Sampling strategy and analysis of cannabis, alcohol and nicotine biomarkers in pregnant women pre- and post-legalization in Alberta, Canada

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Background

Research has demonstrated that co-exposure to cannabinoids and alcohol increases the risk of birth defects. Recreational cannabis use was legalized in Canada on October 17th, 2018. ACFT is conducting a biomonitoring survey to measure biomarkers of cannabis, alcohol and nicotine in the serum of pregnant women in Alberta pre/post-legalization. The data will indicate the degree of use and any change of use of these substances in this population. The challenges for the survey were to collect large numbers of valid samples to ensure statistical significance and to establish sensitive and cost effective analytical methods suitable for the survey.

Method

Residual serum samples collected pre-legalization and 6 months after legalization in three age groups (18-25, 26-30, 31+) from seven health regions in Alberta (Calgary, Edmonton, Fort McMurray, Grande Prairie, Lethbridge, Medicine Hat and Red Deer) were identified. The blood samples were spun down and pools created: 12 serum samples were allocated to each pool, yielding 15 pools/age group/region. Three liquid chromatography tandem mass spectrometry (LC-MS/MS) methods will be used for analysis.

Results

To obtain statistically powerful data, a minimum of 15 pools/age group/region was required. Each age group per region required a minimum of 180 samples. A total of 7,560 (3,780 pre-legalisation, 3,780 post-legalisation) maternal blood samples were needed. It was impossible to collect pre-legalization samples after legalization. Furthermore, it would have been time-consuming, labor-intensive and costly to recruit this number of pregnant women from different age groups and geographic locations. We proposed to utilize leftover samples that would otherwise be discarded from the Provincial Public Health Laboratory. Thus far we have prepared 315 pools (3780 samples) from pre-legalization. Three LC-MS/MS methods were developed and validated (Table1).

Table 1: Detection/Quantification Limits of the LC-MS/MS Methods for Biomarker Analysis

Method	Drugs	Biomarker	LOD/LOQ(ng/mL)
1	Cannabis	THC-COOH	1/1
		THC-COOH-glucuronide	1/1
2	Alcohol	Ethyl glucuronide	10/10
		Ethyl sulfate	1/1
3	Nicotine	Cotinine	0.1/0.1

Conclusion

Using leftover samples for biomonitoring studies offers great advantages, including reduced cost and simplification of sample procurement. The biomarkers will highlight any differences in the use of cannabis, alcohol, and nicotine pre- and post-legalization of cannabis.

Key words: Biomonitoring, Sampling, Biomarkers, Cannabis legalization