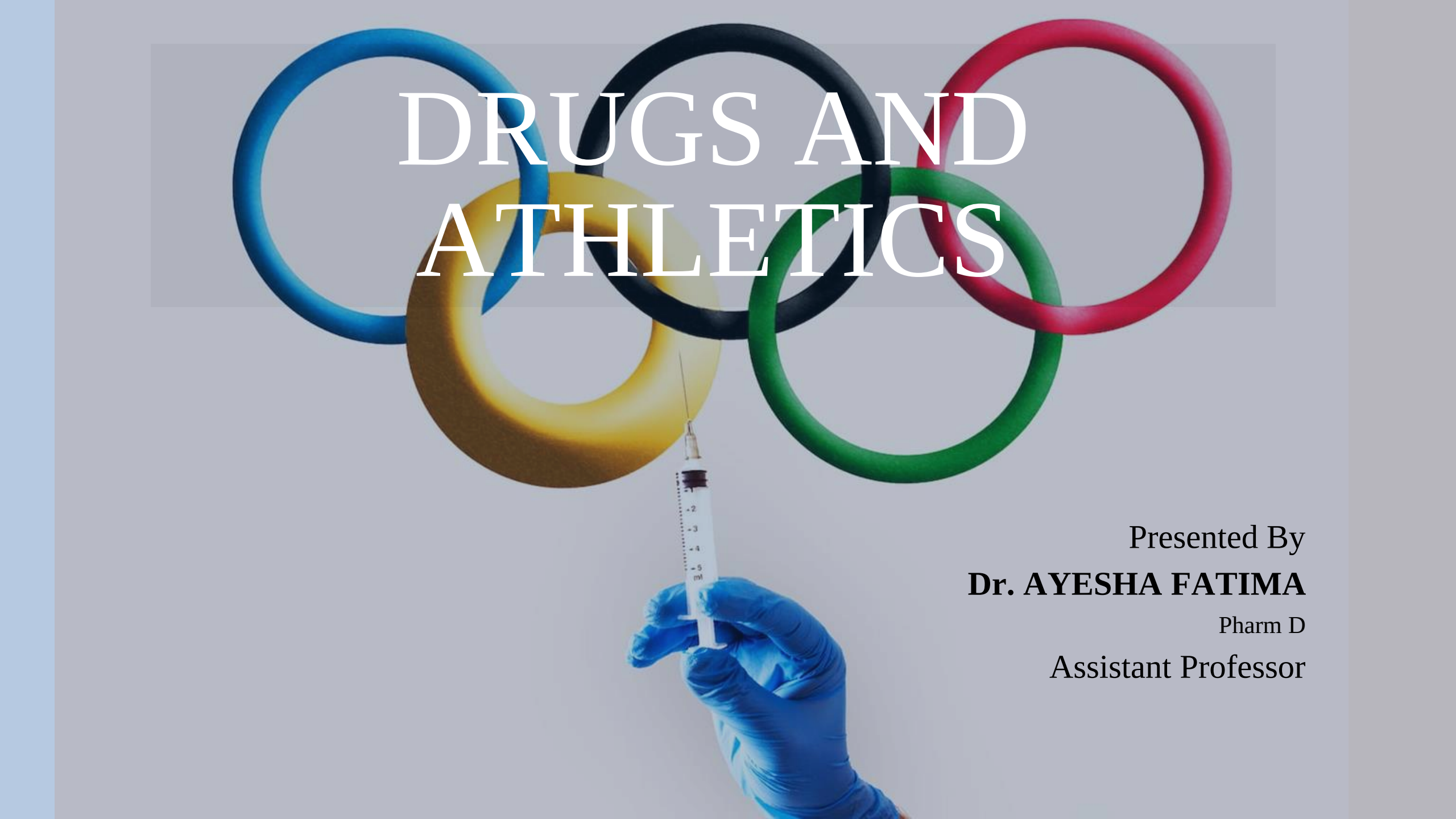


The background of the slide features a hand wearing a blue nitrile glove, holding a clear medical syringe with a needle. The syringe has markings for 1, 2, 3, 4, and 5 ml. In the background, the five Olympic rings (blue, yellow, black, green, and red) are visible. The title 'DRUGS AND ATHLETICS' is overlaid in white serif font.

DRUGS AND ATHLETICS

Presented By
Dr. AYESHA FATIMA
Pharm D
Assistant Professor

- Athletics use drugs for number of reasons
 1. Performance enhancement,
 2. To self-treat otherwise untreated mental illness, and
 3. To deal with stressors, such as pressure to perform, injuries, physical pain, and retirement from sport.
- Apart from these they use drugs to increase chance of winning, to become famous, to become wealthy and because everyone else is doing it.
- Drug abuse in the athlete population may involve doping in an effort to gain a competitive advantage.

TYPES OF DRUGS USED BY ATHLETICS

CATEGORY	EXAMPLES
Androgens	Testosterone, danazol, nandrolone, stanozolol
Growth hormone and growth factors	Insulin-like growth factor, insulin
Stimulants	Amphetamine, D-methamphetamine, methylphenidate, ephedrine, pseudoephedrine, caffeine, cocaine
Methods to increase oxygen transport	Blood transfusions, recombinant human erythropoietin, darbepoetin alfa
Nutritional supplements	Vitamins, minerals, herbs, extracts, metabolites
Other recreational drugs	Alcohol, cannabinoids, narcotics, nicotine
Beta agonists	Albuterol, formoterol, salmeterol
Beta blockers	Propranolol
Other prescription drugs	Diuretics and other masking agents, glucocorticoids, phosphodiesterase type 5 inhibitors

Growth hormone and growth factors

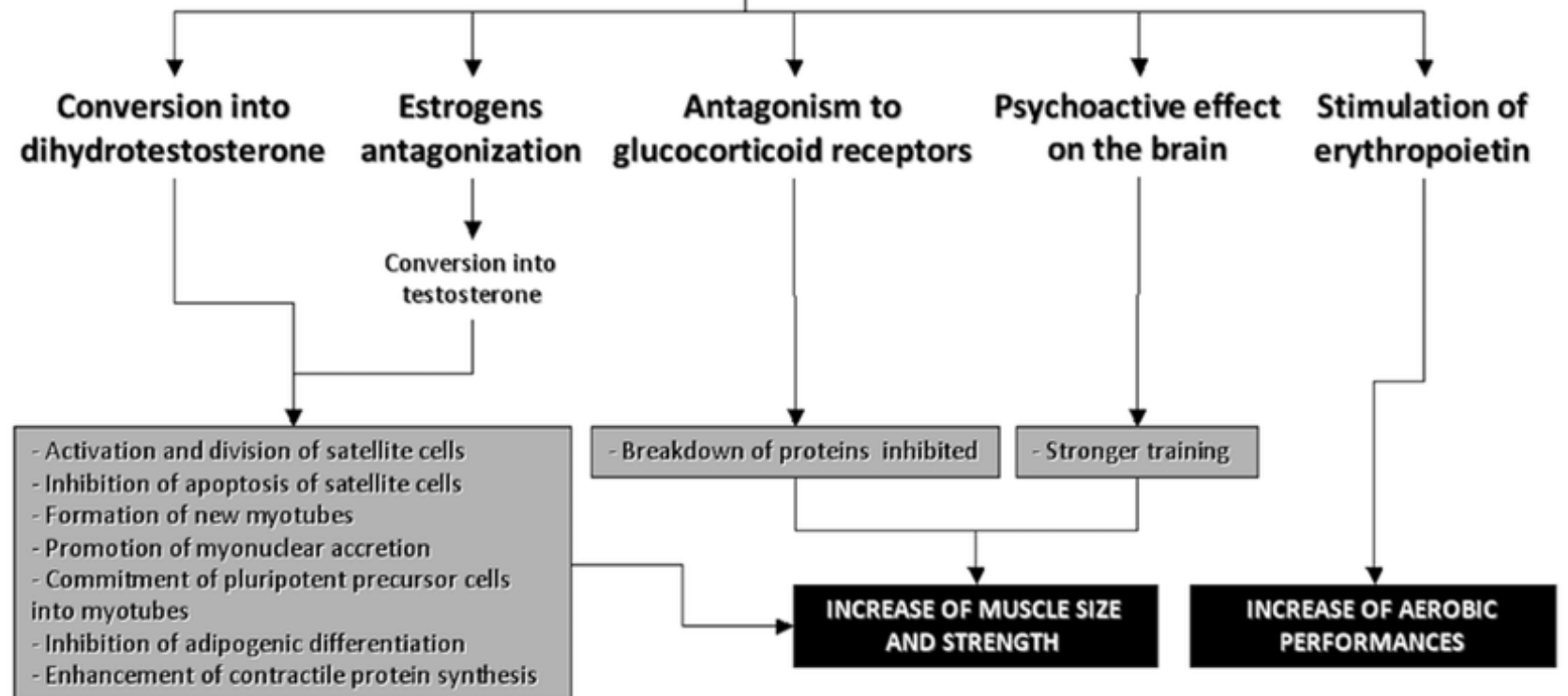
Category	Details
Substances	Recombinant human growth hormone, Insulin-like growth factor (IGF), Insulin
Physiological Effects	Increases muscle mass, decreases adipose tissue
Performance Effects (Both Genders)	Decreased fat mass, increased lean body mass, improved sprint capacity (no significant change in strength, power, or endurance)
Possible Side Effects	Insulin resistance, hyperglycemia, diabetes mellitus, cardiomegaly, hastened epiphyseal closure in adolescents, myopathy, hypertension, edema, carpal tunnel syndrome

Stimulants

Category	Details
Common Stimulants	Amphetamine, D-methamphetamine, Methylphenidate, Ephedrine, Pseudoephedrine, Caffeine, Dimethylamylamine, Cocaine, Fenfluramine, Pemoline, Selegiline, Sibutramine, Strychnine, Modafinil
Performance Uses	Improve endurance, increase anaerobic performance, decrease fatigue, improve reaction time, increase alertness, promote weight loss
Possible Side Effects	Hypertension, tachycardia, myocardial infarction, stroke, heat stroke, weight loss, rhabdomyolysis, headache, nausea, tremor, insomnia, anxiety/panic attacks, agitation, aggression, psychosis

Androgens

Androgen Anabolic Steroids



Type of Androgen	Examples
Exogenous Testosterone	Testosterone
Synthetic Androgens	Danazol, Nandrolone, Stanozolol
Androgen Precursors	Androstenedione, Dehydroepiandrosterone (DHEA)
Selective Androgen Receptor Modulators (SARMs)	Ostarine, ligandrol
Other Forms of Androgen Stimulation	General category for any other androgenic agents or mechanisms

Category	Side Effects
Reproductive	Diminished spermatogenesis and gynecomastia in men, decreased fertility, decreased testicular size, possible benign prostatic hypertrophy or prostate cancer
Cardiovascular	Decreased high-density lipoprotein (HDL) cholesterol, increased low-density lipoprotein (LDL) cholesterol
Hepatic	Hepatotoxicity
Neuropsychiatric	Depression, mania, psychosis, aggression
Other	Hastened epiphyseal closure in adolescents, acne, hirsutism, temporal hair recession, clitoromegaly, voice deepening, oligomenorrhea/amenorrhea in women, infections (abscesses at injection sites, septic arthritis, hepatitis/HIV from sharing needles), tendon rupture

Methods to increase oxygen transport

Category	Details
Substances/Methods Used	Blood transfusions, recombinant human erythropoietin, darbepoetin alfa, hypoxia mimetics (e.g., desferrioxamine, cobalt), artificial oxygen carriers
Performance Effects	Increased aerobic power and physical exercise tolerance
Possible Side Effects	Myocardial infarction, stroke, deep vein thrombosis (DVT)/pulmonary embolism (PE), hypertension, antibody-mediated anemia

Nutritional Supplements

Definition:

Nutritional supplements include vitamins, minerals, herbs, extracts, and metabolites used to enhance dietary intake.

Important Considerations:

- Purity and safety of supplements cannot always be guaranteed.
- Supplements may be contaminated with banned substances (e.g., steroids, stimulants) without the athlete's or manufacturer's knowledge.
- This contamination poses risks, especially for athletes subject to drug testing.

Supplement	Possible Side Effects	Notes
Creatine	Acute interstitial nephritis, accelerated progression of chronic kidney disease	Monitor kidney function if used long term or in those with kidney problems.
Vitamin A	Toxicity at high doses: headache, nausea, dizziness, liver damage	Fat-soluble vitamin; overdosing can be harmful.
Iron	Gastrointestinal upset, constipation, iron overload	Excess iron can be toxic; use with medical advice.
Herbal extracts (e.g., ginseng, St. John's Wort)	Allergic reactions, interactions with medications	Effectiveness and safety vary widely.

Other Recreational Drugs

Other Recreational Drugs Used by Athletes

- These substances may be used by athletes attempting to reduce anxiety or manage pain, indirectly enhancing performance.
1. **Alcohol:** Used to reduce anxiety but impairs physical and cognitive function.
 2. **Cannabinoids:** Used for anxiety reduction but impair alertness and memory.
 3. **Narcotics:** Used for pain relief during training or competition.
 4. **Nicotine:** Sometimes used to aid weight loss and improve attention.

Side Effects

1. **Alcohol:** Sedation, decreased concentration, impaired coordination.
2. **Cannabinoids:** Reduced alertness, impaired short-term memory, psychomotor slowing, dysphoria, anxiety, psychosis.
3. **Narcotics:** Physical dependence, nausea, vomiting, constipation, decreased concentration, impaired coordination, fatigue.
4. **Nicotine:** Chronic use linked to cardiovascular disease, chronic obstructive pulmonary disease (COPD), and multiple cancers.

Drug	Use in Performance Enhancement	Side Effects
Alcohol	Anxiety reduction	Sedation, decreased concentration and coordination
Cannabinoids	Anxiety reduction	Reduced alertness, impaired memory, psychomotor retardation, dysphoria, anxiety, psychosis
Narcotics	Pain relief	Physical dependence, nausea, vomiting, constipation, decreased concentration, fatigue
Nicotine	Weight loss, improved attention	Cardiovascular disease, COPD, cancer risk

Beta-2 Adrenergic Agonists

- Examples: **Albuterol**, **Formoterol**, **Salmeterol**
- These drugs act on beta-2 adrenergic receptors and are known to have ergogenic (performance-enhancing) effects.
- **Effects:**
 - Improved performance in swimmers who use these substances before racing.
 - Oral beta-2 agonists may:
 - Increase skeletal muscle mass
 - Inhibit protein breakdown
 - Decrease body fat

Beta Blockers

- Examples: **Propranolol** and other beta-adrenergic blockers
- **Effects:**
 - Decrease heart rate (bradycardia)
 - Reduce hand tremor
 - Provide anxiolytic (anxiety-reducing) effects
- These effects may enhance performance in precision sports requiring steadiness and calm, such as archery, shooting, and billiards.

Possible Side Effects

- **Tachycardia** (increased heart rate)
- **Arrhythmias** (irregular heartbeat)
- **Hypokalemia** (low potassium levels)
- **Hyperglycemia** (high blood sugar)
- **Tremor**

Possible Side Effects

- **Bradycardia** (abnormally slow heart rate)
- **Increased airway resistance** (may worsen asthma or other respiratory conditions)
- **Decreased endurance** (due to reduced cardiac output during exercise)

Drug Class	Ergogenic Effects	Side Effects
Beta-2 Agonists	Improved swimming performance, increased muscle, decreased fat	Tachycardia, arrhythmias, hypokalemia, hyperglycemia, tremor
Beta Blockers	Decreased heart rate, reduced tremor, anxiolysis (useful in precision sports)	Bradycardia, increased airway resistance, decreased endurance

Other prescription drugs

Drug Class	Uses in Sports	Side Effects
Diuretics & Masking Agents	Rapid weight loss, mask other PEDs	Dizziness, cramps, rash, gout, renal insufficiency, electrolyte imbalance, gynecomastia (spironolactone)
Glucocorticoids	Anti-inflammatory, analgesic to reduce pain	Hyperglycemia, fluid retention, mood changes, muscle weakness, osteoporosis, hypertension, obesity, cataracts
Phosphodiesterase-5 Inhibitors	Improve oxygenation and exercise capacity	Headache, dizziness, flushing, dyspepsia, nasal congestion

1. Diuretics and Other Masking Agents

- **Purpose:**

- Used for rapid weight loss in weight-class sports (e.g., wrestling, boxing).
- Used to hasten urinary excretion of performance-enhancing drugs (PEDs) to reduce positive drug test results.
- Masking agents include:
 - Diuretics
 - Epitestosterone (to normalize testosterone/epitestosterone ratio)
 - Probenecid
 - 5-alpha reductase inhibitors
 - Plasma expanders (e.g., glycerol, albumin, dextran, mannitol)

Side Effects:

- Dizziness
- Muscle cramps
- Rash
- Gout
- Renal insufficiency
- Electrolyte imbalances
- Gynecomastia (especially with spironolactone)

2. Glucocorticoids

- **Purpose:**

- Used for their anti-inflammatory and analgesic properties to reduce pain and inflammation, potentially enhancing performance.

- **Side Effects:**

- Hyperglycemia
- Fluid retention
- Depression, mania, psychosis
- Chronic use: muscle weakness and atrophy, osteoporosis, diabetes mellitus, hypertension, weight gain, central obesity, cataracts

3. Phosphodiesterase-5 (PDE-5) Inhibitors

- **Examples:** Sildenafil, Tadalafil, Vardenafil
- **Purpose:**
 - Block degradation of cGMP, causing vasodilation.
 - Athletes may use these drugs to improve oxygenation and exercise capacity.
- **Side Effects:**
 - Headache
 - Dizziness
 - Flushing
 - Dyspepsia (indigestion)
 - Nasal congestion or rhinitis