

# \*The Impact of Prenatal Exposure to Marihuana and Cigarettes on Cognitive Development from Birth to Young Adulthood

- OR

- *Are there Joint and/or Sig-nificant Effects on the Prefrontal Lobes?*

Plus legal status of Marihuana

## \*Plant

Female is more potent especially the flowering or bud portion.

Both leaves and buds can be smoked.

Male plants do not produce buds - which is what most people are after these days. So they are weaker generally in THC but they will still get you stoned.



# \*The plant

- Cannabis preparations are usually obtained from the female *Cannabis sativa* plant.
- The plant contains at least 750 chemicals and some 104 different cannabinoids
- The principal cannabinoids in the cannabis plant include delta-9-tetrahydrocannabinol (THC), cannabidiol (CBD), and cannabinol (CBN).
- THC is the primary psychoactive compound, with CBD, a non-psychoactive compound, ranking as the second cannabinoid.
- Generally, THC is found at higher concentrations than CBD

# The plant's chemistry\*

- . The cannabinoid that is primarily responsible for the psychoactive effects sought by cannabis users is THC
- THC is found in a resin that covers the flowering tops and upper leaves of the female plant.
- Most of the other cannabinoids are either inactive or only weakly active, although some, such as CBD, may modify the psychoactive effects of THC
- The most common cannabis preparations are marijuana, hashish and hash oil.
- Marijuana is an herbal form of cannabis prepared from the dried flowering tops and leaves of the plant.
- Its potency depends on the growing conditions, the genetic characteristics of the plant, the ratio of THC to other cannabinoids, and the part of the plant that is used.
- Cannabis plants may be grown to maximize their THC production by the “sinsemilla” method by which only female plants are grown together

# What happens when you smoke up

- When a person smokes up a number of chemicals enter the brain including tetrahydrocannabinol (THC) thought to be the major psychoactive ingredient in marijuana.
- THC latches on to a protein in the brain called cannabinoid receptor type 1, or CB1.
- These receptors are sprinkled liberally throughout the brain but in rather specific regions.

# Sites of Cannabis Receptors\*

- CB1 receptor in parts of the brain to do with
  - movement (basal ganglia; cerebellum)
  - Learning, memory (hippocampus)
  - Higher cognitive functions (cerebral cortex especially frontal lobes)
  - Reward Center (Nucleus accumbens)
  - Emotional responses (amygdala)
- CB2 receptors outside the brain to do with
  - immune system (spleen)



OPPS

## Observations in OPPS Neonates and Infants born to Cigarette smokers\*

### Cigarette Neonatal Effects

- ★ **State Regulation**
  - ◆ Increased tremors (at 4 days)
- ★ **CNS 'excitation'**
  - ◆ hypertonicity (at 9 & 30 days)
  - ◆ heightened reflexes (at 9 & 30 days)
- ★ **Behaviour**
  - ◆ Auditory Effects
    - \* decreased responsiveness
    - \* decreased rate of habituation
- ★ **Growth**
  - ◆ reduced weight & head circumference
  - ◆ catch up by 3 years
- ★ **Nursing**
  - ◆ less likely to breast feed
  - ◆ wean sooner



OPPS

## Summary of Cigarette Findings

*0-4 years of age\**

- Newborn - ↓ auditory responsiveness & habituation; & motoric reflexes ↑ tremors
- 1 year - ↓ MDI (96 vrs 110) & verbal cluster.
- 2 years - ↓ MDI (106 vrs 119) & Reynell Expressive & Comprehensive. Significance lost when confounds controlled.
- 3 years - ↓ GCI & language after confounds controlled.
- 4 years - ↓ GCI & language after confounds controlled

# Prenatal Marijuana

## Summary Up To Preschool\*

- Course of pregnancy, fetal and postnatal growth and behavior are relatively unaffected during neonatal and toddler stages
- Starting at approximately 3 years of age converging findings (from the OPPS and two other cohorts) suggest that
  - 1/overall IQ is not affected but
  - 2/abstract/visual reasoning subscales on IQ tests are negatively impacted
  - 3/ as are facets of attention.
- Together, this suggests an impact on aspects of Executive Function - this will be elaborated in a moment.



# Overall Summary\*

- There appears to be a double-disassociation between the impact of the two drugs.
- Prenatal cigarettes have shown a continuity over the life-span with an impact on a number of domains contributing to overall IQ, verbal/auditory functioning and impulsivity.
- Prenatal marihuana impacts upon particular aspects of executive functioning - complex visuoperceptual problem solving and sustained attention.



# Interpretation of Cigarette Findings-13-16yr olds\*

- IQ deficits consistent with earlier findings
- Vulnerability of verbal memory also consistent with findings at younger ages
- Why achievement tests not significantly related while IQ is after statistical adjustment?
  - Possibly reflecting formal learning versus application of learning in new and different situations. Parental Education was major confounder



# Marihuana Findings in 13-16 yr olds\*

- Like in this & other cohorts at younger ages, IQ not related to prenatal marihuana exposure.
- Complex visual behaviour impacted (Peabody spelling versus WRAT spelling); longer latency [but not increased errors] on abstract design).
- In a complex mirror motor tracing task where both carefulness and speed emphasized, prenatally heavily exposed offspring did not differ from controls in precision but were significantly slower.
- Longer latencies (but not increased errors) also noted in visual search tasks in other cohorts.

# Adolescence & Use\*

- Thus using marijuana— the fancy term is Exogenous cannabis- during adolescence affects the function of the endocannabinoids in their role of neurogenesis at a critical stage of brain development.
- The teenage brain is still growing and refining its neural connections — as we said -a process that's regulated in part by the brain's natural endocannabinoid system.

# What is Federally legal as of October 17, 2018\*

- Subject to provincial or territorial restrictions, adults who are 18 years of age or older are legally able to:
- possess up to 30 grams (one ounce) of legal cannabis, dried or equivalent in non-dried form in public

# Objectives of the Marihuana legislation in Canada\*

- The Government of Canada believes that the new regime for legal access to marijuana must achieve the following objectives:
- Protect young Canadians by keeping marijuana out of the hands of children and youth.
- Keep profits out of the hands of criminals, particularly organized crime.
- Reduce the burdens on police and the justice system associated with simple possession of marijuana offences.
- Prevent Canadians from entering the criminal justice system and receiving criminal records for simple marijuana possession offences.

# Objectives of the Marihuana legislation\*

- When considering how best to minimize harms associated with marijuana use, it is helpful to consider the two different approaches taken in controlling tobacco and alcohol use.
- In the case of tobacco, the overall objective is to reduce or even eliminate use for all Canadians.
- In contrast, the overall objective with respect to alcohol is to promote responsible use amongst adults, and to prohibit use amongst youth.
- These objectives are achieved largely through actions such as setting a minimum age for purchase, educational tools aimed at promoting responsible use, and taxation measures.