VITAMINS, MINERALS, & NUTRITION SUPPLEMENTS

Chapters 10 & 11

WHAT DO YOU TAKE?


WHY WOULD
YOU TAKE
VITAMIN C

COCHRANE REVIEW

VITAMIN C FOR PREVENTING AND TREATING THE COMMON COLD

GENERAL POPULATION

- Daily supplementation saw no decrease in number of colds
- Reduced length of the cold by 8% in adults
  - Only if supplementation had been greater than 2 weeks @ 200mg/day or more.
- Acute supplementation at onset of symptoms saw no reduction in length of cold or severity of symptoms

ATHLETIC POPULATION

- Daily supplementation saw a 52% decrease in number of colds
  - Effects seen only after 2 weeks of supplementation
- Acute supplementation at onset of symptoms had no effect
- Was most effective in athletes that perform regular or acute bouts of intense training
  - Marathon runners, skiers

NITROGEN SPIKING

- Dramatic increase in whey protein price since 2009
- Padding whey protein powders with amino acids that will throw off quality control tests
  - Kjeldahl method tests for nitrogen & then you do a conversion factor for the protein being tested (soy, dairy, etc…)
- Look for the following in the ingredients list
  - Arginine (3x more nitrogen than whey)
  - Glycine
  - Creatine (1.5x more nitrogen)
  - Taurine
- Look at the Amino Acid Profile Panel. 25g of whey protein should have at least 2.8g of Leucine
- If you see crystalline material in your powder its an indication of high amounts of Taurine
- Brands That have used this in the past
  - Body Fortress, ProSupps, MusclePharm Arnold series, 4 Dimension Nutrition, Designer Whey, Mutant Nutrition, Gaspari Nutrition, Giant Sports Nutrition, Infinite Labs, and Beast Sports Nutrition.

5 CONSIDERATIONS IN EVALUATING SUPPLEMENTS

1. Safety
2. Effectiveness
3. Doping Status
4. Dose
5. Quality

WHAT IS A SUPPLEMENT?

- Vitamins
- Minerals
- Herbs
- Botanicals
- Amino acids
- Any concentrate, metabolite, constituent, or combination of the above ingredients

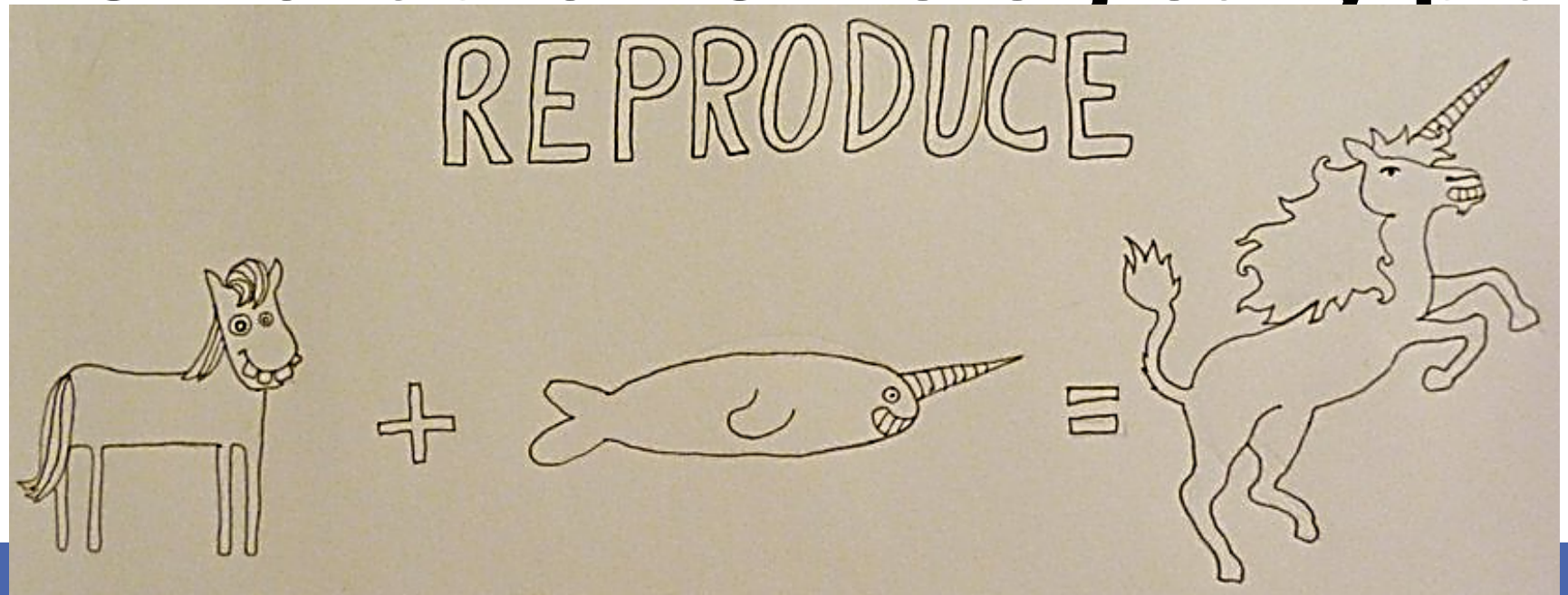
SAFETY

- In considering the risks and benefits of supplement and drug use, credible information on safety and effectiveness is essential.
- Safety is paramount, because as the Hippocratic Oath states: “First, do no harm.”

“Practice Paper of the American Dietetic Association: Dietary Supplements (*J Am Diet Assoc.* 2005;102:460-470)

EFFECTIVENESS

- Is the claim being made reasonable from a physiological perspective.
- I.E. - Is the supplement's purported mechanism of action is **biologically plausible**



DOPING STATUS

- Will this legal sports supplement cause the athlete **to test positive for a prohibited substance**
- Some may contain ingredients not declared on the label that are prohibited by doping regulations

NCAA®

WORLD ANTI-DOPING AGENCY
play true

INTERNATIONAL OLYMPIC COMMITTEE

CONTAMINANTS

- Anabolic androgenic steroids and ephedrine
- Result of poor manufacturing processes or deliberate adulteration
- An unsuspecting athlete may test positive for banned substances.
- **Innocent ingestion of prohibited substances is not an acceptable excuse.**
- Athletes who test positive for banned substances are legally responsible and subject to penalties.

“THE DOSE MAKES THE POISON”

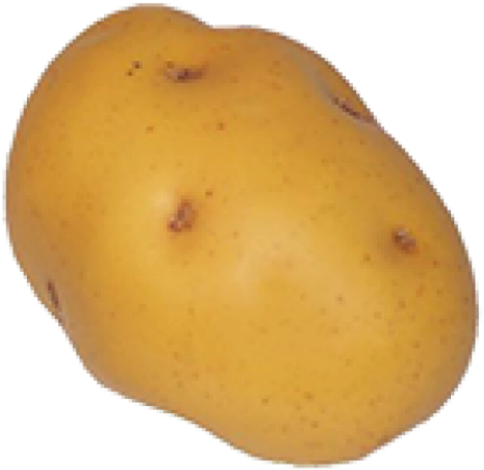
APPLE SEEDS

CONTAIN AMYGDALIN
~0.6g/kg of seeds

PEARS

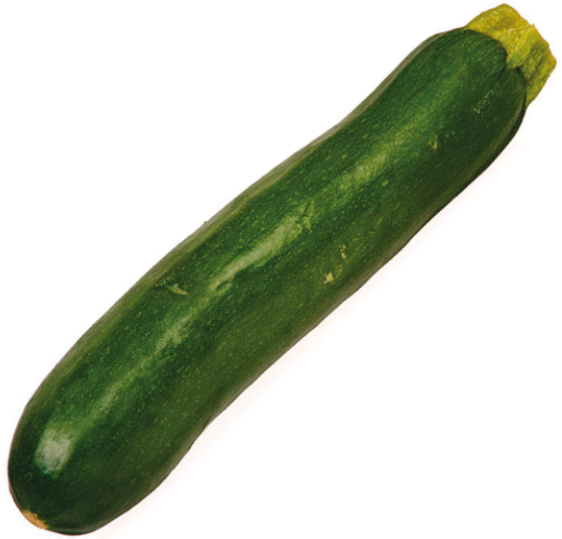
CONTAIN FORMALDEHYDE
~0.06g/kg

POTATOES



CONTAIN SOLANIN
~0.2g/kg
(higher in green potatoes)

COURGETTES

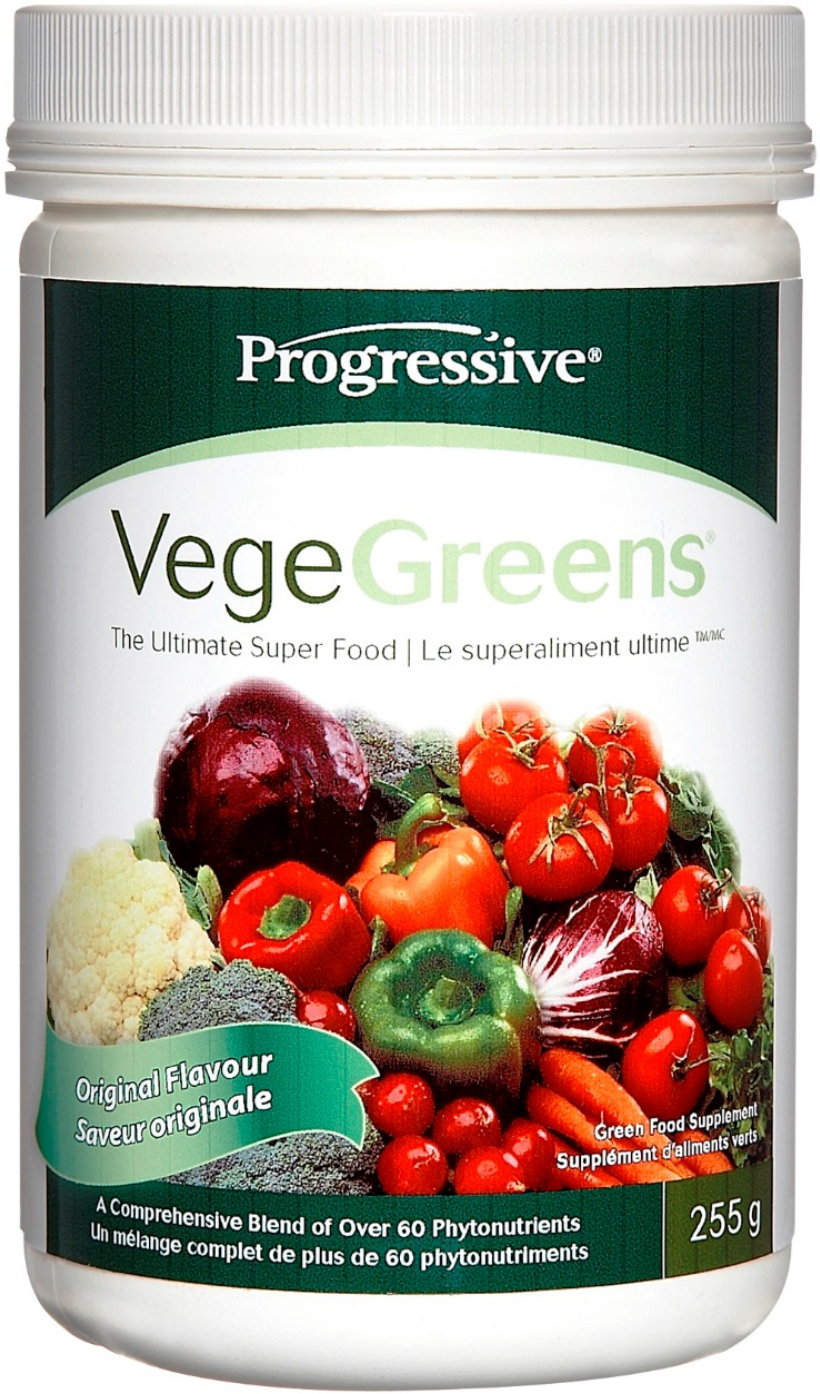


CONTAIN CUCURBITACIN E
Variable
(higher in bitter courgettes)

ALL OF THE FOOD ITEMS ABOVE CONTAIN NATURAL CHEMICALS THAT ARE TOXIC TO HUMANS. HOWEVER, THEY ARE USUALLY PRESENT IN VERY SMALL AMOUNTS, FAR BELOW THE HARMFUL DOSE.

DOSE

- Does the product contain enough of the ingredient to elicit a physiological response?



VegeGreens

INGREDIENT	VEGEGREEN DOSE	EFFECTIVE DOSE
Oat Bran (Beta-Glucan)	30mg	3,000 mg/day
Blueberry Fruit Powder	50mg	3.3% of 1 single blueberry
Resveratrol	2.5mg	150mg/day at minimum
Ginkgo Biloba	20mg	200 mg/day
Green Tea Extract	20mg	400mg/day

QUALITY

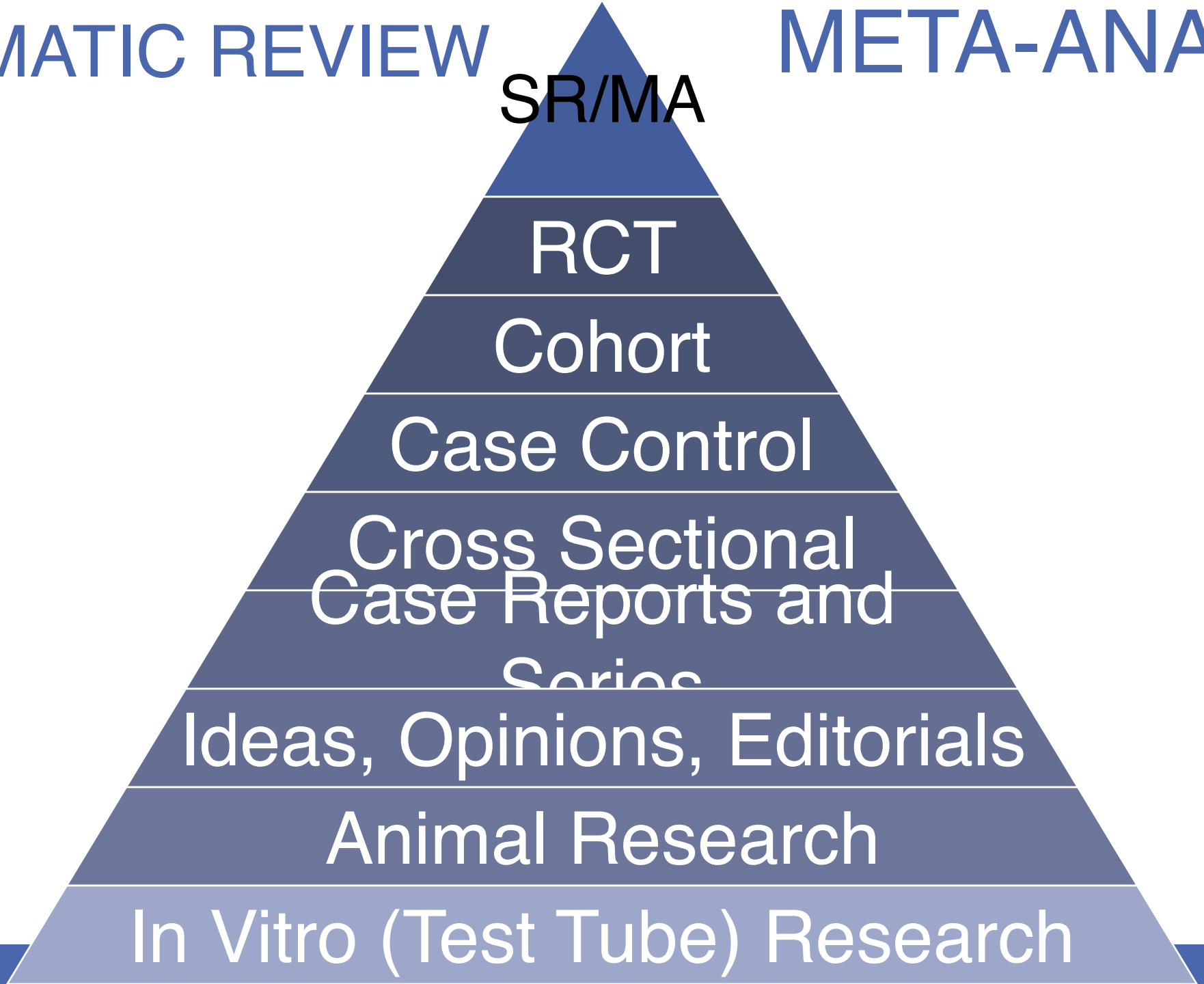
- The following four factors should be examined when assessing quality:
  - **Identity** - Does the product's contents match what is printed on the label?
  - **Potency** - Does the product contain the amount of the ingredient claimed on the label?
  - **Purity -** Is the product free of unacceptable levels of contaminants?
  - **Bioavailability** - Does the ingredient break apart properly in the body so that it may be assimilated?
- Several organizations are involved in testing supplements and certifying products that pass tests for identity, potency, purity, and bioavailability
- It is recommended that products receive certification from one of these organizations.
- The term "pharmaceutical quality" does not apply to supplements and is **meaningless**.

INVESTIGATE

- Review the scientific literature
- Examine the quality and quantity of studies provided
- All supportive research should be published in a reputable peer-reviewed journal and cited in the National Library of Medicine database (PubMed)
- The American Dietetic Association's position paper on dietary supplements provides guidelines for critically appraising the scientific validity of research.

SYSTEMATIC REVIEW

META-ANALYSIS



WHEN YOU SEE A CLAIM THAT A COMMON DRUG OR VITAMIN "KILLS CANCER CELLS IN A PETRI DISH,"

KEEP IN MIND:

SO DOES A HANDGUN.

INTERNET RESOURCES FOR EVALUATING SUPPLEMENTS

- **ConsumerLab (www.consumerlab.com)** Free information; not referenced.
  - Access to Natural Products Encyclopedia by EBSCO for subscribers.
- **Examine (www.examine.com) –** Free information, referenced.
- **Natural Medicine Comprehensive Database (www.naturaldatabase.com)**
  - Referenced monographs; subscription required.
- **USDA National Agricultural Library: Dietary Supplements (http://fnic.nal.usda.gov/dietary-supplements)**
- **NIH Annual Bibliographies Of Significant Advances In Dietary Supplement Research (http://ods.od.nih.gov/Research/Annual_Bibliographies.aspx)**
- **NIH Dietary Supplement Label Database (http://www.dsld.nlm.nih.gov/dsld/)**
- **National Library of Medicine Database (www.ncbi.nlm.nih.gov/PubMed)**

THIRD PARTY TESTING

- **Beware of products that have not been tested by a qualified third-party.**
- There are many supplements that claim to be “steroid free” or are guaranteed not to produce a positive anti-doping test.
- Some companies claim their products are approved by WADA (World Anti-doping Agency), USADA (US Anti-doping Agency), or the IOC (International Olympic Committee).
- **These are false claims as these agencies do not approve any dietary supplement products!**

SUPPLEMENT

	USP	ConsumerLab	NSF	Informed Choice
Summary	Test for Overall Integrity Does NOT test for banned substances	Test for Overall Integrity Athletic Banned Substances Screening Program (ABSSP) Tests for WADA banned substances	Test for Overall Integrity NFL/NFLPA Supplement Certification Tests for NFL banned substances	Test for Overall Integrity Tests for WADA banned substances
Tests Conducted	Integrity Purity Dissolution Safe Manufacturing	Identity Strength Purity Availability	Identity/Purity Formula Evaluation Good Manufacturing Practices Testing for Metabolites Chain-Of-Custody Procedure	Identity/Purity Product Ingredient Review Good Manufacturing Practices High Testing Standards
One Time Testing or	Continuous testing based on random	Tests every 12 months based on random sample	Each product lot (batch)	Monthly random testing

Definitions

Word/Phrase	Meaning
Integrity	All listed ingredients are in the declared amount.
Purity	The supplement does not contain harmful levels of contaminants (heavy metals, pesticides, bacteria, molds, toxins, etc.).
Dissolution	The supplement will break down and release ingredients in the body.
Safe Manufacturing	Assurance of safe, sanitary, well-controlled and well-documented manufacturing and monitoring processes.
Identity	The product meets recognized standards of quality and the level of quality claimed on the label.
Strength (quantity)	The product contains the amount of ingredient claimed on the label.
Availability	The product breaks apart properly so that it may be used by the body.
Formula Evaluation	Review of product formulations to screen for potential banned substances.
Good Manufacturing Practices (GMP)	Production facilities inspected to ensure controls in place to avoid introduction of, or cross-contamination with, banned substances.
Chain-of-Custody Procedures	Each product lot tested for banned substances must be collected by an NSF auditor. All products pending testing are held under locked quarantine until the NSF notifies the manufacturer of successful test results.
Testing for Metabolites	At the client's request, NSF will oversee testing to determine if any ingredients metabolize into prohibited substances.

ATHLETE SCENARIO

- *I've just been called up from triple A to the Big Leagues. I've been told that to stay here I need to take dietary supplements to gain muscle, recover quickly, and improve performance. Do I need supplements?*
- *Which supplements are safe, effective, and fit within the regulations of the Major League Baseball Players Association?*

EVALUATE

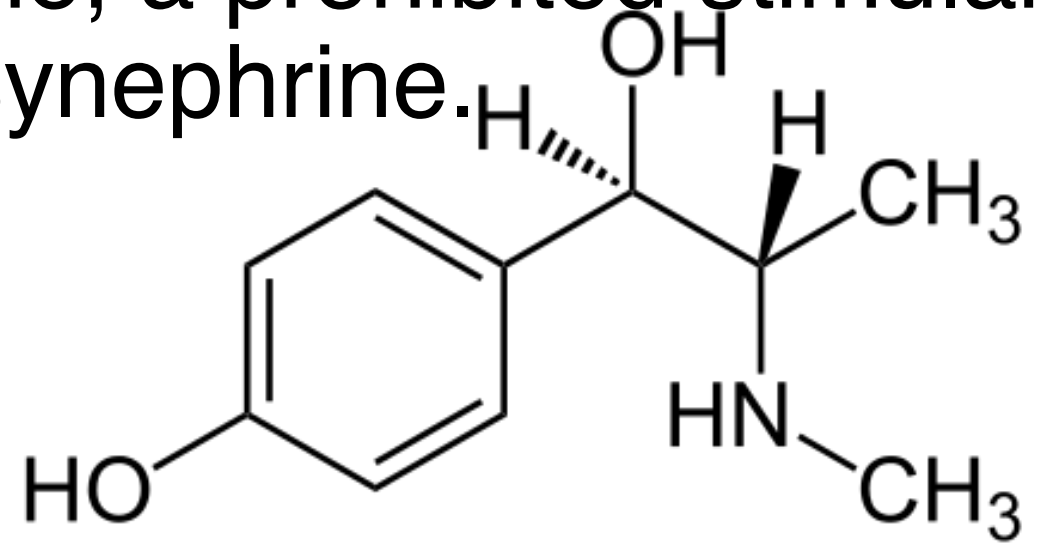
- **Proper nutrition is the first line defense for all athletes.**
- **Evaluate potential and appropriate supplements**
- Know the regulations of your sport organization (MLB/MLBPA, NFL/NFLPA)
- Spots organizations such as Major League Baseball (MLB), National Football League (NFL), and their players associations have partnered with companies like **NSF International** that test and certify dietary supplements.
- **NSF screens supplements for banned substances** (steroids, stimulants, hormones, etc.) and monitors manufacturing facilities for compliance with the U.S. Food and Drug Administration's Good Manufacturing Practices.

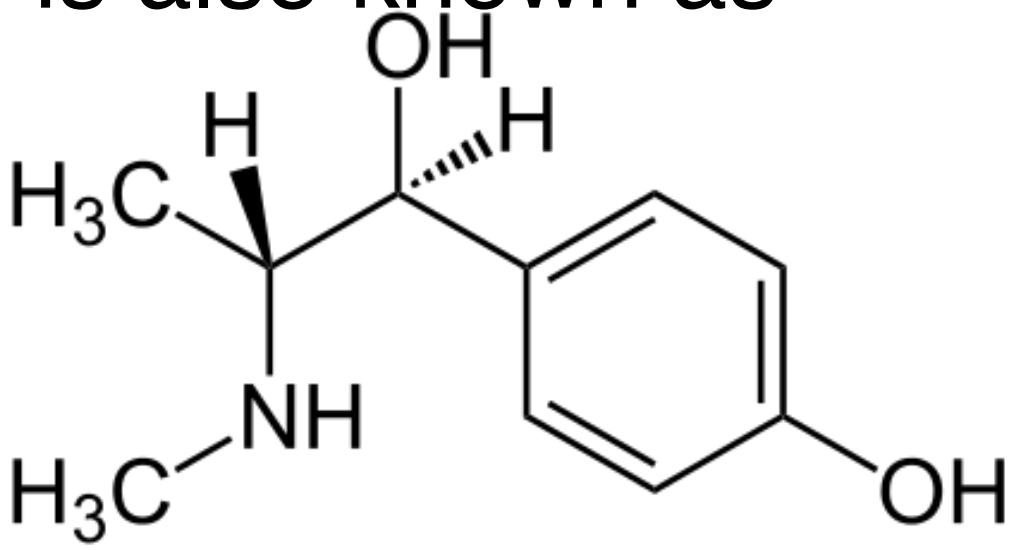
REPUTATION MATTERS

- **Athletes should avoid products made by any company that handles substances prohibited in sport.**
- Athletes should thoroughly research the company of *any* product they are considering using.
- Look at the whole product line sold by the company. If the company sells any product that lists prohibited substances on the label this increases the likelihood that the ingredient could end up in another product, either by accident or intentionally.
- This is particularly true when the products are all manufactured on the same machinery at the same plant.

DIETARY SUPPLEMENT RED FLAGS

- Read the labels!
- Cross reference with the Prohibited List
- Search the Internet for other names for ingredients.
- Oxilofrine, a prohibited stimulant, is also known as methylsynephrine.



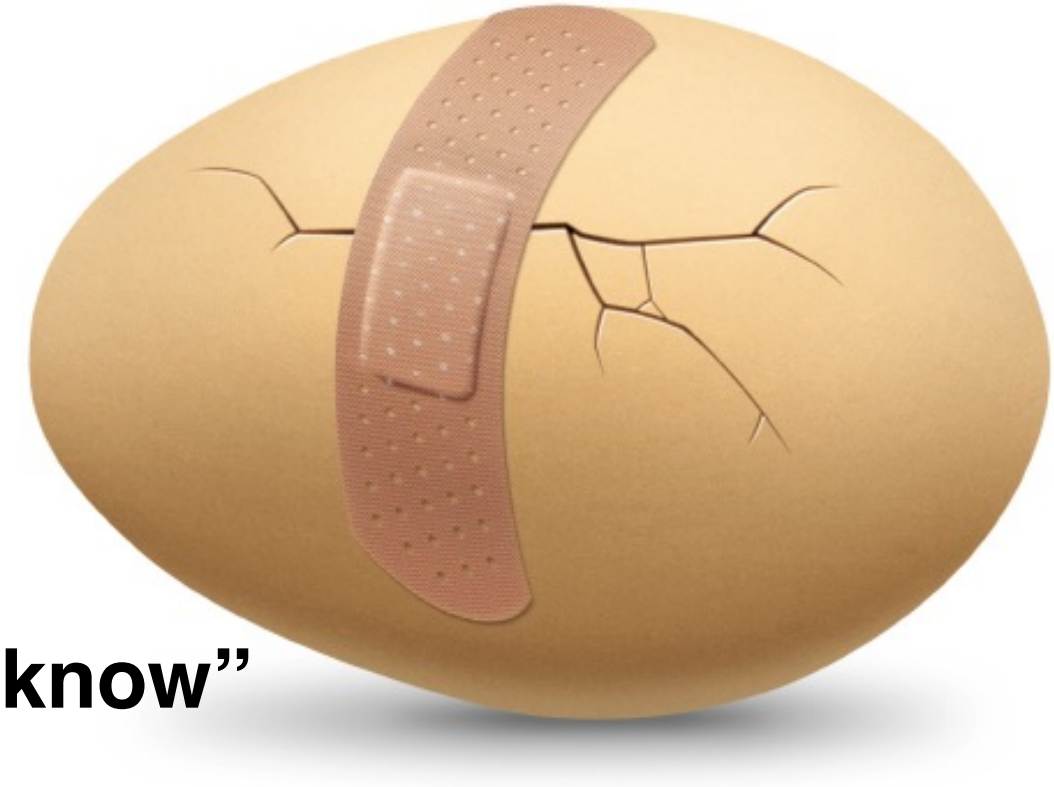


RED FLAG TAG LINES

- **Watch out for companies that market products in the following categories.**
- Muscle Building
  - Anabolic agents
  - Hormones
  - Aromatase inhibitors (prevents testosterone breakdown)
- Weight Loss
  - Stimulants, diuretics, or drugs such as sibutramine.
- Sexual Enhancement
  - Undeclared Viagra or similar substances.
- Energy Supplements
  - May contain stimulants.
- **Watch out for ingredients ending in –ol, –diol, or –stene, or ingredients that contain a lot of numbers. These may be steroids.**

THERE'S NO QUICK FIX!

- **"newest scientific breakthrough"**
- **"secret formula"**
- **"money back guarantee"**
- **"quick fix"**
- **"used for thousands of years"**
- **"what the experts don't want you to know"**



- the use of impressive sounding scientific jargon
- There are no magic pills that can suddenly make you jump higher, run faster, lose 20 pounds in one day, etc.

DISEASE PREVENTION

- **Avoid supplements that claim to treat or prevent a disease.**
  - It is illegal for dietary supplements to promote themselves as fighting disease (cancer, obesity, diabetes, high cholesterol, etc).

“ALTERNATIVE” TO PRESCRIPTION MEDICATION

- Products that claim to be “alternatives to medication” may contain undeclared prescription medication.

“ALL NATURAL”

- “All natural” herbal ingredients are not always safe.
- Herbals can contain active ingredients that may interact with each other or with medications.
  - St. John’s Wort is traditionally used to treat mild depression
  - Interacts with 779 different drugs, 736 of which are considered moderate or major
- Methylhexanamine, a stimulant prohibited in competition, can be listed as “geranium oil” on the label that really contain synthetically produced Methylhexanamine.
- Products such as these can cause athletes to test positive!

LONG LIST OF INGREDIENTS

- The more ingredients there are, the greater the risk for mistakes during the manufacturing process, and the greater the health and anti-doping risks.

Medicinal Ingredients/ Ingrédients médicinaux :	Each Dose (1 scoop/8.75 g) contains/ Chaque dose (1 mesure/8.75 g) contient:
Plant Oils/Huiles botaniques:	
Non-GMO Lecithin (Identity Preserved)/Lécithine sans OGM (identité préservée) (*Glycine max*, Seed/graine)	1750 mg
Flax Seed Oil/Huile de lin (*Linum usitatissimum*)	100 mg
Borage Oil/Huile de bourrache (*Borago officinalis*, Seed/graine)	20 mg
Pumpkin Seed Oil/Huile de graines de citrouille (*Cucurbita pepo*)	17.5 mg
Evening Primrose Oil/Huile d'onagre (*Oenothera biennis*, Seed/graine)	15 mg
Safflower Oil/Huile de carthame (*Carthamus tinctorius*, Seed/graine)	10 mg
Green Food Concentrates/Concentrés d'aliments verts:	
Barley Grass/Herbe d'orge (*Hordeum vulgare*, Whole/entier)	750 mg
Alfalfa/Luzerne (*Medicago sativa*, Herb Top/sommités)	500 mg
Wheat Grass/Herbe de blé (*Triticum aestivum*, Whole/entier)	100 mg
Spinach/Épinards (*Spinacia oleracea*, Leaf/feuille)	75 mg
Parsley/Persil (*Petroselinum crispum*, Leaf/feuille)	20 mg
Dandelion Leaf/Feuille de pissenlit (*Taraxacum officinale*)	10 mg
Land Vegetables/Légumes de terre:	
Brown Rice/Riz brun (*Oryza sativa*, Seed/graine)	800 mg
Beet Root/Racine de betterave (*Beta vulgaris*)	250 mg
Carrot/Carotte (*Daucus carota*, Root/racine)	200 mg
Organic Fermented Soy/Soya fermenté biologique (*Glycine max*, Seed/graine)	150 mg
Celery Seed/Graines de céleri (*Apium graveolens var. dulce*)	20 mg
Pumpkin Seed/Graines de citrouille (*Cucurbita pepo*)	10 mg
Sea Vegetables/Légumes de mer:	
Spirulina platensis (Whole/entier)	1000 mg
Chlorella vulgaris (Broken Cell/Cellules éclatées)	200 mg
Dulse/Algue dulse (*Palmaria palmata*, Whole/entier)	25 mg
Kelp/Varech (*Ascophyllum nodosum*, Whole/entier)	20 mg
Wakame/Wakamé (*Undaria pinnatifida*, Whole/entier)	20 mg
Nori (*Porphyra yezoensis*, Whole/entier)	10 mg
Cruciferous Vegetables/Légumes crucifères:	
Broccoli/Brocoli (*Brassica oleracea var. italica*, Flower/fleur)	100 mg
Cauliflower/Chou-fleur (*Brassica oleracea var. botrytis*, Flower/fleur)	60 mg
Brussels Sprouts/Chou de bruxelles (*Brassica oleracea var. gemmifera*, Whole/entier)	60 mg
Kale/Chou frisé (*Brassica oleracea var. viridis*, Leaf/feuille)	35 mg
Watercress/Cresson (*Nasturtium officinale*, Leaf/feuille)	15 mg
Phytonutrients/Phytonutriments:	
Quercetin/Quercétine (*Styphnolobium japonicum*, Flower/fleur)	25 mg
Lycopene/Lycopène (*Solanum lycopersicum*, Fruit)	3 mg
Resveratrol/Resvératrol (*Vitis vinefera*, Fruit)	2.5 mg
Lutein/Lutéine (*Tagetes erecta*, Flower/fleur)	2 mg
Herbs & Extracts/Plantes et extraits:	
Acerola Extract 4:1/Extrait d'acérole 4:1 (*Malpighia glabra*, Fruit)	115 mg
Astragalus membranaceus (Root/racine)	30 mg
Milk Thistle/Chardon-Marie (*Silybum marianum*, Fruit)	25 mg
Siberian Ginseng/Ginseng sibérien (*Eleutherococcus senticosus*, Root/racine)	25 mg
Ginkgo biloba (Leaf/Feuille)	20 mg
Green Tea Extract 4:1/Extrait de thé vert 4:1 (*Camellia sinensis*, Leaf/feuille)	20 mg
Hawthorn Berry/Baie d'aubépine (*Crataegus laevigata*)	15 mg
Bilberry Extract 4:1/Extrait de myrtille 4:1 (*Vaccinium myrtillus*, Fruit)	10 mg
Grape Seed Extract 4:1/Extrait de pépins de raisin 4:1 (*Vitis vinifera*)	10 mg
Red Wine Extract 8:1/Extrait de vin rouge 8:1 (*Vitis vinifera*, Fruit)	5 mg
Nettle/Ortie (*Urtica dioica*, Herb Top/sommités)	5 mg
Botanicals/Botaniques:	
Inulin/Inuline (*Helianthus tuberosus*, Tuber/tubercule)	1015 mg
Apple Pectin/Pectine de pomme (*Malus pumila*, Fruit)	105 mg
Buckwheat/Sarrazin (*Fagopyrum esculentum*, Seed/graine)	75 mg
Cranberry/Canneberge (*Vaccinium macrocarpon*, Fruit)	75 mg
Blueberry/Bleuet (*Vaccinium angustifolium*, Fruit)	50 mg
Bitter Gourd/Gourde amère (*Momordica charantia*, Fruit)	40 mg
Fringe Tree/Arbre à franges (*Chionanthus virginicus*, Root Bark/écorce de racine)	30 mg
Oat Bran/Son d'avoine (*Avena sativa*, Husk/cosses)	30 mg
Pineapple/Ananas (*Ananas comosus var. comosus*, Fruit)	20 mg
Papaya/Papaye (*Carica papaya*, Fruit)	20 mg
Piperine (*Piper nigrum*, Fruit)	1 mg

Non-Medicinal Ingredients: Stevia Leaf Extract, Organic Maple Syrup, Natural Berry Flavours.

Ingrédients non médicinaux: Extrait de feuille de stevia, Sirop d'érable biologique, Saveurs naturelles de baies.

PROPRIETARY BLENDS

- Don’t have to list the amount of each individual ingredient
- Proprietary blends are a marketing tool that companies use to try to make their product seem unique or special in some way.
- Companies sometimes “fairy dust” their products with the expensive ingredients (using trace amounts that may have no physiological impact), and then bulk out the blend with cheaper ingredients.
- **It is impossible to know how much of a particular ingredient you are receiving in a proprietary blend.**

ADVERSE EFFECTS

- **Beware of products that have a lot of adverse events associated with them**
- Supplement companies are required by law to notify the FDA of serious adverse events associated with their products.
- Always try to find out if there are any adverse events filed with the FDA relating to a particular product.
- Keep in mind, sometimes companies don’t tell the FDA about adverse events so you can’t rely entirely on adverse event reports.

BE SKEPTICAL

- **Be very skeptical of "clinical studies" or advertisements with lots of images of doctors, etc.**
- Many studies "proving" the effectiveness of a supplement are poorly conducted and are not scientifically valid.
- Companies sometimes conduct "proprietary" (i.e. secret) research but never allow the raw data or the study design to be evaluated by experts. Nevertheless, they cover their product with claims like "University Studied" or University approved" or Clinically proven."
- If you can get a copy of the study, then you should examine it carefully with someone who can help interpret the validity of the study, and whether the results of the study will also apply to you.

Water-soluble:

Vitamin	Alternate Name	Function in Body	Food Sources
Thiamin	Vitamin B_1	Aids in carbohydrate metabolism and nervous function	Whole grain cereals, beans, pork, enriched cereals
Riboflavin	Vitamin B_2	Aids in energy metabolism, protein metabolism, skin and eye health	Dairy, dark green leafy vegetables, whole grain cereals, enriched grains
Vitamin B_6	Pyridoxine	Aids in carbohydrate, fat and protein metabolism, protein synthesis	Meats, whole grain cereals, enriched cereals, eggs
Folic Acid	Folate	Aids in formation of DNA and red blood cells	Green leafy vegetables, beans, whole grain cereals, oranges, bananas
Vitamin B_{12}	Cobalamin	Aids in energy metabolism, protein synthesis	Animal foods, fortified cereals
Niacin	Nicotinic Acid	Aids in energy metabolism	Milk, eggs, turkey, chicken, whole grains, meat, fish
Pantothenic Acid	Pantothenate	Aids in energy metabolism	All foods except processed and refined
Biotin	None	Aids in glucose and fat synthesis	Egg yolks, legumes, dark green leafy vegetables
Vitamin C	Ascorbic Acid	Aids in iron absorption, collagen synthesis	Fruits and vegetables

Fat-soluble:

Vitamin	Alternate Name	Function in Body	Food Sources
Vitamin A	Retinol	Aids in maintaining healthy cells, eyes and immune system	Liver, cheese, dark green and brightly pigmented fruits and vegetables
Vitamin D	Cholecalciferol	Aids in absorption of calcium and phosphorus	Fish liver oil, eggs, canned fish, fortified milk, margarine
Vitamin K	Phylloquinone	Aids in formation of blood clots and assists with bone strengthening	Dark green leafy vegetables, vegetable oils
Vitamin E	Tocopherol	Aids in antioxidant protection of cells	Poly- and monounsaturated vegetable oils, margarine, fortified cereals, eggs

Macro minerals:

Mineral	Function in Body	Food Sources
Calcium	Growth and maintenance of bones and teeth, important for heart and skeletal muscle function, nerve impulse transmission, blood clotting, and release of some hormones	Dairy products, dark green leafy vegetables, calcium fortified foods/beverages
Phosphorus	Aids in bone strength and structure, acid-base balance, B-vitamin function	High protein foods, whole grains, carbonated drinks
Magnesium	Aids in protein synthesis, glucose metabolism, bone structure, muscle contraction	Milk and milk products, meat, nuts, whole grains, dark green leafy vegetables, fruit
Sodium	Aids in water balance, acid-base balance, muscle contraction	Processed and canned foods, cheese, soy sauce, (almost everything)
Chloride	Aids in water balance	Table salt
Potassium	Aids in water balance, glucose delivery to cells	Citrus fruits, potatoes, vegetables, milk, meat, fish, bananas

Micro minerals:

Mineral	Function in Body	Food Sources
Iron	Aids in oxygen delivery, essential for aerobic metabolism	Meat, fish, poultry, shellfish, eggs, whole grains, vegetables, nuts
Iodine	Aids in metabolism control by forming thyroid hormone	Iodized salt and seafood
Selenium	Antioxidant	Meat, fish, seafood, whole grains, nuts
Copper	Aids in iron transportation	Meat, fish, poultry, shellfish, eggs, nuts, whole grains, bananas
Manganese	Aids in energy metabolism, fat synthesis, bone structure	Whole grains, legumes, green leafy vegetables, bananas
Zinc	Aids in energy metabolism, protein synthesis, immune function	Meat, fish, poultry, shellfish, eggs, whole grains, vegetables, nuts
Chromium	Aids in glucose control	Brewer's yeast, mushrooms, whole grains, nuts, legumes, cheese