

Welcome

to the first newsletter from (ROAR) Forensics. The aim is to provide a regular update on the area of toxicology reflected through the work of the company. This will be enhanced by articles and interviews to hopefully present an interesting insight into the discipline.

Open Day
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Interview with Dr Roumen Sedefov EMCDDA



OpenDay

Although first opening for business on 2nd January 2008, the laboratory received a formal opening on 19th September. Months in the planning, the event was attended by HM Coroners, HM Coroner's Officers, pathologists, university lecturers, councillors, business leaders, manufacturers, forensic service providers, scientists, the press and other invited dignitaries. Attendees met the staff and management of (ROAR) Forensics and received a tour of the extensive laboratory and office facilities.



Director, Dr Simon Elliott, gave a presentation of the setting-up process, features of Great Malvern itself, the Malvern Hills and Science Park, in addition to an overview of the company service and future developments.

(ROAR) Forensics is a trading name resulting from a collaboration between Forensics Ltd and an existing nanotechnology company, ROAR Particles Ltd. Our principles of service are based on our over-riding aim to provide our customers with the best possible service. This has been achieved based on many years of clinical and forensic toxicology knowledge and

experience, the latest analytical techniques and equipment, efficient laboratory methods and procedures to enable rapid turnaround of casework and charges significantly lower than those currently listed as payable by HM Coroner.

Also, in order to enhance and expand the service, a number of future developments were

announced including this newsletter, offering a training course in forensic toxicology, producing a handbook of toxicology, implementing an innovative case management system and exploring the potential use of pharmacogenomics.

The Laboratory and Science Park



Following a focused search for a site, (ROAR) Forensics' brand-new forensic toxicology laboratory opened at Malvern Hills Science Park, Worcestershire in January 2008.

The science park is situated on a previous Ministry of Defence site and support of technology-based companies is their primary concern. Overall, there is little that separates the forensic laboratory from other scientific laboratories but when planning the laboratory a number of pre-requisites were borne in mind; notably security, working environment, flexibility for expansion and ability to accommodate varying types of equipment with their own specific requirements. It was clear that the science park provided these and in the case of Malvern Hills, also had a particularly attractive location which is of significant benefit as a working environment and when receiving regular visitors.

As the building was a newly constructed addition to the existing phases of the science park, we were afforded the opportunity of a blank canvas. The laboratory was designed around an open-plan system to utilise space efficiently for equipment and staff use in-line with the utilities present. Additional consideration was made to the ever

increasing reliance on a robust I.T. and communication network, with computer and data security a particular requirement.

Specialised equipment is used for drug analysis and a wide-range of instrumentation is required. Analysis is divided into two areas, qualitative (determining presence or absence and identification) and quantitative (measurement). For confidence in the result, complementary techniques are used such as gas chromatography, liquid chromatography, immunoassay and spectrophotometry. Following extraction of prospective compounds from the biological matrix (usually using chemical solvents and reagents), chromatography is a method of separating the components to aid identification and utilises detection methods such as UV, flame-ionisation or mass-spectrometry. For identification, although some structural information can be obtained, particularly using mass-spectrometry, it is more common to compare analytical characteristics of case data with that of in-house or commercially available analytical libraries. Despite advances in technology, identification can be difficult in some situations, typically due to the marketing of newer drugs but absence of any available reference material for laboratories. This has a knock-on



effect for quantitation and lack of reference standards for concentration calibration curves can hinder measurement. These processes are often presented in a remarkably assured way in the many forensic TV programmes, with analytical results provided rapidly and unequivocally. Unfortunately this is not always the case or is possible and information regarding an individual's drug or medical history is a necessity.

As for many scientific disciplines and businesses, quality assurance is an important part of forensics, particularly with the obvious degree of scrutiny due to the potential implications of the work. Confidence in the methodologies and the results can also be achieved by introducing an internal quality system which is enhanced by participation in external quality assurance schemes and where necessary, accreditation of the laboratory procedures.

Further aspects of setting-up the laboratory can be read in the September 2008 edition of the UK Science Park Association Journal (www.ukspa.org.uk).



Future Developments

- **Newsletter**

To improve communication and inform customers of relevant aspects of toxicology

- **Training course in forensic toxicology**

To provide theory and experience based learning for interested professionals such as Pathologists, HM Coroner's Officers, Police Officers, HM Coroners and Forensic Submission Officers.

- **Handbook of toxicology**

To support the training course and provide clear and descriptive quick reference material for customers for drugs and issues commonly encountered within toxicology.

- **Innovative case management system**

A recent European funded project providing a bespoke internal software system to enable us to deal rapidly with case enquiries and support sample submission, chain of custody and Human Tissue procedures.

- **Pharmacogenomics**

An individual's genetic profile can affect drug metabolism, resulting in "slow" and "fast" metabolisers for certain drugs. This can have an impact on the interpretation of drug concentrations in blood.





The detection of cutting agents in heroin and cocaine deaths

For many years, drug workers, drug users and forensic scientists have been aware of the use of “cutting agents” or excipients to bulk out the drug material sold to users.

This typically occurs during the supply chain in order to increase the weight and reduce drug purity but may happen at source with adulterants and impurities as a result of manufacture. Sugars and various non-medical powders aside, there are a number of pharmaceutical compounds regularly found in abused drugs such as cocaine and illicit heroin. They may be used as they possess the same visible or chemical characteristics to the illicit drugs (e.g. white powder).

However, to some extent the nature of cutting agents has changed and rather than purely being a bulking/diluting agent, some compounds are added that may produce effects sought by the user but may be easier and cheaper to obtain than the main drug itself (e.g. amphetamine as an alternative stimulant to cocaine). Consequently, cutting agents or substitution drugs may be detected in post-mortem samples in deaths particularly involving heroin and cocaine. Without analysis of the drug material itself, it is not possible

to determine exactly which compounds detected are present as cutting agents.

Pharmaceuticals identified in seized heroin and cocaine include;

Cocaine

Levamisole, lignocaine, benzocaine, phenacetin, atropine, diltiazem, paracetamol, caffeine

Heroin

Barbiturates (e.g. phenobarbital), paracetamol, alprazolam, caffeine, diazepam

As part of the comprehensive analysis routinely performed, (ROAR) Forensics have found many of these in post-mortem samples in deaths involving heroin and/or cocaine. In the first instance, their presence could be due to the prescription, use or administration of these drugs. This is very dependent on knowledge of the drug and medical history of the deceased. Once this has been excluded, their detection can support the use of heroin and cocaine, particularly as more than one of these compounds are invariably present (e.g. levamisole, lignocaine and diltiazem in cocaine) – such combinations would unlikely to be prescribed. Furthermore, depending on the nature and amount of drugs present, their presence can be toxicologically relevant. For instance, alprazolam

is a potent benzodiazepine and even at therapeutic dosage could exacerbate the respiratory depressant effects of the heroin taken at the same time.

Additional compounds detected specifically with heroin, include papaverine, codeine and noscapine. These are present as components of the opium poppy from which the morphine used to make heroin (diacetylmorphine) is derived. As medical heroin (diamorphine) is produced from purified morphine, these compounds are not present and are therefore associated with illicit or “street” heroin only, which can assist in the interpretative context of the toxicology findings.

The ability to detect and interpret the presence of these and the cutting agents described above for heroin and cocaine cases can provide useful data in determining the role of these drugs in the circumstances and cause of death.





Interview with Dr Roumen Sedefov EMCDDA (www.emcdda.europa.eu)

When did the EMCDDA originate and what is its function?

Just over a decade ago, Europe's capacity for monitoring its drug problem was extremely limited. National approaches to the topic varied greatly and there was a lack of reliable and comparable information at European level concerning drugs, drug addiction and their consequences. In other words, it was impossible to talk with confidence about patterns and trends in drug use across the EU. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) was founded in 1993 to change that.

Inaugurated in Lisbon in 1995, the EMCDDA is the hub of drug-related information in Europe. It exists to provide the EU and its Member States with a factual overview of European drug problems and a common information framework to support the drugs debate. The EMCDDA consists of a 90-strong team of specialists representing some 20 nationalities. EMCDDA offers policy-makers the scientific evidence base they need for drawing up drug laws and strategies and helps professionals and researchers pinpoint best practice and new areas for analysis.

How does it link in with other international and national drug and health organisations?

The EMCDDA has numerous working partners throughout Europe. These include technical bodies from all Member States which furnish the agency with the national drugs pictures (called National Focal Points), as well as political/policy bodies which use EMCDDA information when taking decisions on drug-related issues. In addition to cooperating with partners at national level, the EMCDDA also collaborates with its peers worldwide (UNODC, WHO, WCO, Interpol), as well as with key European and international organisations working in the drugs field - the European Commission, Europol, European Medicines Agency (EMA), European Centre for disease control (ECDC), the Pompidou Group of the Council of Europe, etc).

What have been some of the EMCDDA's greatest achievements?

Improving the comparability of drug information in the EU is central to the agency's work. To achieve this, the EMCDDA coordinates and relies on a network of some 30 national monitoring centres (Reitox network) to gather and analyse country data according to common data-collection standards and tools. The results of this national monitoring process are fed to the

Lisbon centre for analysis and are ultimately released in the Annual report on the state of the drugs problem in Europe — one of its many outputs.

While the EMCDDA monitors the drug situation today, it is ever vigilant for new drugs and emerging trends that may pose a threat to Europe's citizens tomorrow. With the production of cocaine and heroin at historically high levels and with over 7,000 Europeans dying every year of drug overdoses, constant monitoring is imperative.

What is your background and when did you start at the EMCDDA?

I started work at the EMCDDA in the beginning of 2001. My original training is in substance misuse and psychiatry of addictions, but in the years immediately before joining the EMCDDA, I have been involved in various European Commission international assistance projects in the field of drug information systems, drug demand reduction, etc.

What is your role within the organisation?

I am currently responsible for the EMCDDA's action on new drugs - a role that involves primarily the implementation of the early warning system (EWS) and risk assessment of new psychoactive substances (i.e. substances which are not subject to international control). This is a multi-disciplinary, multi-

agency exercise which involves rapid information collection and appraisal of information/data originating from various sources such as forensic and toxicological establishments, law enforcement, treatment and care institutions, users, media, internet, etc.

What are the current trends with new psychoactives?

In recent years, the Member States have reported on average about 15 new substances per year via the EWS. Currently, the list of the substances monitored by the early warning system consists of more than 90 new compounds. They include synthetic substances from better known chemical groups such as phenethylamines (e.g. amphetamine-derivatives), tryptamines (e.g. DMT) and piperazines (e.g. BZP and TFMP), as well as substances with a less common chemical make-up. The group is almost equally divided between substances that have pronounced hallucinogenic effects and those that exhibit predominantly stimulant properties. Since 2005, the new psychoactive substances reported via the EWS have diversified to include medicinal products, naturally-occurring substances and plants (e.g. *Salvia divinorum*, various Spice products etc.)

Where is the National Focal Point for the UK?

The UK National Focal Point is

located at the Department of Health in London.

How and in what circumstances can information be provided to the National Focal Point and the EMCDDA?

In order to achieve high level of comparability and reliability, the EMCDDA has strict methodological requirement which guide the data collection at national level, but the actual way the information collection is organised in each country may vary. Therefore, the proper and the best way to submit information to the EMCDDA is through the UK National Focal Point.

Are there any particular topics at the moment that the EMCDDA are requiring information on?

Currently, we are monitoring carefully the developing story of the so-called 'Spice' products - a mixture (blend) reportedly containing various plant/herbal ingredients. Spice products can be purchased on the internet from online shops, but also there appears to be a number of Spice products currently available (or have been available) through various 'smart', 'head', 'fun' etc shops in some EU Member States (Austria, Germany, Poland, Hungary and Slovenia, Netherlands and the UK). When smoked, Spice products have been reported by some users to have

effects similar to those produced by cannabis. In December, the Austrian National Focal Point informed us about the identification of the new psychoactive substance JWH-018 (Naphthalen-1-yl-(1-pentylindol-3-yl)methanon) – a cannabinoid receptor agonist. The compound has been identified in at least three Spice products (gold, silver and diamond) both in Germany and in Austria. But currently, it is not known if JWH-018 is present in all Spice products (or batches of the same product). Any information on the use, effects or identification of spice products or any synthetic cannabinoids would be highly appreciated.



The prevalence of drugs and alcohol found in road traffic fatalities:

A comparative study of victims – alcohol and cannabis most likely to be involved in road traffic deaths

The possible role of drugs and particularly alcohol in road traffic incidents has been looked at for many years. Many different types of research have been performed but with particular emphasis on the possible impairment of the driver. However, demonstration of specific effects and/or impairment is very difficult due to drug nature and inter-individual differences. Little research has been done to assess the types of drugs found in victims other than drivers.

Thanks to the support of HM Coroners, Dr Elliott recently produced a paper describing a comparative study of drug and alcohol findings in differing victim groups (drivers of cars, vans or lorries, car passengers, motorcyclists, motorcycle passengers, cyclists and pedestrians) in cases he investigated between 2000-2006. Under the direction of HM Coroner, post-mortem blood and urine specimens submitted were analysed for a wide range of drugs as well as alcohol. The results of 1047 cases indicated 54% of all victims were positive for drugs and/or alcohol, with the highest percentage of positive findings occurring in pedestrians (63%). Males between the age of 17-24 were most likely to be involved in a road traffic accident, whether being in control of a vehicle (driver) or involved indirectly (car passenger, pedestrian, motorcycle passenger).

A wide range of drugs were detected (e.g. drugs of abuse, anti-convulsants, anti-histamines, anti-inflammatories, anti-psychotics, cardiac drugs and over-the-counter products), but alcohol and cannabis were the most frequent substances found across the victim groups. When detected, alcohol was commonly above the legal driving limit in blood and urine (>63% in those in control and >60% not in control). Overall, the presence of drugs and/or alcohol was of similar frequency in those victims in control (55% of driver, 48% of motorcyclists, 33% of cyclists) and not in control of a vehicle (52% of car passengers, 63% of pedestrians). This degree of frequency strongly implicates the involvement of drugs and alcohol in road traffic incidents and infers an effect on driving ability and individual impairment.

The study has just been published in the peer-reviewed journal, *Science and Justice*, the official journal of the Forensic Science Society. *Publication ref: Science and Justice, Vol.49 pg 19-23. 2009.*

Toxicology Training Course

One day lecture and workshop-based training at Malvern Hills Science Park.

Cost £295 (+VAT) per person, £500 (+VAT) for two people, including lunch and training material. Please contact enquiries@roarforensics.com or telephone **01684 585282** for further information and to book a place.

Monday 20th July 2009

Monday 17th August 2009

Monday 28th September 2009

Additional dates will be added following demand.



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