

Opioid analgesics - Drug abuse.

## Chapter 28: Opioids and other CNS analgesics

### Opioids and endogenous peptides

- Opioids/opiates (eg morphine) most effective analgesic drugs
  - Mimics 3 families of endogenous opioids peptides: enkephalins, endorphins, dynorphins
- Agonists produce analgesia
  - But also respiratory depression, sedation, euphoria, decreased GI motility and psychological/physical dependence
  - No newer opioid agonists truly superior to morphine, eg Alfentanil, fentanyl (1000/100x more potent - same efficacy)
  - Agonist-antagonist
  - Antagonist

Drugs Actions at receptors:

|                           | Mu         | Kappa      | Delta   |
|---------------------------|------------|------------|---------|
| <b>Endogenous opioids</b> | Agonist    | Agonist    | Agonist |
| <b>Opiate Drugs</b>       | Yes        | Yes        | N/A     |
| Opioid agonists           | agonist    | Agonist    |         |
| Agonist-antagonists       | Antagonist | Agonist    |         |
| Antagonists               | Antagonist | Antagonist |         |

### Adverse effects of morphine

- Safety alert: Respiratory depression
  - Most serious. Not usual at therapeutic doses. Death following OD almost always from respiratory arrest.
- Constipation
- Orthostatic hypotension
- Cough suppression
- Urinary urgency/hesitancy/retention
- Increase in intracranial pressure
- Euphoria/Dysphoria (Both lead to abuse ..euphoria turns into dysphoria.. as the level drops so you can reach for more —> vicious cycle)
- Delirium/agitation —> sedation —> coma
- Tolerance and physical dependence
  - Withdrawal syndrome: yawning/rhinorrhea/sweating —> anorexia/irritability/tremor/“gooseflesh” —> violent sneezing/weakness/NVD/abdominal cramps/bone and muscle pain/muscle spasm and kicking. X7-10d
    - unpleasant, rarely dangerous
    - Neonates (in utero exposure). Rx paregoric (tincture of opium)
  - Overdose —> Classic triad. Rx: IV naloxone (opioid antagonist)

\*Withdrawal from CNS depressants (eg. Barbs, ETOH, Benzes) can be lethal

Physical dependence/abuse/addiction as clinical cancers

- “Excessively concerned” health professionals (~25%), fearing opioids cause addiction, may prescribe less needed
- Physical dependence “extremely rare” with short term use
- If physical dependence, vast majority have gradual withdrawal, never take opioids again
- Administer opioids in lowest effective dosages for shortest time
- Switch to non opioid analgesic (eg aspirin/acetaminophen) asap
- Suffering b/o insufficient dosage unacceptable
- unacceptable to promote abuse by failing to exercise good judgment
- Don’t feel responsible for having created an addict/“drug fiend”
- If abuse/addiction occurs, reflects preexisting use/tendencies
- Nonabusers, will not abuse drugs
- Withholding from abuse-prone individuals won’t reverse tendencies

### The Opioid Epidemic We Failed to Foresee

- *One of biggest mistakes in modern medicine*: regardless of length of Rx/dosage, pts would not become addicted to opioids [AMA Morning Rounds Feb 3, 2016](#)
- *Flawed concept of pseudoaddiction*: if pt drug seeking, not actually addicted – needs more to control pain/prescribe more [NYTimes. May 6, 2016](#)
- *A Killer High: How Canada got addicted to fentanyl* [Globe & Mail, Aug 2016](#)
- *Drug Linked to Overdoses Kill in Doses Smaller than a Snowflake* [NYTimes. Sep 5, 2016](#)
- *Typical opioid overdose*: pills that MD prescribed legally but someone else ingested [NY Times. Mar 16, 2017](#)
- *State Sues Drug Makers, Saying They Aided Opioid Epidemic*. Lawsuit accused drug makers of marketing that misled doctors & pts about danger of addiction and overdose [NYTimes. May 31, 2017](#)
- *Fentanyl Overtakes Heroin as Leading Cause of U.S. Drug Deaths*. First governmental account of nationwide drug deaths in 2016 shows overdose deaths growing even faster than previously thought. [NYTimes. Sep 2, 2017](#)
- *Prosecutors increasingly treating overdose deaths as homicides*, but aren’t just going after dealers. Friends, family, fellow users going to prison. [NYTimes. May 25, 2018](#)
- *Origins of an Epidemic: Purdue Pharma Knew Its Opioids Were Widely Abused* [NYTimes May 30, 2018](#)

#### Moderate-strong opioid agonists

- Generally similar to morphine, same adverse effect profile
  - Decrease analgesia/respiratory depression/ “abuse potential”
  - eg. Codeine, oxycodone (OxyContin!!)

#### Opioid agonist - antagonists

- Agonists in low doses but antagonists in higher doses
- eg. Pentazocine, buprenorphine
  - uses: withdrawal/maintenance, depression

#### Clinical use of opioids

- Objective assessment of pain very difficult - it is subjective
  - Pts overreport (seek euphoria)/underreport (fear addiction/needles/“be brave”)
- To minimize symptoms of abstinence/withdrawal, opioids should be withdrawn slowly (3-10 days)
- Patient-controlled-analgesia (PCA)
  - Pt self-administers parenterally (transdermal, IV, subQ, epidural) PRN
  - Steadier levels/relief when pt needs

### Opioid antagonists

- Naloxone (IV, IM, subQ)
  - Immediately reverses opioid-induced analgesia/sedation, euphoria/respiratory depression. Can cause withdrawal!
  - Uses: reversal of OD, posts, neonatal respiratory depression
- Methylnaltrexone (IM), alvimopan (PO):
  - Uses: opioid-induced constipation
- Naltrexone (PO):
  - Blocks opioid-induced euphoria, not craving (both)
  - Use: opioid and alcohol abuse

### Nonopioid CNS analgesics

- Relieve pain by unique mechanisms - not opioid-related
- No respiratory depression, “no physical dependence, or abuse”
  - Not regulated, but both reported to have abuse potential
  - Tramadol:
    - Moderately strong analgesic; 5-HT/NE reuptake blocker
  - Clonidine, Dexmedetomidine:
    - Severe pain (and HTN); central  $\alpha_2$  agonists

### Chapter 37: Drug abuse I. Basics

#### Definitions

- Drug abuse: use inconsistent with medical/societal norms
  - Hard to define: reason for use, inter-/intra-cultural, substance
- Addiction: chronic, relapsing brain disease with compulsive drug seeking and use, despite harmful consequences
- Tolerance: decrease response from same dose, increase dose needed
  - Cross-tolerance: tolerance to drug A  $\rightarrow$  tolerance to drug B of same class, eg heroin  $\rightarrow$  morphine but not amphetamines
- Psychological dependence: intense subjective need/craving
- Physical dependence: withdrawal syndrome (aka abstinence syndrome) will develop if drug stopped abruptly
  - Particular signs and symptoms for a given class of drugs
  - Contributes to addiction, but not necessary/sufficient
- Cross-dependence: drug B supports dependence on drug A
  - Drug B prevents withdrawal if drug A stopped
  - Eg Benzodiazepines and alcohol

#### Diagnostic criteria

##### Substances-Related/addictive disorders

##### A: Impaired control

1. Larger amounts/longer period than intended
2. Multiple unsuccessful efforts to cut down
3. Much time obtaining/using/recovering
4. Craving

##### B: Social impairment

1. Failing in major role obligations
2. Continued use despite problems from use
3. All other activities given up

### C. Risky use

1. Hazardous situations
2. Use knowing problems

### D. Pharmacological criteria

1. Tolerance
2. Withdrawal

### Controlled drugs and substances act

- To reduce diversion likelihood of legitimate drugs
- Like U.S Controlled Substances Act:
  - Schedule 1 - no legitimate medical use, high abuse potential
  - Schedules II-V - some legitimate medical use, some abuse potential
- The Canadian Controlled Drugs and Substances Act serves a similar purpose, but how drugs are categorized is a bit mysterious!

### Schedule 1- (MOST DANGEROUS)

- Controlled substances that have no established medical usage, cannot be used safely, and have great potential for abuse. This schedule includes:
  - Heroin
  - LSD
  - Mescaline
  - Peyote
  - Methaqualone
  - Psilocybin
  - Marijuana
  - Hashish
  - Other specified hallucinogens

### Chapter 38: Drug abuse II. Alcohol

#### Acute effects of alcohol

- Most common used/abused psychoactive substance in US/Canada
  - Moderation: prolongs life, decreased risk dementia/CV, "joy of living"
  - In excess "does nothing but diminish quality/quantity of life"
  - CNS depression: activates inhibitory GABA receptors/ inhibits excitatory glutamate receptors
  - 'Reward circuit' : binds with 5-HT receptors, increases DA release
- Alcohol limit: 0.08
  - Warn range: 0.05-0.08. Sanctioned if > 0.00 and <2L or novice driver
  - Hybrid offence: >0.05 + THC > 25 ng/ml (blood analysis)

#### BAL

#### CNS response

|           |  |
|-----------|--|
| .05-.1    | Euphoria, decrease self-restraint, increase sociability                  |
| 0.2       | Decrease attention, tremor/ataxia, slurred speech, decrease motor skills |
| 0.25 - .3 | Altered perception/equilibrium, double vision                            |
| 0.35      | Apathy, inertia  |
| .4-.45    | Stupor, coma   |

## 0.5 Respiratory depression, peripheral collapse

(1 can beer = 1 glass wine = 1 shot of whiskey = 18 ml ETOH)

### Chronic effects of alcohol\*

- Psychiatric - decrease cognitive function, anxiety, depression, suicide, school/job/family disruption
  - Low use may protect v dementia. Excess damages brain (Wernicke encephalopathy, Korsakoff psychosis)
- Cardiovascular
  - Moderate: decrease stroke/CAD/MI/heart failure, increase HDL. Excessive: direct damage to myocardium
- Endocrine
  - Type 2 DM risk decreases
  - Bone mineral density increases
  - Breast CA risk increases
- Gastrointestinal
  - Fatty liver → hepatitis → cirrhosis → death; pancreatitis; erosive gastritis; malnutrition (→ Wernicke-Korsakoff); liver/GI cancer increases
- Sexual function:
  - Decrease inhibitions/physiologically inhibits
  - Male feminization
- Pregnancy:
  - Fetal alcohol spectrum disorder → fetal alcohol syndrome
    - Mild neurobehavioral deficits → facial malformation, mental retardation, stillbirth, abortion, alcohol-dependent infants

### Tolerance, dependence and withdrawal

- All produced by ETOH use
- Cross-tolerance to barbiturates and benzodiazepines, not opioids
- Tolerance to many effects, not respiratory depression
  - Chronic alcoholics fully conscious with BAL 0.4% (5x eagle limit)
  - If BAL slightly higher, chronic alcoholic/novice will die

### Drug interactions

- Effects additive with other CNS depressants
- +NSAIDs: injure GI tract; + acetaminophen (therapeutic): fatal liver

### Acute overdose

- Vomiting, hypotension, respiratory depression, coma
- Aspiration → pneumonia → hypotension, renal failure, shock
- Rx: gastric lavage, dialysis. No stimulants.

### Alcohol withdrawal syndrome

- Mild: disturbed sleep/weakness/nausea/anxiety/mild tremors. Duration < 1 day
- Severe: cramps/vomiting/hallucinations/intense tremors/ increase HR-BP-T/tonic-clonic seizures/disorientation/ delirium tremens (DTs, severe persecutory hallucinations). Onset 12-72hrs after last drink..continues 5-7 days

### Drugs for alcohol use disorder

- 100,000 (CND) seek Rx (cut down/stop entirely) annually
  - Although half relapse in first few months, Rx should be tried
- Drug Rx helps in 2 ways:
  - Manage alcohol withdrawal

- Prevent relapse

#### Drugs used to facilitate alcohol withdrawal

| Drug   | Benefit during withdrawal  |
|--|--|
| Benzodiazepines<br>- eg. Chlordiazepoxide<br>- Diazepam<br>- Oxazepam<br>- Lorazepam | Decrease withdrawal symptoms; stabilize vital signs; prevent seizures and delirium tremens |
| Beta-adrenergic blockers<br>- Eg Atenolol<br>- Propranolol                           | Improve vital signs; decrease craving; decrease autonomic component of withdrawal symptoms |
| Central Alpha2-adrenergic agonist<br>- Clonidine                                     | Decreases autonomic component of withdrawal symptoms                                       |
| Antiepileptic drugs<br>- eg. Carbamazepine   | Decreases withdrawal symptoms; prevents seizures   |

#### Drugs to maintain abstinence

- Disulfiram (Antabuse):
  - Blocks metabolism: ETOH → acetaldehyde —X→ (not) acetic acid
    - N+V/flush/palpitate/ H/A / sweat/ chest pain/ weak/ blurred vision → hypotension/resp depression/ CV collapse/ MI/ heart fail/ seizures
  - Safety alert: any form of alcohol, eg in sauces, cough syrups, skin products (colognes, etc) → Severe, potentially fatal
- Naltrexone (pure opioid antagonist)
  - Alcohol craving and pleasurable effects both reduced
- Acamprosate
  - Reduces tension/dysphoria/anxiety caused by abstinence
- Topiramate (antiepileptic drug)
  - Reduces craving
- Ondansetron (serotonin receptor antagonist for chemo Rx N+V):
  - Prevents ETOH from activating brain's reward system
  - All require counselling/peer support (eg Alcoholics Anonymous)

#### Chapter 39: Drugs abuse III. Nicotine and smoking

##### Pharmacology of nicotine

- Mechanism of action:
  - Activate CNS/PNS nicotinic cholinergic receptors (not muscle)
  - Also mimics cocaine/other highly addicting drugs
- Pharmacologic effects:
  - CV - Constrict blood vessels, increases HR/cardiac contraction/BP
  - GI - increases secretions/motility. Promote vomiting
  - CNS - stimulant
    - Increases alertness/memory/cognition
    - Decreases appetite/aggression
    - Increases Dopamine. Activates brain pleasure/reward system
- Tolerance and dependence:
  - Tolerance to nausea/dizziness, not to cardiovascular effects

- Abstinence syndrome: craving/ nervous/ restless irritability/ impatience/ hostility/ insomnia/ decrease concentration/ increases appetite/ weight gain. Begins in 24hr, lasts week-months
- Benefits:
  - Improve cognition, memory, attention, mood, anxiety, chronic schizophrenia (?) in some individuals

#### Toxicity from smoking

- >40 mg fatal
- Acute (tobacco ingestion by children, nicotine-containing insecticide exposure):
  - Symptoms: vomit/diarrhea/cold sweat/disturbed hearing/vision / confusion/ faintness/ rapid/ weak/ irregular pulse —> death from respiratory paralysis
  - Antidote: none
- Chronic
  - Nearly every organ in body injured
    - Notably: lungs, heart
    - CA (larynx/lungs/GI/bladder/cervix/kidney/blood)
    - Cataracts, pneumonia, diabetes
    - Birth weight/preterm labour/stillbirth/miscarriage/abortion/perinatal mortality/SIDS

#### Smoking cessation: pharmacologic aids

- 40% try annually to quit. 3-5 % sucked on own/ 30% with help
- Most try 5-7x before finally quitting permanently
- After-1-yr relapse rate - 15% / After-5-yr relapse rate - 3%
- Quitting always decreases risk/slow progression tobacco-related illness
  - Former smokers' disease-risk = non-smoker' after 20-30yr
- Best bet: counselling + drugs
- Nicotine-replacement therapy (NRT)
  - Gum/lozenge/patch/inhaler/nasal spray
  - Analogous to methadone maintenance/weaning
  - 1-yr success rate 24% (placebo 9%)
- Bupropion:
  - Amphetamine-like antidepressant
  - Effective in presence/absence of depression
  - Reduces craving and withdrawal anxiety/irritability
- Varenicline ("most effective")
  - Partial nicotinic receptor agonist prevents nicotine from binding, decreases pleasure/reward; but mildly activating, so reduces craving
  - Postmarketing: mood change, erratic behaviour, suicidality
    - Safety alert: 2,925 cases self-injurious behaviour/5 million
- Nortriptyline (AD), Clonidine (a2 agonist)
  - Second-line drugs
  - Not FDA-approved (off-label use)
- Nicotine vaccine (in clinical trials)
  - Antibodies to nicotine in blood - prevent binding
  - No pleasurable effects
  - Ethical questions if used coercively
- Electronic cigarettes
  - Lehne: deliver 'safe' nicotine

Fun fact; E-cigarettes 2x as successful as patches or gum for smoking cessation

#### Chapter 39: Drug abuse IV. Other drugs

##### Other drugs of abuse

- Table: Pharmacologic categorization of abused drugs

| Category           | Examples  |
|--------------------|---|
| Opioids            | Heroin, Morphine, Meperidine, Oxycodone, Hydromorphone  |
| Psychostimulants   | cocaine, dextroamphetamine, methamphetamine, methylphenidate  |
| Depressants        | 1) Amobarbital, Secobarbital, Pentobarbital, phenobarbital<br>2) Diazepam, flunitrazepam, lorazepam<br>3) Alcohol, methaqualone, gamma-hydroxybutyrate, meprobamate |
| Psychedelics       | LSD, Mescaline, psilocybin, dimethyltryptamine  |
| Dissociative drugs | Phencyclidine, Ketamine   |
| Anabolic steroids  | Nandrolone, oxandrolone, testosterone   |
| Miscellaneous      | Dextromethorphan, marijuana, nitrous oxide, amyl nitrite  |

#### Heroin, oxycodone and other opioids

- Tolerance and physical dependence:
  - Tolerance: euphoria and respiratory depression (unlike ETOH!)
  - Abstinence Syndrome
- Rx acute toxicity
  - Naloxone; can —> full-blown withdrawal reaction!
    - OTC injection kits and nasal spray for accidental overdose
- Detoxification:
  - Methadone (agonist) substitution and taper - 10 days
  - Buprenorphine (agonist-antagonist)
  - Clonidine (a2 agonist) - for autonomic S&S (NVD)
- Long-term maintenance
  - Methadone - safe/clean alternative to street heroin
  - Buprenorphine - alleviates craving, low abuse potential
  - Naltrexone - blocks all effects. Needs motivated/detoxed addict
- Long-term sequelae: almost no direct adverse effects

#### Psychostimulants: cocaine

- Forms:
  - Cocaine hydrochloride snorted/IV
  - Freebase cocaine, aka crack smoked
- Subjective effects:
  - Euphoria —> dysphoria
  - Smoked/IV > snorted
- Acute toxicity
  - Agitation/dizzy/tremor/blurred vision —> hyperpyrexia/cardiac arrhythmias/stroke/angina/MI/seizures
  - paranoia/hallucinations (visual/antipsychotics/anti-HTN, etc)
- Chronic toxicity: nose and lung
- Pregnancy: crosses placenta but < toxicity than tobacco/ETOH
  - Low birth weight, behavioural/congenital abnormalities reported

- Tolerance: no? Withdrawal: dysphoria/craving/fatigue/insomnia
- Addiction Rx: psychotherapy, pharmacotherapy (vaccine disulfiram - also used with ETOH)

### Methamphetamine

- Forms/routes:
  - Crystalline powder
  - PO/intranasal/smoked/IV
- Patterns of use: declining?
- Subjective/behavioural effects: arousal, euphoria, increase talk, increase sense of strength/ mental capacity/confidence/ decreases sleep/eat / better orgasms
- Adverse effects:
  - Psychosis: delusions and visual hallucinations. Cognitive deficits
  - Cardiovascular: HTM/dysrhythmias/angina/stroke/renal failure
  - Weight loss
  - Pregnancy - multiple problems
- Tolerance/dependence/withdrawal
  - Yes/ psychological only: craving, fatigue, depression
- Treatment:
  - Psychotherapy, ?Drugs (bupropion/modafanil)
  - vaccine?

### Marjuana

- Most common illicit drug: 10 million Canadians use
- Source: Indian hemp plant. Cannabis sativa ->10% delta-9-tetrahydrocannabinol (THC)
- Activates endogenous brain cannabinoid receptors (binds > 100!!)
  - Endogenous ligand: neurotransmitter anandamide
- Dose-related behavioural effects:
  - Low: euphoria/relax/gaiety/enhanced sensory/time distortion
  - Moderate: decrease memory/performance/judgement/decision making/social-job function; temporal disintegration/depersonalization
  - High: hallucinations/delusions, persistent psychosis, amotivation
- 2nd most common: cannabidiol (CBD): non psychoactive
  - Opposite effects: THC impairs leaning, psychosis-like effects, increases anxiety. CBD enhances learning, antipsychotic/antianxiety
- Therapeutic use
  - Suppression of chemotherapy - induced N&V
  - Appetite stimulation in AIDS its
  - Glaucoma
  - Relief of neuropathic MS pain, also tremor/spasticity
  - ???Opioid withdrawal, PTSD, protect vs AD???
- Adverse effects:
  - Lower BP, higher HR, bronchoconstrict, asthma, lung CA?, hyperemesis
  - Fetal exposure —> widespread cognitive deficits
  - Impaired driving (ETOH additive!)
  - ‘Gateway drug?’
- Addictive?? Withdrawal syndrome:
  - Aggression, anxiety, insomnia/ decreased appetite, depressed/ abdominal pain, tremor, tremor, sweating, fever, chills



### MIXED RESPONSE TO MJ LEGALIZATION

- Some jubilant:
  - Globe: “Canadians with low-level cannabis convictions will soon be able to apply for a pardon . . . many adult users procure/enjoy a relatively safe narcotic that may have been part of their lives for years.
- Many clinicians/scientists less so:
  - Commercial interests sweeping science aside
  - Legalization not subject to Health Canada standard by for efficacy/safety
  - U.S. National Institute on Drug Abuse cautioned against popular notion - harmless pleasure, with access not to be regulated or considered illegal
  - Policy changes could trigger broad range of unintended consequences - profound and lasting implications for the health/social systems <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4827335/>





## DETECTION OF CANNABIS IN WORKPLACE

- Comparison with ETOH:
  - Appetite: decreases with ETOH/ increases with mj
  - Hostility and aggression: increases with ETOH/ decreases with mj
  - Loss of judgement: increases with ETOH
  - Toxic psychosis: increases with mj

### Psychedelic drugs

- Hallucinogens or psychotomimetics
- Psychedelic state: increases sensory awareness, harmonious world view, unity with cosmos, dream-like thoughts/ perceptions/feelings
- Lysergic Acid Diethylamide (LSD)
  - Toxicity: psychological (“bad-trips”): panic, depression, dissociation, prolonged psychosis, persisting visual hallucinations (“flashbacks”)
  - Along with other psychedelic drug therapeutic potential: addiction/depression/anxiety/OCD/ terminal CA?
- Mescaline, Psilocin, Psilocybin, DMT
  - Synthetic, like LSD, or from cactus/mushrooms
  - Similar to LSD, but less potent (LSD/mescaline 4,000/1)

### Dissociative drugs

- Originally developed as anesthetics: detach from reality
- Phencyclidine (PCP, angel dust)
  - Anesthetic use in humans withdrawn b/o delirium
  - Readily synthesized by amateur (“underground”) chemists
  - Exceedingly dangerous: high incidence of adverse effects
    - Low-mod dose: initial like ETOH —> excite/anxiety/disorient/confusion/altered body image/ hostility/bizarre behaviour
    - High dose: above exacerbated/psychosis. HTN/seizures/coma/hyperthermia/rhabdomyolysis (muscle tissue disintegration)
  - Management: isolation. Treat symptomatically. Antipsychotic drugs have limited effect.
- Ketamine
  - Commonly used as a ‘dissociative anesthetic’
  - Remarkably rapid antidepressants effect
  - Abused, very similar to PCP, perhaps not as extreme
    - Commonly used in eg ‘raves’

### Inhalants

- Anesthetics
  - Eg Nitrous oxide - dental anesthetic and aerosol propellant - and diethyl ether
  - Effects similar to ETOH
- Volatile nitrites (amyl/butyl/isobutyl):
  - Abused by homosexual men - relax anal sphincter - and by men in general: prolong/intensify orgasm (“poppers”)
  - Adverse effects: hypotension, methemoglobinemia —> hypoxia
- Organic solvents:
  - gasoline, lighter fluid, airplane glue, nail-polish remover, etc
  - High use by children and very poor
  - “bagging, huffing, sniffing”
  - Acute: ETOH-like/hallucination/disorient —> death from anoxia/resp depression/bradycardia

- Even though worker tests +ve for urine THC, doesn’t necessarily mean impairment at time of the accident: **marijuana remains in the system for quite some time** (eg use Friday night, +ve test Monday morning)
  - No consensus currently exists around length of time to wait between consuming cannabis and engaging in safety-sensitive work
  - Vastly different policies from employers across Canada: eg police officers in Ottawa & Vancouver face no restrictions on their off-work use if fit for duty when they show up for work; officers in Calgary have been banned outright from using cannabis, and Toronto officers face a 28-day abstinence period



<http://www.cannabixtechnologies.com/thc-breathalyzer.html>

- Chronic: liver/kidney/heart/brain/bone marrow damage

Anabolic steroids

- Testosterone, stanozolol, etc
- Used by athletes and body builders