Table of Contents

GHB
Ecstasy
Ketamine
Rohypnol
Up and Coming
Pharming Out
Cocaine
Energy Drinks
Supplements
• Drug use brings pleasure – at first
• Altering the brain can be hazardous to your health.
• Legal and illegal drugs alter the way nerve cells in the brain communicate by affecting neurotransmitters.
• A drug may have a medical benefit yet be abused.
• Seratonin, dopamine, glutamate, GABA, Noradrenaline, endorphins

• Excessive, blocked or altered metabolic breakdown of neurotransmitters

• Dosage determines effect.

• Illegal drugs = unknown dosage
GHB
(Gamma-hydroxybutyrate, Sodium oxybate)

- G, Liquid E, Grevious Bodily Harm, Easy Lay, G-Riffick, Scoop, Salty Water, Gina
- Naturally occurring
- Mostly found in brain
- ? Neurotransmitter, ? Metabolic by-product
- Acts as central nervous system depressant
Effects

- Intoxication
- Euphoria
- Relaxation
- Loss of inhibitions
- Sociable
- Affectionate and playful
- Impaired judgment
- Resembles alcohol intoxication
• Loss of coordination
• Nausea/vomiting
• Loss of muscle tone
• Loss of gag reflex
• Memory loss – amnesia
• Depressed respirations
• LOC – “carpeting out” or “G-ing out”
• Death
Appearance

- Clear, odorless liquid
- Slightly salty taste
- Powder/capsules on the rise
- Often mixed with juice, soda or alcohol
Duration

- Rapidly absorbed: 20-30 min
- Duration: 2 – 4 hours
- Elimination occurs via expired CO2
- Detected in blood: up to 4 hours
- Detected in urine: up to 12 hours
HISTORY OF GHB

• 1960s – discovered during anesthetic research with GABA
• Varying side effects
• Medical use in Europe
• 1980s – appears in products sold in health food stores, gyms, mail order outlets
• “natural supplement”
Purported Uses

- Fat burner
- Growth hormone promoter
- Sleep aid
- Sexual enhancement
- Fight stress
- Combat aging
- Prevent cell damage*
• People found increased dosage leads to euphoria
• Recreational drug users began taking these “natural” products
• 11/8/90 – FDA banned OTC sale for human consumption
• Used to facilitate sexual assault
• 2/13/00 – CSA I
Precursors/Analogs

- GBL – gammabutyrolactone
- BD – 1,4 butandiol
- Converts into GHB in the body
- Many products re-labeled or mislabeled
- GHB easy to make
- Formulas, products available on Net
<table>
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<th>Analog</th>
<th>Chemical Name/Alternative Name</th>
<th>Precursor for Production of</th>
<th>Metabolizes into</th>
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<tr>
<td>GBL</td>
<td>Gamma butyrolactone</td>
<td>GHB</td>
<td>GHB</td>
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<tr>
<td>BD</td>
<td>1,4 butanediol</td>
<td>GBL</td>
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<tr>
<td></td>
<td>Tetramethylene glycol</td>
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<tr>
<td></td>
<td>Surol-B</td>
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<tr>
<td></td>
<td>Butylene glycol</td>
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<tr>
<td>GHV</td>
<td>Gamma-hydroxy valerate</td>
<td>*</td>
<td>*</td>
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<tr>
<td></td>
<td>Methyl GHB</td>
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<tr>
<td></td>
<td>GHV is NOT used as a precursor and is NOT metabolized into another drug.</td>
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<tr>
<td>GVL</td>
<td>Gamma-valerolactone</td>
<td>GHV</td>
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<tr>
<td></td>
<td>4-pentanolide</td>
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</table>
• GVL (gamma valerolactone)
• GHV (gamma hydroxyvalerate)
• Similar physiological effects, less euphoric, more sedative than GHB
• Mix together DRAIN CLEANERS, PAINT STRIPPERS, FLOOR CLEANERS!!!

• Bootleg GHB – varying strengths, purity, contaminants

YOU DON’T KNOW WHAT YOU ARE GETTING !!!!
Emergency Department mentions for GHB and GBL in 22 major U.S. cities, 1994-2000

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<th>Year</th>
<th>Total</th>
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Current Status

• 8/28/01 – Orphan Medical received FDA approval for clinical trials
• Xyrem (Sodium oxybate)
• Cataplexy, narcolepsy
Ecstasy (MDMA)
Methylendioxymethamphetamine

- X, XTC, Adam, E, Rolls, Beans, Hug Drug
- Chemically related to amphetamine and mescaline
- Entactogen- “touching within”
- Empathogen- “identify with others”
Effects

- Pure Ecstasy described as instant anti-depressant
- “Happy, warm feeling”
- “All is right with the world”
- Increased personal insight
- Emotional closeness
- Enhancement of senses
- Increased energy
- Decreased inhibitions
• Teeth grinding/jaw clenching
• Scratching/rubbing skin
• Nystagmus
• Increased BP, HR, temperature
• Inappropriate emotional bonding
• Nausea/vomiting
• Dehydration
• Hyponatremia
• Erectile dysfunction
• Confusion
• Panic attacks
• Short term memory loss
• Nerve cell damage
• Organ failure
How it Works

- Floods brain with serotonin
- Serotonin regulates mood, memory, sleep
- SSRIs (Zoloft, Paxil, Prozac) prevent serotonin recapture but do actively release
Ingestion/Duration

- Pill: 20-40 min.
- Snort: 2-5 min.
- Lasts 4-6 hours
- Recovery time 1-2 days
- Dullness of senses/mental process
History of MDMA

• 1912 - formulated by Merck
• 1950 - U.S. Army investigated
• 1970s – Synthesized by Shulgin
• Quickly finds place within psychotherapy community
• Many patients claim “Empathy” profoundly changed their lives
• Leaps from “couch to community”
• SMU
• 1980s – promoted as new party drug
• Raves
• Senate hearings
• 7/1/85 CSA I
Results of Criminalization

• Purity
• Varying dosages
• Clandestine/kitchen labs
• Black Market
• No further research
• Distribution system
• Organized crime
Analysis of Illicit MDMA

- 3,346,071 tabs analyzed by DEA from 6/1/99 – 12/31 99
- Dose range: 0.1mg – 193.0mg/tab
What’s Really in “E”

- MDE - Methylendioxyethylamphetamine - less empathetic
- MDA - Methylendioxyamphetamine - more hallucinogenic
- PMA - Paramethoxyamphetamine - more speed/side effects
- MBDB - Methylendioxyphenylbutane - softer than “E”, legal
• 2-CB - Dimethoxy-bromophenylethylamine
• MeO-DIPT - Diisopropyl-methoxytryptamine
• MBT - Butyl-N-methyl-T
• MeO-DET - Diethyl-5-methoxy-T
• Amphetamine
• Methamphetamine
• PCP
• Ketamine
• Caffeine
• Guaifenesin
• Ephedrine
• Pseudoephedrine
• Dextromethorphan (DXM)
• Acetyl salicylate
• Acetaminophen
• Diphenhydramine

YOU DON’T KNOW WHAT YOU ARE GETTING!!!
Current Status

- 11/01 – FDA approved “E” research for PTSD
- Medical University of South Carolina
- Dr. Michael C. Mithoefer
Ketamine

- 1965 - developed by Park Davis while researching anesthetics
- Dissociative anesthetic
- Veterinary use
- Effects similar to PCP (phencyclidine)
Effects

- Detachment
- Distant
- Separation of perception from sensation
- Numbness
- Image distortion
- Mood swings
- Amnesia
• Rapid absorption  5 – 20 min
• Duration  2 – 4 hours
• Routes  oral, snort, IM
• 1978  popularized by Lilly’s “The Scientist”
• 8/12/99  CSA III
Rohypnol (flunitrazepam)

- Benzodiazepam
- 7 - 10x more potent than Valium
- Manufactured by Hoffman-LaRoche
- Legal in >50 countries
- 1984 – CSA IV
• Onset 5 – 20 min
• Effects 4 – 6 hours
• Partial amnesia
• Detectable in urine up to 72 hours
“Up and Coming”

“Cheese”

- Mixture of Tylenol PM and heroin
- Tylenol PM = Acetaminophen + diphenhydramine
- Tan colored powder
- Snort
- Euphoria, disorientation, lethargy
• Withdrawal Symptoms
  – Headaches
  – Chills
  – Muscle Pain
  – Anxiety

• $2/dose
Salvia Divinorum
(Maria Pastora, Sadi, diviner’s sage)

- Usually smoked
- Loss of coordination
- Altered perceptions
- Dream-like experience
- Hallucinations
- Sensation of alternate realities
- Fear, terror, panic
YaBa

- Methamphetamine (speed) but more easily manufactured
- Increased heart rate, blood pressure, temperature, respirations
- Anorexant
- Chronic use: paranoia, auditory and visual hallucinations, self-absorption, irritability, aggressive behavior
Pharming Out

The abuse/misuse of prescription medications

- **Stimulants:** Ritalin, Adderall
- **Benzodiazepines:** Xanax, Valium, Ativan
- **Analgesics/Opiates** Oxycontin, Percocet
- **Nasal Decongestants/Antitussives**
  - Dextromethorphan (DXM)
  - Coricidin Cough & Cold (CCC)
  - Robotussin (Robo)
Dextromethorphan

- DXM, Orange Crush, Triple C's, C-C-C, Red Devils, Skittles, DXM, Dex, Vitamin D, Robo, Robo-trippin', Robo-dosing
- Cough suppressant 15-30mg dose (1/6-1/3 oz.) of DXM is considered safe
- At doses >4 oz disassociative effects are similar to PCP and ketamine
DXM Effects

- Euphoria, enhanced awareness, impaired judgment, loss of coordination, dizziness, nausea, seizures, panic attacks, psychosis, brain damage, and addiction.
- Coma and death may result from taking cold medicines with DXM.
• Tolerance and physical dependence may develop with prolonged use.
• Withdrawal symptoms include restlessness, muscle or bone aches, insomnia, diarrhea, vomiting, and cold flashes with goose bumps (“cold turkey”)

DXM Products
A DXM Trip: 4 Plateaus

- **1st Plateau**: 1.5-2.5 mg/kg gives mild stimulant effects with a little bit of a buzz, psychedelic effects, sound euphoria, comparable to MDA
- **2nd Plateau**: 2.5-7.5 mg/kg gives visual hallucinations, more intoxicating “body high”, impaired coordination, double vision, itching, skin irritation, nausea, vomiting
DXM Trip

- **3rd Plateau**: 7.5-15 mg/kg gives altered state of consciousness, psychosis, impaired sensory input, delusions, disorientation, no logic or causality. Most trips “go bad” at this level.
- **4th Plateau**: 15-30 mg/kg (although > 20mg/kg is not advisable) gives total mind/body dissociation, loss of external senses, extreme hallucinations, completely irrational, vomiting, seizures, coma, brain damage, death.
When Tolerance is a Factor

- Teens have been reported to drink three or four bottles of cough syrup in one day and take up to 20-30 tablets of Coricidin® at once to attain the same high that was once attained with lower doses
DXM Cocktails

• DXM and Alcohol
  – Prolonged vomiting
  – Alcohol poisoning
  – Temporarily brings back dissociative effects lasting several days
  – Respiratory depression
  – Asphyxiation
Stimulants

- Ritalin® (methylphenidate), Adderall® (amphetamine)
- Used to help treat
  - Attention Deficit Hyperactivity Disorder (ADHD)
  - Narcolepsy
  - Some forms of depression
- High potential for abuse and addiction
Got Adderall?
- The Ivy League Crack -
Stimulant Effects

- Restlessness
- tremors
- rapid breathing
- confusion/hallucinations
- panic
- hyperreflexia
- nausea, vomiting, diarrhea
- aggressiveness
- irregular heartbeat
- increased blood pressure
- seizures
Stimulants

• Withdrawal symptoms
  – depression
  – stomach cramps
  – nausea or vomiting
  – "the shakes"
  – tiredness
• Acts as a central nervous system stimulants
• Onset within 15-20 minutes
• Ritalin® effects lasts ➔ 3.5-4 hours
• Adderall® effects lasts ➔ 6-12 hours
Benzodiazepines

- Xanax®, Valium®, Ativan®, Klonopin®
- Used for reducing anxiety, panic disorders, and sleep/sedation, muscle relaxants, anticonvulsant, psychiatric issues, adjunct detox medication
- Often used in combination with other drugs to enhance effects
Effects

- Drowsiness
- Ataxia
- Syncope
- Increased irritability
- Liver dysfunction
- Amnesia
- Rebound insomnia
- Daytime anxiety
• Hostility
• Increased impulsiveness
• Aggression
• Increased risk of depression
• Suicidal ideation
Abuse

• Rarely preferred or sole drug of abuse
• Most commonly used in combination with opioids or alcohol
• Fatal overdose with benzodiazepines is rare. When it does occur, the combination of benzodiazepines and alcohol, with or without opiates, is often the cause of death
Analgesics/Opiates

• CNS depressant
• Used to help alleviate or decrease pain
• Chemically related to opium
  – Substance collected from poppy plant
• Prescription medication only

• Alter brain activity leading to dependence
Effects

• Sedation
• Sleepiness
• Lethargy
• Confusion
• Weight loss
• Respiratory depression

• Decreased GI motility
  – Constipation
• Nausea
• Vomiting
• Itching
Effects

- Compulsive behavior
- Physical dependence
- Addiction
- Drug seeking activity
- Paranoia
- Dangerously high body temperatures
- Irregular heartbeat
COCaine

- “Coke” “Snow” “Blow” “Nose Candy” “Crack”
- Addictive stimulant
- Derived from coca leaves
- Powdered form – snort or dissolve in H₂O and injected
- Rock crystal (cocaine not neutralized by acid) smoked or “freebase”
EFFECTS

- Massive amounts of dopamine, serotonin, norepinephrine released
- Increased alertness, energetic, activity, temperature
- Decreased appetite, rational thought
- Irritability, aggression, paranoia, violence
- Prolonged release can be toxic to neurons
• Initial “rush” or sense of well-being
• More energy, more alert
• Effects quickly wear off, leaving user feeling down, depressed
• Use more to feel “normal”
• Withdrawal - depression, anxiety, paranoia
Cocaethylene

- Alcohol + cocaine = cocaethylene
- Intensifies cocaine’s euphoric effects
- Increases risk of sudden death
- Animal studies show rats will endure electrical shocks and go without food to receive cocaine.
“Energy Drinks”

• Very popular
• Expensive $30/gal
• Mixers
• Marketing hype
• Different from “sports drinks”
What’s Really in “Energy Drinks”

- 20–30gm carbohydrates – extra carbohydrates
- Ma huang (ephedra)
- Caffeine
- Guarana
- Vitamins
• Amino acids (taurine)
• Glucuronolactone (glucose by-product)
• Herbs
Supplements

University of Rhode Island
Health Services/Education

Susan A. Ash, M.S., R.D., L.D.N.
Nutritionist/Health Educator
Supplements

- Performance enhancers
- Muscle development
- Fat burners
Diet Industry

• 30 to 50 Billion Dollars
• Unproven Claims
• No Oversight
• Anyone can write a diet book
• Public must prove harm
• Untested products
• No federal regulation
Growth of Dietary Supplement Sales

Growth of an Industry

Dietary Supplement Sales Per Year

- Total Market in Billions of Dollars
- 1990: $3.3
- 1991: $3.3
- 1992: $3.7
- 1993: $4.4
- 1994: $5.0
- 1995: $5.8
- 1996: $6.5

Source: Packaged Facts Inc.
What is a supplement?

- “Any product used for ingestion as a supplement to the diet.”
- Vitamins
- Minerals
- Herbs
- Botanicals
- Plant derived substances
- Metabolites
- Constituents
- Extracts
What does a supplement look like?

- Capsule
- Tablet
- Powder
- Soft gels
- Gel caps
- Liquids
- Bars
Where can you buy them?

• Health Food Stores
• Grocery Stores
• Drug Stores
• Discount Chains
• Mail Order Catalogs
• TV
• Internet
• Direct Sales
Are they considered a drug?

- Supplements are not considered a drug
- FDA does not authorize or test
- FDA must prove unsafe before they can restrict use
  - Approximately one half of the most common supplements for weight loss have not been studied in randomized controlled trials in humans.
- Cannot claim to cure or treat disease
- May make structure claims such as calcium builds strong bones.
Dietary Supplement Health and Education Act (1994)

- Signed by President Clinton in 1994.
- New law which created a new regulatory framework for the safety and labeling of dietary supplements.
- Dietary supplements do not need approval by the FDA before they are marketed.
Are all of the ingredients contained in the products listed?

• Not necessarily, other substances may be in the product without anyone knowing.
• An international study analyzed 634 non-hormonal nutritional supplements, obtained from 13 countries and 215 suppliers.
  – Of the 634 samples analyzed, 94 (14.8%) contained prohomones (ie. Nandrolone, testosterone) not declared on the label.
  – Of the samples found with prohormones, 18.8% were bought in the United States.

Standardized Serving Sizes?

• There are no rules that limit a serving size or the amount of a nutrient in any form of dietary supplements.
• This decision is made by the manufacturer and does not require FDA review or approval.
Information that is required on the label of dietary supplements
Structure Function Claim

• “This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.”

• Statement required on all dietary supplements.
Popular Weight Loss Drugs

- Xenadrine
- Hydroxycut
- Metabolife
- Dexatrim
- Cortislim
- Trimspa
- Others
Hydroxycut
Claims: Burn 613% more fat. Potent weight loss supplement.
30 pounds in 8 weeks

• Ingredients:
  – Hydroxy oxygen 500mg
  – Ma Huang 83.5mg
  – Guarana Extract 227.5mg
  – Willow Bark 25mg
  – L-carnitine 25mg
  – Chromium 75mcg
Hydroxycut (Ephedra Free)
Claims: Burn 613% more fat. Potent weight loss supplement. 30 pounds in 8 weeks

- Ingredients:
  - Calcium 50mg
  - Chromium 44mcg
  - Potassium 75mg
  - Hydroxagen Plus 0.56g
  - Garcinia Cambogia
  - Gymnema Sylvestre
  - Glucomannan
  - Alpha Lipoic Acid
  - Willow Bark
  - L-Carnitine
  - Hydroxy Tea 131mg
  - Green Tea Leaf extract
  - Caffeine
  - Guarana seed extract 66.5mg
Hydroxycut (Caffeine Free)

Claims: Burn 613% more fat. Potent weight loss supplement. 30 pounds in 8 weeks

- Ingredients:
  - Calcium 50mg
  - Chromium 44mcg
  - Potassium 75mg
  - Hydroxygen Plus 0.56g
  - Garcinia Cambogia
  - Gymnema Sylvestre
  - Glucomannan
  - Alpha Lipoic Acid
  - Willow Bark
  - L-Carnitine
  - Green Tea leaf extract
    66.5mg
Xenadrine EFX

Claims: “proven fat burner”, increases your metabolism and energy

• Ingredients:
  – Vitamin C 50mg
  – Vitamin B6 5mg
  – Pantothenic Acid 6mg
  – Magnesium 5mg
  – L-Tyrosine
  – Green Tea extract
  – Cocoa extract
  – Yerba Mate
  – DL Methionine
  – Ginger root
  – Quercetin
  – Fisetin
  – Bitter Orange
  – DMAE
  – Grape Seed extract
Xenadrine NRG
Claims: “proven fat burner”, increases your metabolism and energy

• Ingredients:
  – Vitamin B12 94mcg
  – Norambrolide 18.75mg
  – L-Tyrosine
  – L-Theanine
  – Yerba Mate
  – Guarana seed
  – Cocoa seed
  – Green Tea leaf
  – Green Coffee bean extract
  – Infused with natural caffeine
Metabolife 356

Claims: Burns fat not lean muscle and higher energy levels. Reduces appetite.

- Ingredients:
  - Chromium (75mcg)
  - Guarana (40mg)
  - **MaHuang (12mg)**
  - Goldenseal
  - GotuKola
  - Caffeine
  - Vitamin E (6IU)
  - Magnesium (75mg)

  - Bovine Complex
  - Zinc (5mg)
  - Bee Pollen
  - Ginger root
  - Ginseng root
  - Spirulina algae
  - Lecithin
  - Damiana Leaf
Metabolife (Ephedra Free)
Claims: Burns fat not lean muscle and higher energy levels. Reduces appetite.

• Ingredients:
  – Sodium 30mg
  – Potassium 15mg
  – Calcium 25mg
  – Chromium 75mcg
  – Green Tea leaf extract
  – Garcinia Cambogia
  – Guarana seed extract
  – Yerba Mate
  – Caffeine
Metabolite Ultra (Caffeine Free)

Claims: Burns fat not lean muscle and higher energy levels.
Reduces appetite.

• Ingredients:
  – Thiamin 0.75mg
  – Riboflavin 0.85mg
  – Niacin 10mg
  – Vitamin B6 2.5mg
  – Pantothenic Acid 5mg
  – Calcium 37.5mg
  – Chromium 66.5mg
  – Potassium 75mg
Dexatrim Natural-Ephedra Free
Claims: fat burning and appetite control

- Ingredients
  - Calcium 23mg
  - Chromium 83 mcg
  - Bitter Orange Peel 120mg
  - Siberian Ginseng
  - Green Tea with added caffeine
  - Fenugreek extract
  - Guarana seed extract with added caffeine
  - Ginger root
  - Licorice root
  - Vinadium amino acid chelate 340mg
Dexatrim Natural Green Tea Formula
Claims: Control appetite and increase metabolism

• Ingredients:
  – Iodine 30mcg
  – Chromium 250 mcg
  – Vanadium 100mcg
  – Green Tea Extract 200mg
  – Heartleaf Extract 120mg
  – Licorice Root
  – Panax Ginseng root
  – Cinnamon bark
  – Ginger root
  – Sasparilla root
  – Kelp
Cortislim

Claims: weight loss through stress reduction.

• Ingredients:
  – Vitamin C 100mg
  – Calcium 150mg
  – Chromium 50mg
  – Magnolia Bark extract
  – Beta-sitosterol
  – L-Theanine
  – Green Tea Leaf extract
  – Bitter Orange Peel (Synephrine)
  – Banaba Leaf extract
  – Vanadyl sulfate
Trimspa X32
Claims: Appetite suppressant causing weight loss.

• Ingredients:
  – Chromium 75mcg
  – Vanadium 15mcg
  – Glucomannan 200mg
  – Citrus Nariginine 5mg
  – Glucosamine 50mg
  – Cocoa extract 162mg
  – Green Tea extract 125mg
  – Hoodia Gordonii cactus 75mg
Ripped Fuel (Ma Huang Free)

Claims: Muscle definition.

• Ingredients:
  – Citrus Aurantium extract (Synephrine) 162mg
  – St.John’s Wort extract 150mg
  – L-phenylalanine 25mg
  – Guarana seed extract 400mg
  – Coleus Forskohlli
  – Green Tea extract
  – Citrus Bioflavanoids
  – Ginger root
  – Cayenne
  – Yohimbe bark extract
Nitrix

Claims: Muscle building and “body altering”

- Ingredients:
  - L-Arginine Alpha-Ketoglutarate 1000mg (converts into NO)
  - Phospholex
  - 2CM (dicreatine malate)
  - L-Citruline
  - NAD
  - Folic acid
Nitro-Tech

Claims: Allows muscles to gain greater lean weight and strength.

- Ingredients:
  - Vitamin E 30IU*
  - Vitamin B6 10.5mg*
  - Folic Acid 400mcg*
  - Calcium 140mg*
  - Iron 0.36mg*
  - Phosphorous 100mg*
  - Magnesium 50mg*
  - Sodium 60mg*
  - Potassium 180mg*
  - Whey Protein
  - Guar Gum
  - Calcium Alpha Glutarate
  - L-Glutamine

*Amount in each 28.5g scoop
Diet Teas

• Claims: Weight Loss
• Contain senna, aloe, cascara sagrada, and or buckthorn
• Interfere with absorption of electrolytes
• Diarrhea, nausea, stomach cramps, dehydration
What’s Really in Supplements

- Caffeine
- Ma huang (Ephedra)
- Guarana
- Carnitine - amino acid
- Chromium - trace mineral (helps convert glucose into energy)
• Pyridoxine - B6
• 5HTP - made from tryptophan, serotonin precursor
• Hydroxycitric acid – extract from Garcinia
Caffeine

- Uses: Endurance & weight loss
- Greater that 250 mg may cause headaches, irritability, sleeplessness, fatigue, and nervousness
  - Fatal if used in doses estimated to be 10-14 g
- Individual reactions
- Stronger in those who do not usually consume the substance
- Chronic use, especially in large amounts, can produce tolerance and dependence.
Ma Huang (Ephedra)

- Used to treat asthma and allergies. Also used for weight loss, obesity, and to enhance athletic performance.
- Contains: Ephedra, pseudoephedrine, and norpseudoephedrine. Converted to methamphetamine
- Plant amphetamine may suppress appetite
- Some studies show modest increase in metabolism, others do not.
- Banned in the US. Ephedra can cause severe life-threatening or disabling effects in even small doses (20-60mg).
- FDA proposed to limit Ephedra alkaloids to 8 mg per dose and 24 mg per day
Ma Huang (Ephedra)

- Since 1993 FDA reports 100 deaths
- US Poison Control reported 1,178 adverse reactions in 2001
- Poison Control Center data indicates Ephedra is the most frequently associated with reports of adverse effects.
  - It is 100 times more likely to generate an adverse effect than other herbs.
- Side Effects
  - Stroke, irregular heartbeat, rapid heartbeat, heart attack, high blood pressure, nervousness, nerve damage, muscle damage, stroke, insomnia, irritability, headaches, death (100 persons)
Guarana

- Used for such indications as weight loss, performance enhancement, appetite suppressant, and to reduce mental and physical fatigue.
- Contains 2 times the caffeine in coffee.
- Has been used as a flavoring agent in beverages and candy.
- May extend action of ephedra.
- Prolonged use can produce tolerance, dependence, and significant adverse effects.
- Doses greater than 250-300mg per day have been associated with significant adverse effects such as tachyarrhythmias and sleep disturbances.
  - Fatal if used in doses estimated to be 10-14 g
Carnitine

• Involved in fat metabolism (transports fatty acids to muscle tissue)
• Is available in diet & body building supplements.
• The most common form, L-Carnitine is found naturally in the body and plays a role in cellular energy production.
• No evidence of claims
• L-Carnitine has been associated with side effects including nausea, vomiting, abdominal cramps, heartburn, gastritis, diarrhea, body odor, and seizures.
Chromium

• Best selling mineral behind calcium
• Chromium is an essential trace element.
• Claims: promotes weight loss, burns fat, carbohydrates, increases muscle mass, enhances athletic performance, and increase energy and vigor.
• No evidence
Some patients can experience cognitive, perceptual, and motor dysfunction at doses as low as 200-400 mcg per day of chromium picolinate. Some patients can also experience headaches, insomnia, sleep disturbances, irritability, and mood changes.

Chromium picolinate has also been associated with weight gain in young women who do not exercise and in those on a weight-lifting program.

Caution: picolinic acid may cause iron deficiency and chromosome damage.

Acute chromium toxicity can cause vomiting, diarrhea, hemorrhage and blood loss into the gastrointestinal tract.
Hydroxycitric Acid
HCA

- Found in Garcinia fruit.
- Claims Promotes weight loss
- Suppresses appetite
- Increases fat oxidation/mobilization
- Increases energy
- Theory that inhibits the enzyme that converts carbohydrates to fat
- Major pharmaceutical company tried to turn HCA into a weight loss drug scrapped due to testicular atrophy and other toxicities in lab animals
- Can cause nausea, GI discomfort, and headache.
Chitosan

• Claims: weight loss (fat binder and fat burner)
• Fiber like substance made from shells of lobsters, crabs, shrimp, and other marine organisms.
• No significant evidence as a stand alone weight loss agent.
• Those with a shellfish allergy should use extreme caution in taking this.
Blue Green Algae Spirulina

- A mixture of single celled organisms with structures that are similar to both plant and animal species.
- Blue Green Algae is commonly found in tropical waters with a high salt content.
- Claim: reducing appetite and causing weight loss.
- The FDA reviewed this claim and found no evidence to support using blue-green algae for weight loss.
Blue Green Algae
Spirulina

- Select products may be contaminated with heavy metals or microbes.
- Caution: blue-green algae products are promoted as an excellent source of dietary protein. However, they are no better than meat or milk and are estimated to cost more than 30 times as much as beef on a per gram basis.
7 Keto-DHEA

- Is a metabolite of DHEA, which is found naturally in the body.
- Claims: Aids in increasing metabolism and thermogenesis to promote weight loss, improving lean body mass and building muscle, and increasing the activity of the thyroid gland.
- Questionable study regarding weight loss
- Evidence has not been demonstrated in human subjects.
Willow Bark

• The active ingredient in the bark is salicin which broken down in the body in the same way as aspirin.
• Claims: weight loss
• Possible side effects include: Stomach irritation, itching, rash, and anaphylaxis reaction in those with an aspirin sensitivity.
Pyruvate

- Is converted into the alpha-hydroxy acid, lactic acid.
- Claims: promotes fat and weight loss, increases muscle mass, and increases exercise endurance.
- Only one small study with small differences between groups (supplemented very high).
- Intravenously, one death was associated with pyruvate use in a child with restrictive cardiomyopathy.
Creatine

- Claims: Used to increase muscle mass and improve exercise performance.
- People who have lower initial total creatine, such as vegetarians, are more likely to respond to supplemental creatine, while people with higher initial levels may not respond.
- No effect on 30% of the population
- May enhance anaerobic exercise
- Increased size of muscle may be due to
  - Increased protein synthesis
  - Increased water retention
Creatine

- Hydration with water necessary
- Side effects – mostly anecdotal
  - Cramping, diarrhea, nausea, dizziness, dehydration, muscle strain, high blood pressure, incontinence, abnormal kidney and liver functions
  - Long term side effects on heart muscle and kidneys unknown
Many manufacturers are taking ephedrine out of their products due to lawsuits and replacing with bitter orange.

Active Ingredient – Synephrine. The applicable parts of bitter orange are the peel, flower, leaf, and fruit.

Claims: weight loss

Similar to ephedrine

There are case reports of cardiotoxicity including tachyarrhythmia, syncope, and myocardial infarction in otherwise healthy patients who have taken bitter orange extract in combination with other stimulants such as caffeine.
Warnings

• Caffeine
  Banned by NCAA in high amounts

• Ephedra
  Banned by NCAA, IOC, NFL

• Creatine
  Anecdotal
  Cramping, diarrhea, nausea, dizziness, dehydration muscle strain, high blood pressure, incontinence, abnormal liver and kidney function

• Steroids
  Currently banned by the MLB. Congressional investigation continues.