many individuals jump to conclusions based off studies using questionable sample sizes. Thus, I want to make a quick note regarding sample size…

A couple of **problems exist in studies with small numbers**. The first issue ties in with external validity. Individuals are not genetic clones of each other (although identical twins are pretty dang close). Even if study participants have similar background (eg- males, 20-25 years of age, 3+ years of resistance training), major differences still exist between individuals. Thus, in larger sample sizes, more variability is present, increasing the likelihood that the results are applicable to you. For example, would you be more confident that a supplement was legit if it significantly improved muscle growth in a study involving 5 vs. 20 individuals?

The second problem with small sample sizes is that **the results from 1 or 2 individuals can greatly skew results**. For instance, let's say a study measuring the effects of supplement "X" on improved bench performance assigns 4 individuals to each respective study group (control & experimental). After 4 weeks of supplementation, 1RM are measured and compared to values obtained at the start of the study. Researchers find the following changes in bench press strength (measured in pounds) at the conclusion of the study:

- Control Group (received placebo): 5, 5, 0, 0,
- Experimental Group (received supplement): 0, 5, 5, 30

After going through statistical test, it's determined that taking supplement X significantly improved bench press strength. As we can see though, 1 individual in the experimental group had an extreme increase in bench press strength (30 lbs). If we exclude him/her from study results, we see that results are not significantly different between groups. With larger sample sizes, outliers still appear. However, as a sample size increases, the effects of a single extreme outcome tend to be minimized. Thus, it's less likely that statistically significant results will occur when no true difference really exists.

So what do I consider to be a small sample size? Unfortunately I cannot give you a set number. It varies from study depending on what's exactly being examined. However in a typical study involving, "The effects of supplement X on increased performance" I generally like to see 10-20

participants per study group. I'm not saying studies containing <10 participants per study group are necessarily "bad" studies. I'm simply saying more potential validity issues are present.

Bottom Line

Well, it's been a long journey through research terminology. Hopefully, this article was able to shed a little light on different types of studies. As detailed above, every study design has its own strengths and weaknesses. Thus, do not form rock hard opinions based off a single study. Rather a collection of studies are needed before one can form solid conclusions about a given topic.

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[3] Thumbnail photo image- created by Andrew Baron. Accessed May 30, 2010 from:www.flickr.com/photos/andrewbaron/2083620607/

Appendix III: Making Sense of Animal Studies

Quick Hit Summary

Quite often while watching the nightly news or reading articles in general layperson publications, one will come across headlines proclaiming something along the lines of, "*Drug X was found to slow down cancer progression in mice*" or "*Diet Y reduced cardiometabolic diseases in rats*", etc. Being an inquisitive individuals, you may be asking yourself, "Do the results obtained from mice or rat studies even apply to humans?", "What are the +'s and –'s of animal research?" Truth is, there are many benefits to animal research. Yet, due to genetic differences, we cannot freely assume that the results seen in animals while taking a given supplement, diet, or exercise protocol will necessarily translate over to humans. Thus, animal based research should be viewed as a foundation for what may be worth examining in future human based trials.

Animal Studies and Popular Media

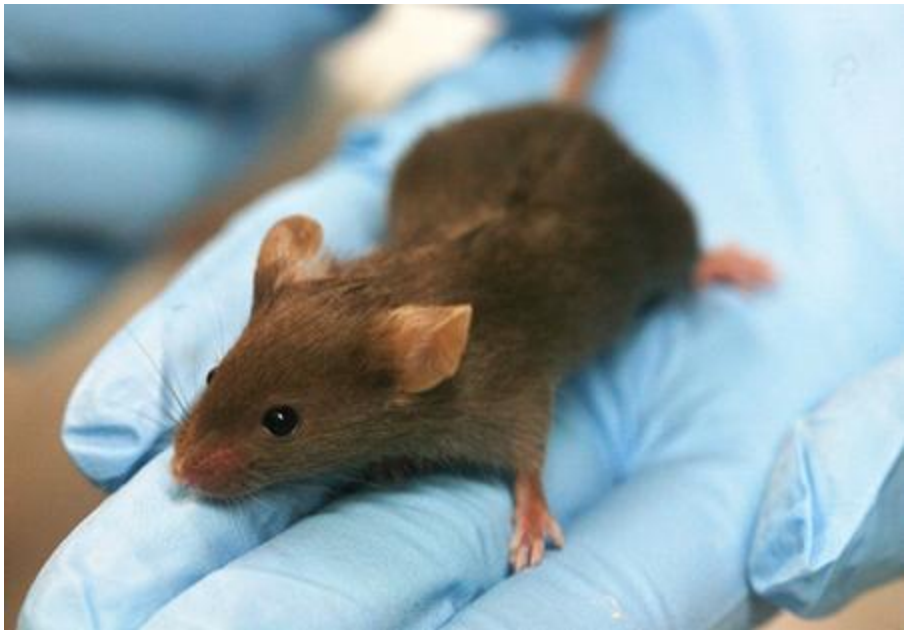

Figure 1. A lab mouse. (7)

PLEASE NOTE: Any time I refer to "animal studies" in this article, I'm actuality referring to "non-human studies."

Quite often, while watching the news, reading general layperson publications, etc, I'll come across headlines such as *"Breakthrough Research: Product X Increases Testosterone Levels …"*, *"Researchers show that compound Y protects against Heart Disease"* or *"Want to speed up fat loss? Science indicates that by adding ingredient Z to our diet…"* Like any health and performance conscious individual, I will often read/listen to what they have to say. Half the time, upon looking a little deeper into the news brief, I'll find one key fact that was left out of the headline —> The research was completed on animals. Furthermore, this key fact is often glazed over pretty quick as the news piece tends to highlight the potentially positive effects that the compound/variable of interest may have on humans. I'm sure that you've found yourself in a similar situation on numerous occasions. Being of inquisitive nature, you may find yourself asking, "Why was this study done in animals rather than humans?", "Should we even care?" or "Can we expect to see similar results in humans?" In other words, "How should we interpret animal research?"

Benefits of Animal Research

Please note, when I say "benefits of animal research", I am referring to this in PURELY scientific terms. This is NOT intended to be a discussion on if it's ethical or moral to perform studies on animals. That is for you to decide based on your personal belief system.

No Harm to Human Health

From a scientific perspective, there are many advantages to running studies with animals vs. humans. **The most obvious benefit is that animal studies allow researchers to study a physiological mechanism without the risk of harming humans.** For instance, scientists often genetically manipulate mice such that they're predisposed to develop various cardiometabolic diseases (I refer you to the "animal studies" section of Part I of my article on dietary AGEs for examples). Similarly, if scientist want to find out if substances "X", "Y", or "Z" influences cancer development or progression, they're going to use animal models as the basis of the research. In doing so, they learn more about the disease process without the risk of hurting humans.

Reducing Confounding Factors

Another advantage of animal studies is that **it's easier to prevent confounding variables from influencing the results of the study**. Let's take a hypothetical study in which we're investigating the long term effects (i.e. 3-12+ months) of a given diet on cardiometabolic diseases. If we're using animals as test subjects, we control their food exposure 100%. In contrast, humans may follow the prescribed diet 90%, 80%, or 70% of the time over the course of the study. Even if they do follow the diet 100% (which in reality doesn't happen), differences in their lifestyle can throw other confounding factors into the equation. This includes living

conditions (vs. mice which all live in similar cages, held at similar temperatures, etc), stresses that may be going on in their life, activity levels, etc. Although specific statistical tests, accounting for these differences can be run, it's never as good as if the confounding factors weren't present in the first place.

Truly Assessing Long Term Effects

It's also much **easier to assess the long term effects of manipulating a given variable over the course of one's lifespan** in animals vs. humans. For instance, the average lifespan of mice is 1.5-3 years.[1] Thus, using the diet-cardiometabolic disease example from above, a 12 month study represents tells us the effects of how eating a specific way for ~1/3 to ~2/3 of their life affects disease outcomes. On the flip side of the equation, this same 12 month window only covers 1/70th of the lifespan in humans (using a life expectancy of 70 years). As you can see, this makes it much harder to assess the effects of a certain diet when, in all actuality, the "long term human study" only represents a minute fraction of an individual's life.

The Economy Stupid

The final beneficial factor of running animal studies is what I like to call the Bill Clinton principle known as **"The Economy Stupid."** (For those who do not follow American politics, former US President Bill Clinton used this as a campaign slogan during his successful 1992 presidential campaign). More or less, animal studies are cheaper to run than human studies. Think about it; let's say that researchers are assessing the effects of following Diet A vs. Diet B for 2 weeks. Meals and snacks are to be provided for each participant. Using this study design, is it going to be more expensive to feed humans or mice/rats over this time span?

Downside of Animal Research

From a scientific viewpoint, there is one "little" problem with freely applying animal research to humans…. WE ARENOT MICE/RATS!!! Due to genetic differences, we cannot freely assume that the results seen in animals while taking a given supplement, diet, or exercise protocol will necessarily translate over to humans. At times the results match up relatively close between species. Yet, as seen in the 2 examples that follow, clear discrepancies exist dependent upon the population studied.

Example 1: Vitamin C

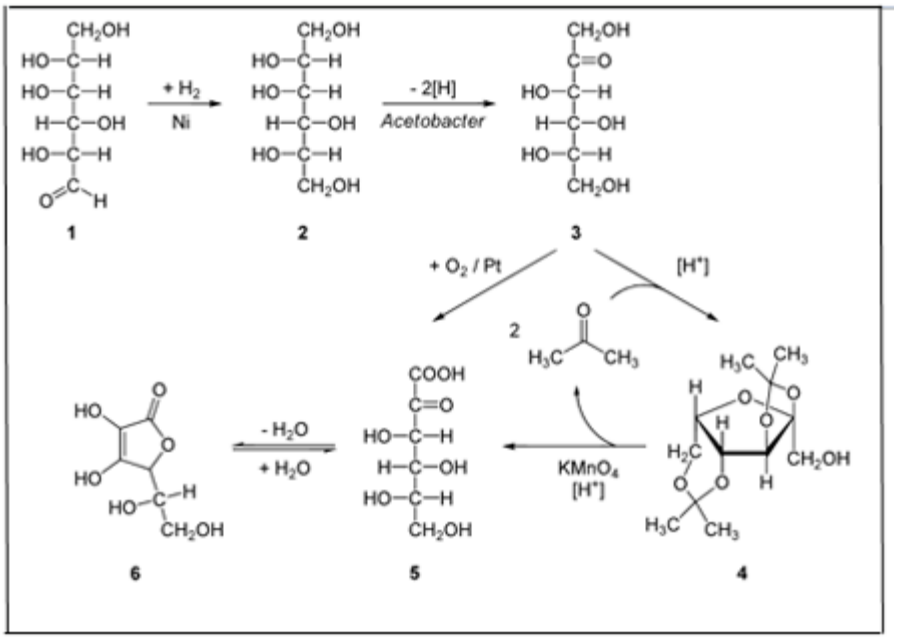

Figure 2. The conversion of glucose to vitamin C. Image 1 = Glucose, Image 6 = Ascorbic Acid. Please note that the glucose molecule presented above is in its open chain form (Fisher Projection). In the body, glucose is actually in a closed ring structure. However, this was the best picture that I had free access to that showed the pathways. Photo Source (8).

I'll let you in on a little known fact… Vitamin C is not required in the human diet. What, you don't believe me? Well, it's been proven beyond a reasonable doubt that vitamin C is not required in the diet of mice or rats.[2] Since **mice and rats don't need it, surely we don't need it!** Ok, ok, maybe I'm partially pulling your chain. Vitamin C is required in the human diet. However, it is true that mice, rats, and most other animals for that matters do not require vitamin C in their diet as they can convert glucose into vitamin C (See **Figure 2**). For better or for worse, we lack the key enzymes that are responsible for this process.

Example 2: Creatine

Do not take creatine because it will not be absorbed into your muscles. What, you don't believe me? Well, in a study conducted by Sewell and Harris, 4 horses were given a human equivalent dose of 0.35-0.45g/kg creatine over the course of 13 days.[3] (I have a range for this as I only had access to the abstract of the journal article. Thus, I could not see the actual "size" of the horses, which plays a role in equating the human equivalent doses. Thus the figures I used were based off the respective Km's of both a large and small horse which were 110 and 87.5 respectively[4]. If you're confused with what I'm referring to, please skip down to the Human Equivalent Dose Section). At the end of the study, it was observed that **creatine monohydrate supplementation did not increase total muscle creatine content in horses.**

If we blindly accepted the results of this animal based study, we'd conclude that creatine supplementation is unable to increase the creatine content of our muscles. However, this is NOT

the case. Creatine monohydrate supplementation has routinely been shown to increase muscle stores (10-40%), leading to enhanced physical performance.[5, 6]

Animal Studies – Should we Pay Attention?

Now that I've laid out the +'s and the –'s of animal studies, we're back at the main question… Animal Studies – Should we pay attention? My recommendation – **Be aware of them but don't "jump the gun" and assume their results will necessarily translate over to humans. Animal studies should serve as the foundation upon which future human based trials can be based off.** I've always thought of animal studies as "back pocket ideas". In other words, when I hear about interesting results from animal based studies, I'll make a mental note of the findings, tuck it into the back of my mind, and wait to see if human studies refute or concur with it before I make any major changes into my lifestyle. (Please note that this is a general statement. If I come across a study showing that substance "X" causes cancer, etc in animals, I'd be much quicker in incorporating this information into my daily routine).

The other part where I strongly recommend "being aware of animal research" is when purchasing supplements. In my opinion, **supplement companies are generally the WORST OFFENDERS of abusing the results of animal studies.** As mentioned in the intro, when reporting the news, most reporters tend to de-emphasize the fact that the research of note was conducted in animals. In the case of supplement manufactures many go BEYOND de-emphasizing this fact and COMPLETELY FAIL to mention that the studies supporting their claims were done on animals. Usually you'll just see claims along the lines of:

"Scientifically proven to increase testosterone levels, muscle growth, aerobic/anaerobic capacity, etc, etc"

If you see a claim like this, try hard to find out if the study was completed on humans or animals. Do not let supplement companies trick you into assuming that the results were found in humans. If they fail directly list the references to support their claim(s), look at the ingredients list and put to use the skills you learned while reading the articles in this Consumer Savvy ebook.

Human Equivalent Doses (HED)

There is one topic related to translating results from animal studies to human studies that I briefly want to discuss. One of the biggest errors that reporters, online gurus, etc, make when interpreting research is that they fail to properly translate the animal supplemental dose into the human supplemental dose; this is not a simple 1:1 ratio. For instance, let's say that in an animal study, rats receive supplemental plant extract "X" in the amount of 500 mg/kg of body weight. After 4 weeks, researchers observed that taking "X" significantly improved health/performance outcomes vs. the control group. Seeing these results, our resident "guru" goes out and proclaims:

"If you want to receive the health benefits of substance "X" you need to eat 500 mg/kg of bodyweight. "

I want to inform you that this is WRONG. **Different species have different metabolic rates**. As a result, we have to account for these differences by calculating human equivalent doses (**HED**).[10]

To calculate the HED for studies using rats, use the following equation:

HED = (animal dose) (0.162)

To calculate the HED for studies using mice, use the following equation:

HED = (animal dose) (0.081)

Please be aware that **HED are only estimations**. I must also mention that I am quickly glossing over the use and logic of using human equivalent doses. **I STRONGLY RECOMMEND you checking out an article, written by my friend Dr. Moussa, over at SuppVersity entitled** What Are Human Equivalent Doses (HED) and How Do I Calculate Them?

Bottom Line

As I've presented in this article, there are many benefits and drawbacks to using animal studies. At times the results of some studies may translate well over to humans; yet, in other instances a little factor known as "genetics" throws a wicked curveball into the equation. Thus, animal based research should be viewed as a foundation for future human based trials. Once we have thoroughly done our "Re"-search, we can take the information, do a little "Me"-search and truly determine if the results of a study apply to our health/performance goals.

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Testimonial Support for Sean Casey

From his peers…

"Not only is Sean a great nutritionist, but he's an excellent strength coach. I've coached athletes with him on multiple occasions. The most impressive attributes I've seen in him is his integrity, work ethic, ability to work with athletes and desire to be the best coach possible."

- *Luke Richesson. Head Physical Preparation Coach for NFL's Denver Broncos.*

"Sean Casey is one of the great up and coming minds in the human performance field. Between his diverse academic background, training experiences and thirst for knowledge, Sean elevates himself above the pack. His writings are extremely well researched yet easy to understand; a great resource for both the competitive and recreational athlete."

- *Dr. Jamie Cooper, PhD, Assistant Professor and Instructor for graduate courses in Nutrition, Exercise, and Sport at Texas Tech University. Marathon and Triathlon Competitor.*

"Whenever I need to bounce nutrition/supplement ideas off someone, I always turn to Sean Casey. I know that anything Sean tells me is backed by multiple scientific studies. It's a true pleasure working with him."

- *Anita Nall-Richesson. Director of Nutrition - Jacksonville Jaguars. 3 time Olympic Medalist. Former world record holder in 200 Breaststroke. Creator of PhenomaNALL Nutrition.*

"Sean was a positive influence on our student-athletes and the Strength and Conditioning Department at UW-Madison. He is a bright, innovative thinker and always looking for ways to improve the performance of the clients he works with, regardless of their starting skill level."

- *Scott Hettenbach. MS- Exercise Science & Sport Administration, Assistant Director of Strength and Conditioning at University of Wisconsin- Madison. Head Strength Coach for Badger Men's Basketball team.*

"This web site was created by Sean Casey, an individual who has dedicated himself to improving your knowledge of exercise science. His commitment to offering up-to-date information to his clients and non clients alike comes as no surprise to me. Having known Sean for over ten years, I can vouch for his personal character and work ethic in everything he does. As you begin to read his blogs on nutrition and training you will find a well thought out, research based analysis of each topic. His opinions are supported by scientific research, not anecdotal evidence. I recommend his articles to any individual wanting to learn about the science of exercise for the first time or someone trying to update their knowledge."

- *Chris Rotzenberg, MS Human Performance, Collegiate Cross Country/Track and Field Coach*

From his clients…

"I had the fortunate opportunity to work with Sean Casey at the Athlete's Performance Institute. While coaching, Sean demonstrated a strong work ethic and a desire for perfection. Sean's knowledge of multiple training methods helped prepare me for that season. His greatest concern was making his athletes better each day. Sean Casey is a rising star in the fitness industry."

- *Brady Quinn. NFL Quarterback – Kansas City Chiefs.*

"A few years ago I contacted the University of Wisconsin-Madison for nutrition and weight loss info for both myself and the high school wrestling team that I coach. I was informed that Sean Casey was the guy I wanted and I quickly saw why... Sean explained to us how the food we ate affected our performance on the wrestling mat. With Sean's help, my wrestling team and I stopped dwelling over weight loss and began to concentrate on how to properly fuel our systems. The emphasis of Sean's dietary program was not centered around food restriction; rather it was focused on incorporating healthier food choices to help us attain our specific weights. Additionally, he taught us how to read food labels when evaluating our food options.

Throughout my lifetime, I have tried many different ways to lose weight and have always failed. To date, I am please to say that I personally have lost weight and our wrestlers have much less to worry about during the season. I truly doubt that we would have learned everything we did and feel so good about reaching our goals without Sean's help. Sean is the utmost professional with a great understanding of his clients needs. I am thrilled to be able to say that I worked with him."

Sincerely yours,

Matthew Poster. High School Wrestling Coach. Owner / Lead Motivator of Get Fit Staying Fit

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"I first knew Sean Casey from the excellent articles he posted on the internet. He clearly knew what he was talking about, both with regard to training and to nutrition. His research was always sound and the fact that he always quoted his sources, further increased my esteem. When I needed advice on my nutrition, Sean was the obvious choice. Still, I had some doubts if even he could help me. I am a middle-aged, competing weightlifter from Europe, who suffers from a digestive disorder; Not exactly your typical college aged athlete."

"Sean exceeded my expectations. He studied my training schedule, food intake, medications and came up with a dietary program that exactly fitted my needs. He taught me the principles of what to eat and when; my meals now fuel my workouts and my supplements no longer conflict with my medications. To make things easier, Sean even took the trouble to convert everything to metrics for me. Since I've started to work with Sean, I am fitter and stronger than I ever was and haven't gained any weight despite eating more food."

"I am very lucky to have worked with Sean. If you're serious about your performance, I can recommend no one better."

- *Alexandra Faber. 2011 World Masters Level Olympic Weightlifter.*