

Multi-directional Optimization of Hair Drug Testing Platform: Rehabilitation Services Support for Local communities

Executive Summary

Background & Objectives

Drug abuse has been the social, mental and physical health problems during the past decades. In October 2007, a high level inter-departmental task force (the Task Force) led by the Secretary for Justice was formed and is responsible for making recommendations on how to tackle the youth drug abuse problem. According to the Task Force, drug testing may serve the objectives of monitoring and deterrence, early identification, preventing drug abuse and crime investigation and prevention. Among all the specimens, hair provides a longer detection window up. This enables retrospective investigation of the past drug consumption. Hair drug testing has irreplaceable role in rehabilitation programs. Hair drug test provides a continuous record of drug consumption across the rehabilitation programs which not only provides important information for program evaluation, but also encourage drug abusers and their families that the rehabilitation program is working well for them.

Our laboratory, Laboratory for Molecular Testing of HKUST, have developed HPLC-MS/MS technology in the detection of drug residues in the hair. This method is more sensitive than the existing hair drug detection methods. The method satisfies the requirement of ISO17025 accreditation. Our laboratory has been cooperating with various NGOs in the project, providing them with free drug testing services on hair samples. With this experience, we now understand the utmost needs of NGOs and rehabilitation units, and are able to optimize the drug testing platform to best suit the society. Hence, we believe our reliable platform can well fit into the drug control and rehabilitation schemes in place in Hong Kong.

Objectives:

1. To optimize the existing drug testing platform;
2. To include the most updated drug residues in the testing platform;
3. To provide free tests to schools and NGOs;
4. To provide tailor-made support to schools and NGOs;
5. To evaluate the cut-off value of ketamine in hair drug tests.

Methods

To optimize the existing drug testing platform, the amount of hair specimen has been reduced to 5mg (about 20 strands of hair). Our laboratory has been accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) under the scope of abuse drugs in human hair, covering 16 analytes of 10 commonly abused drugs and their metabolites (cocaine, norcocaine, benzoylecgonine, cocaethylene, morphine, 6-Acetylmorphine, codeine, methadone, amphetamine, methamphetamine, MDMA, MDEA, MDA, phencyclidine, ketamine and norketamine). With the accredited hair-drug testing service, we have been serving for 14 NGOs and rehabilitation units and issued HOKLAS-endorsed test reports during the project. We have collected the information including gender, age, types of drug addicted, frequency and dosage of consumption by providing questionnaires to the subjects in order to understand their drug use behavior. The first 3-cm from hair root of hair samples (approximately corresponding to 3-month history) was analyzed. Hair test reports were issued to the coordinator of the NGO or rehabilitation units for their record.

In order to cover the most updated drug residues in our platform, the detection methods for another 16 abused therapeutic and new designer drugs have been investigated. Three of them are under the process of accreditation in the scope extension. About the tailor-made support to our users, we have provided urgent hair test, consultation service and tailor-made service (segmental analysis for past drug consumption).

Results

Our hair drug test service platform provided sensitive, accurate, reliable accredited services for rehabilitation units. The operation workflow of our test has been optimized and standardized for routine service. About 5mg of hair (approximately 20 strands) was sufficient for revealing the drug use history. Over 1700 hair samples have been analysis from Jan 2012 to Mar 2016. Among the 16 analytes of 10 commonly abused drugs and their metabolites, ketamine, cocaine and methamphetamine were the most frequent detected drugs.

In May 2014, our laboratory (Laboratory for Molecular Testing, The Hong Kong University of Science and Technology) has obtained HOKLAS accreditation of ISO17025 on testing drug of abuse in human hair. A total of 12198 free tests have been performed and 651 HOKLAS-endorsed test reports have been issued. Apart from the accredited test service, the cut-off value for hair ketamine has been proposed and published in peer-review journal. A cut-off level at 400 pg/mg is proposed for positive identification of ketamine users.

Conclusion

With the support of Beat Drug Fund Association, we have optimized our hair drug test service platform and provided free accredited hair drug test services for the rehabilitation units. We have built the communication and logistics in the drug test service to our clients with satisfactory results. Our proposed cut-off hair ketamine value could act as a useful reference value with international acceptability.

頭髮驗毒平台的多向發展：支援本地社福機構及復康計劃

摘要

背景及目的

青少年吸毒問題是過去數十年的社會問題，政府於 2007 年跨部門成立青少年毒品問題專責小組，專責打擊青少年吸毒問題，其中一項目標是研究新方法打擊吸毒問題，在適當情況下就推行有關措施和計劃。毒品測試是及早辨識和作出介入的最有效方法，在戒毒治療及康復策略中的主要策略。由於頭髮驗毒可檢驗時段較長，可評估吸毒者的吸毒歷史，有助社工施行適合的戒毒治療計劃。頭髮驗毒可作為香港目前常用的尿液驗毒等方法以外的另一選擇。

香港科技大學(分子檢測實驗室)已成功以液相色譜-質譜技術研發頭髮驗毒方法，並獲香港認可處認可，符合國際 ISO 17025 標準。頭髮驗毒技術靈敏度較傳統一般頭髮驗毒技術方法高，可追溯吸毒者過去至少三個月的吸毒歷史，包括毒品種類及吸毒時間。實驗室已為社福及復康機構提供頭髮驗毒服務，為青少年和家長提供準確的數據，並配合戒毒康復治療措施，證明戒毒計劃的有效性。

目標:

1. 優化現有的頭髮驗毒平台；
2. 於現時平台檢測更多常見毒品；
3. 為學校及非牟利組織提供免費頭髮驗毒服務；
4. 為學校及非牟利組織提供度身支援的頭髮驗毒服務；
5. 訂定利用頭髮檢測氯胺酮的截取值。

方法

利用認可的液相色譜-質譜技術的頭髮驗毒方法，為 14 個非政府組織及復康機構提供免費頭髮驗毒服務，檢驗 10 種常見毒品及其代謝物，包括可卡因(Cocaine)及其代謝物(去甲可卡因 Norcocaine，苯甲酰愛康寧 Benzoylcegonine，乙基苯酰愛康寧 Cocaethylene)、嗎啡(Morphine)、海洛因代謝物 6-乙酰基嗎啡(6-Acetylmorphine)、可待因(Codeine)、美沙酮(Methadone)、苯丙胺(Amphetamine)、甲基苯丙胺(Methamphetamine)、搖頭丸(二亞甲基雙氧安非他明 MDMA 及其代謝物亞甲基雙氧乙基安非他命 MDEA，亞甲基雙氧安非他命 MDA)、苯環己哌啶(Phencyclidine)以及氯胺酮(Ketamine)及其代謝物(去甲氯胺酮 Norketamine)。服務以問卷形式收集吸毒者的基本資料以及吸毒習慣(尤其對氯胺酮)，檢驗結果會用作吸毒習慣及頭髮氯胺酮截取值的統計分析。頭髮驗毒服務同時提供特快檢測、諮詢及樣本分段檢測服務。

結果

香港科技大學的驗毒技術可提供可靠、有效的頭髮驗毒服務。優化後的頭髮樣本數量只需約 5 毫克(約 20 條頭髮)。由 2012 年 1 月至 2016 年 3 月已為 14 間有需要的復康機構提供超過 1700 份頭髮樣本檢測報告，檢驗 10 種常見毒品及其代謝物(共 16 種檢測物)。由實驗室於 2014 年 5 月取得認可資格後至 2016 年 3 月，提供 651 份認可的頭髮檢測報告，總檢驗檢測物項目合共 12198 項。訂定頭髮氯胺酮截取值方面，從分析 2012 至 2014 年的 997 個氯胺酮陽性樣本中，頭髮氯胺酮截取值定為 400 皮克每毫克(pg/mg)。

結論

由禁毒基金撥款贊助香港科技大學的頭髮驗毒服務平台項目，多年來支援本地社福機構及復康計劃，香港科技大學分子檢測實驗室已優化頭髮驗毒服務平台，可為復康機構提供認可的頭髮驗毒服務。我們已與復康機構及業界建立良好的溝通及服務渠道，並取得滿意成果。此外，我們利用頭髮檢測氯胺酮的結果，成功訂定頭髮氯胺酮的截取值，並已發表學術文章，期望此截取值可作為有用的參考值及得到國際上的認同。