PROJECT DETAILS

Project Title

Drugs in Oral Fluid and Implications for Near Subject Testing

Project Summary

The project aims to enhance knowledge and understanding relating to the uptake, storage and subsequent release of drugs from mouth tissue via salivary excretion. The study of drugs in saliva has a huge impact in the field of forensic toxicology, workplace drug testing and also in medicine where saliva is being investigated for use as a matrix for near subject testing. Traditionally urine has been the most widely used matrix for drug screening however urine has a number of disadvantages in that drugs and their metabolites in urine are perceived as having been eliminated from the body and measurement of drugs in urine has little interpretative value. Urine tests are none interpretable with respect to their toxic or therapeutic effects or on the influence that they may exert on behaviour or performance such as in driving. Further, urine is not a convenient specimen for collection in the workplace, at the roadside or in a hospital casualty department.

Advances in technology have increased the sensitivity and portability of drug screening devices such that near body drug tests are being developed utilising saliva / oral fluid as the test matrix as this is easy and non-invasive to collect. As a consequence, saliva drug testing has gained in popularity over urine testing however our understanding about the physiological and biochemical mechanisms governing drug secretion via saliva is poorly understood. The original concept of drug excretion via saliva was based on the theory that drugs passed into saliva from the circulating blood to form a plasma : saliva ratio in relation to their pKa value as defined by the Henderson Hasselbalch equation. Whilst this explanation may be applicable to drugs with a low volume of distribution (Vd<1) Osselton and Robinson (2002) observed that cocaine and opioids are present in saliva at significantly higher concentrations than those that may be explained by the pKa properties of the drug alone. Recent work by Reichardt et al (2-4) has demonstrated that cocaine, heroin and their metabolic breakdown products can accumulate in porcine tongue and cheek tissue to form depots from which they may be subsequently released over time.

The project aims to study the release of drugs from oral tissues and explore how this might be influenced by a range of products sold via the internet to adversely affect the drug testing process.

The intended outcomes of the project will be:

a) enhancement of knowledge relating to the mechanisms of drug entry and release from oral tissues in order to explain the phenomenon of drug depots.

b) to provide information relating to the reliability or otherwise of products claimed to influence the drug testing process.

c) provision of knowledge that will have an impact on the Criminal Justice System in relation to roadside drug testing.

d) a series of publications in the scientific / medical literature

This is particularly timely in relation to the UK Government's intention to introduce roadside drug screening and subsequently evidential roadside drug testing using saliva / oral fluid.

Academic Impact

The concept of saliva / oral fluid drug testing has been based on the premise that drug concentrations in saliva reflect those circulating in the blood of the donor and may therefore be used to provide an indication of the drug’s
effects on the donor. Within the past few years the concentrations of drugs that are either smoked or taken by nasal insufflation e.g. heroin and cocaine have been demonstrated to be present in oral fluid at concentrations that would be potentially fatal if they originated from the circulating blood. This lead to the concept that drugs may be incorporated into mouth tissues to form depots from which they may be subsequently released.

The project proposes to increase scientific knowledge concerning the mechanisms and kinetics of drug release from oral tissue to enhance our understanding of the chemical and physiological processes involved. Current knowledge regarding drug uptake and release from oral tissue depots is scant and the mechanisms for this are unknown. Work undertaken at Bournemouth University has demonstrated that drugs can be incorporated into mouth tissue following exposure to heroin and “crack” cocaine smoke and also solutions of these drugs. Work undertaken to date has generated significant interest at scientific meetings and has been presented as peer reviewed presentations at a number of international conferences and is currently being written up for publication. The proposed PhD will build upon the work already undertaken at Bournemouth and will lead to peer reviewed publications in the scientific and medical literature.

Societal Impact

Road safety and traffic accidents related to drug use are a priority concern of the UK Government and in 2012 an Expert Advisory panel was commissioned by the government to make recommendations in relation to changes in the Road Traffic Act 1988 relating to roadside drug testing employing saliva/oral fluid. On 27th March 2014 the Home Office announced that the recommendations of the Expert Committee had been accepted and would be incorporated into traffic law such that “per se” limits would be prescribed for 8 illicit drugs and 8 prescription drugs. The government also announced its intention to introduce roadside drug screening using saliva/oral fluid as the test matrix and an intention to introduce evidential saliva testing as soon as possible and after confidence could be placed in the results obtained. Evidential testing cannot however be implemented until the concept of drug release into saliva is fully understood and can be defended in a court of law as the introduction of new testing will inevitably lead to legal challenges. A project that will contribute to our understanding of processes involved with the release of drugs in oral fluid therefore has very significant societal impact. Bournemouth University is currently amongst the world leaders in this area.

Training Opportunities

The student will work under the direction of internationally recognised scientists in the field of Oral Fluid Drug Testing and gain experience in the use of a range of analytical methodologies. The student will also have an opportunity of working with scientists in the UK’s leading drug testing laboratory, Allere, Abingdon, Oxford. This topic is one of the key forensic problems currently under investigation and should open up a range of career opportunities for the student in forensic and pharmaceutical science. The student will also develop instrumental and analytical skills, writing skills (Courses and writing journal articles), and experience in research methods.

SUPERVISORY TEAM & RESEARCH ENVIRONMENT

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<th>First supervisor</th>
<th>Professor M D Osselton</th>
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<td>Additional supervisors</td>
<td>Dene Baldwin - Head of R&amp;D, Alere Toxicology, Abingdon; Dr Sulaf Assi, Bournemouth University.</td>
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Reichardt, E.M., Baldwin, D and Osselton, M.D., 2013, Histochemical Staining as a Method for Demonstrating the Presence of Heroin and Cocaine in Oral Fluid, Proc UKIAFT, Dublin


INFORMAL ENQUIRIES

To discuss this opportunity further, please contact either Professor David Osselton via email: dosselton@bournemouth.ac.uk

ELIGIBILITY CRITERIA

All Candidates must satisfy the University’s minimum doctoral entry criteria for studentships of an honours degree at Upper Second Class (2:1) and/or an appropriate Masters degree. An IELTS (Academic) score of 6.5 minimum (or equivalent) is essential for candidates for whom English is not their first language.

HOW TO APPLY

Please complete the BU Research Degree Application 2014 and submit it via email to the School Research Administrator – Louise Pearson - scitechresearch@bournemouth.ac.uk by Friday 13 June 2014. Further information on the application process can be found at www.bournemouth.ac.uk/phd2014