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The spectrum of expert reports on clinical biochemical toxicology and medicine from an Irish practice

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Abstract

The compounds which generated an expert opinion report in the area of medical toxicology in the period 1999 to 2015 are presented from the toxicological case files of a specialist in chemical pathology and general internal medicine. There were 132 different compounds from 86 cases. Alcohol was involved in 43%, drugs of abuse in 18.6%, volatile carbon compounds in 17.4%, metals in 9.3%, and carbon monoxide in 4.6%. Many compounds appeared once. The duty of the medical expert witness to provide an objective report for the court irrespective of the payer is stated. The addition of references from peer reviewed literature to substantiate the pros and cons of each case is recommended as a standard operating procedure in completing each report.

Keywords

Expert reports, toxicology, compounds

Introduction

In the Republic of Ireland, the Law Reform Commission Report 2008 on ''Expert Witnesses'' made a number of main recommendations that have a particular relevance to medical specialists providing expert witness reports in low case volume specialties. Integrity and professionalism are central to expert witness activity. The professional responsibility of the doctor is best maintained by ensuring that the core responsibility of the expert witness is a duty to the court which supersedes any duty owed to the instructing party. Lord Wilberforce ruled that ''expert evidence presented to the Court should be, and should be seen to be, the independent product of the expert uninfluenced as to form or content by the exigencies of litigation.''[1] There is evidence that some experts act partially and not for the courts in the adversarial system.[2]

The Irish Commission sought a definition of the word ''expert''. Submissions were invited to refine whether experience-only based knowledge alone is sufficient or whether formal professional qualifications or training are necessary for an individual to be considered an expert. The main Australian definition of an expert witness is someone who is competent and qualified, based on their specialist knowledge, to give an opinion to the court.[3] In both England and Ireland, there is no legislative definition of what is an expert.

In England and Wales, the *Jones* v *Kaney* [2011] UKSC 13 case ruled that that a client can sue an expert witness who has acted negligently or dishonestly.[4] This issue remains open in Ireland.

In France, under the civil law system, an expert is appointed by the court from a set list. The duties of the expert are detailed with regard to the judges, to the parties involved, towards colleagues and towards private experts engaged by the parties.[5]

In India, an expert opinion is based on having specialised knowledge in a particular field based on training, study and experience. An expert is specifically defined under s 45 of the Indian Evidence Act.

Regulatory bodies – the Medical Council in Ireland and the General Medical Council in the United Kingdom – should introduce regulatory and disciplinary processes for practitioners who act as expert

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witnesses. Fee arrangements should not be dependent on the outcome of the case because of the risk to the independence and integrity of the witness report. A formal code of practice guidelines should be introduced for expert witnesses with a list of factors which can be used to help the court assess the reliability of the expert witness.

In Ireland, the "Guide to professional conduct and ethics for registered medical practitioners" 2009 does not address the role of the medical expert witness. The role is also not specifically addressed by the "Good Medical Practice" guidelines of the General Medical Council in the UK although section 66 states that "you must always be honest about your experience, qualifications and current role".

While case reports are common, published data on the spectrum of case content for a medical expert witness in the chemical pathology, toxicology and forensic disciplines are scarce. This paper reports the toxins, compounds and clinical context of cases where a formal expert medical opinion of a single practitioner was sought by lawyers or by the coroner over 15 years of practice. It does not include those cases where telephone advice was sought or given in clinical cases for doctors, histopathologists or lawyers.

Methods

The 86 practice files of a consultant in chemical pathology and general internal medicine at Beaumont hospital, Dublin were examined to extract the analytes, compounds and context involved in medico-legal cases in the biochemical medical toxicology area from 1999 to 2015 inclusive. The purpose is to provide some evidence which will inform judges and lawyers of the degree of exposure of an individual practitioner to various clinical and forensic issues over a long period. These data appear unique in this context. Identifiers such as age and sex were excluded to try to preserve anonymity but drug levels are listed to provide context.

Results

A synopsis of each case is presented in Table 1. In summary, there were 132 different compounds from 86 cases. Alcohol was involved in 37 (43%) of 86 cases. Drugs of abuse were the basis of 16 (18.6%) cases; volatile carbon compounds in 15 cases (17.4%); metals in 8 cases (9.3%) and carbon monoxide poisoning in 4 (4.6%) cases. Many compounds were not repeated and, in a small population where industry is subjected to planning approval and is inspected by the Health and Safety Authority, it unlikely that such cases will recur.

Discussion

Medical practice is the conventional description of the doctor's activities. Continuous professional development (CPD) encompasses the duality of experience and qualifications. In 2011, the population of the Republic of Ireland was 4.588 million and Northern Ireland 1.814 million. Specialist medical practice is becoming increasingly focused on a very specific activity that is repeated regularly. In medico-legal practice in toxicology and medicine, the cases are often at the interface of clinical toxicology, forensic medicine, clinical pharmacology, chemical pathology, occupational health and general internal medicine. The role of the expert would be made explicit if all expert reports should be available to the judge or coroner as has been suggested.[6]

An advisory paper in the Indian literature provides a checklist for writers of medico-legal reports. One requirement is that "the expert should not stray beyond their expertise to provide an opinion on matters about which they are unable to demonstrate special qualification or experience".[7]

The impact of changes in the road traffic acts with a culture change regarding drinking and driving has reduced the death rate on the roads and also the legal challenges around alcohol and road traffic accidents. From 1997 with 472 deaths to 396 deaths in 2005 until 190 in 2013, the numbers killed on roads in Ireland decreased steadily. In Ireland, the 2006 Road Traffic Act introduced random alcohol breathalyser tests at the roadside. The 2011 Road Traffic Act obliges the police to conduct a breath test at the scene of a crash where there has been an injury that requires medical attention. The 2014 Road Traffic Act allows a blood specimen to be taken in a serious accident for analysis of intoxicants. Refusal by a driver to give consent is an offence. Law changes are reflected in the toxicology practice with the provenance of alcohol cases reducing over time.

Facilitation of better communication between experts and the courts makes for better decisions. That is why I have taken the step to propose a National Institute for Forensic Toxicology and there is now an opportunity to address this issue as the Coroners Bill 2015 goes through the Irish Parliament.[8] The need for the synthesis of clinical, pathological and analytical data in toxicological cases in forensic pharmacology is because it may be impossible to say beyond reasonable doubt that a particular concentration had a specific effect.

The Health Research Board in Ireland reports that deaths due to poisoning in the Irish Republic decreased from 387 in 2011 to 350 in 2012. The median age of those who died in 2012 was 40 years and 54% involved more than one drug. Alcohol alone was involved in

Table 1. Synopsis of the essentials of each case with the year of occurrence.

1999
1. Accidental swallowing of 5–10 ml of vinegar (acetic acid and water)

2000
1. Report on possible or likely or no effects of an extensive list of homeopathic medicines with names including H Blood tonic, Sanum, Infection capsules, M Viral drops, Immune, Engystol composition, Lepandra, lymphomyosot, renel, Hepat including chelidonium – homacord, momordica compositium and many others.
2. Report on toxicity due to xylene, styrene, methylmethacrylate and urinary s-phenyl mercapturic acid, the biomarker for benzene.

2001
1. Chlordiazepoxide 870 ng/ml, blood ethanol 123 mg per dl and antegrade amnesia in association with the clinical history of ataxia and incoherence.
2. Food poisoning from supermarket purchase. No pathogen identified.
3. Benzyl chloride exposure for less than two hours.
4. Methylene chloride and ammonia mixture poisoning from a chip pan cleaner in a confined space. Methylene chloride is metabolised to carbon monoxide and the person suffered from acute carbon monoxide poisoning.
5. Effect of blood alcohol 139 mg/dl and urine alcohol 193 mg/dl on human performance in the context of a fatal road traffic accident.
6. Skin and urinary tract sensitivity to volatile chemicals including cyclohexanone, tetrahydrofuran ethylacetate and VMP naphtha at the workplace.

2002
1. Chronic environmental exposure to benzene and volatile organic compounds with a clinical background of chronic renal failure, cardiac decompensation and liver cirrhosis.
2. The question was to identify toxic effects from possible blood staining of tea bags.
3. Toxicology of styrene, xylene and methylmethacrylate from air pollution in an environmental class action.
4. Post-mortem blood for analysis of drugs and alcohol in association with iv drug abuse.

2003
1. Cholestatic jaundice due to sensitivity to 'augmentin' (amoxycillin + clavulanic acid) and or dextropropoxyphene.
2. Alcohol in a fatal road traffic accident.
3. Fatal workplace fall with post mortem blood ethanol of 62 mg/dl.
4. Exposure to workplace chemicals causing recurrent symptoms. The chemical used at the workplace included ammonium hydroxide, ammonium chloride, 2-nitrophenol, formaldehyde, ammonium acetate, p-aminosalicylic acid, 5 dithiobis-2-nitrobenzoic acid, calcium carbonate, calcium hydroxide, carbon tetrachloride, cadmium acetate, ethanol, 1-butanol, boric acid, diethylether, benzene, barium chloride, barium hydroxide, potassium antimony tartrate, analine diphenylamine, ammonium sulphate, 4-chlorophenol, citric acid, copper sulphate, phosphoric acid, hydrochloric acid, nitric acid, sulphuric acid, oxalic acid, phenol, n-hexane, n-heptane, mercuric chloride, methanol, acetaldehyde, acetic acid, ammonia, acetic anhydride, potassium hydroxide, l-propanol, potassium dichromate, potassium permanganate, toluene and tetrahydrofuran.
5. Irritation of mucous membranes from benzene, petrol and organic volatile fumes from contaminated soil.
6. Fatal road accident with post-mortem blood alcohol 230 mg/dl in one case and 13 mg/dl in another person.
7. Accident case with blood ethanol 11 mg/dl, urine alcohol 38 mg/dl with urine positive for cannabinoids and benzodiazepines.
8. Report on exposure to trifluoroboron and possible cardiac effects.

2004
1. Interaction of ethanol and flurazepam on behaviour and memory.
2. False positive post-mortem blood alcohols due to putrefaction and failure to use fluoride oxalate specimen tubes.

2005
1. Report on autopsy findings of benzodiazepines, benzylecogonine, lidocaine metabolite, morphine and codeine in urine.
2. Effects on driving ability and reaction times of nordiazepam, diazepam, dextropropoxyphene and mirtazepine.

2006
1. Case of 3,4-methylenedioxymethamphetamine (MDMA) 'ecstasy' poisoning.
2. Blood ethanol 292 mg/dl in a traffic accident.
3. Positive urine amphetamine in a fatal road traffic accident.
4. Evaluation of industrial exposure to isopropanol, acetone, copper, tungsten, carbide, chrome and silicone.
5. Acute alcohol poisoning.
6. Report evaluating toxicity from sodium bisulphite and ethylene oxide.

2007
1. Toxicity of methylene chloride, cyclohexanone, isopropanol, methyl methacrylate and PVC powder following occupational exposure.
2. Effects of ethanol on memory of a possible assault, on balance and on brain injury.
3. Severe head injury following fall after heavy alcohol consumption.
4. Alcohol and sexual assault.

(continued)

Table 1. Continued

5. Alcohol and driving case.
6. Report on the treatment of hypokalaemia.
7. Report on exposure to acrylate, butyl acetate, butanol, glycol ether, ethyl benzene, white spirit, siloxane, 4-hydroxy-4-methyl-pentan-2-one.
8. Postmortem report on a blood alcohol of 27 mg/dl with a urine value of 127 mg/dl. Methadone, diazepam and nordiazepam were also present in blood and methadone in urine.

2008

1. Effects of ethanol in an assault case.
2. Alcohol and lethal aggression at blood alcohol level of 339 mg/dl and urine alcohol of 488 mg/dl.
3. Lethal alcohol intoxication with autopsy blood alcohol 520 mg/dl and urine alcohol 668 mg/dl
4. Report on high values in urine of heavy metals and autism. The values in μg/g creatinine followed by the reference value were aluminium 74.55, (<50); mercury 13.39, (<1.7), nickel 133.98, (<2.0), palladium 4.2, (<0.90), and tungsten 1.09, (<0.79)).
5. Injury while drunk.

2009

1. The likely effects of 2.5 pints of beer on driving performance.
2. Alcohol poisoning in association with head injury from fall.
3. MDMA (ecstasy) and MDEA (ecstasy derivative) in blood in a road traffic accident.
4. A case of blood ethanol of 265 mg/dl with urine positive for cocaine, lidocaine and benzlecogonine in a fatal traffic accident.
5. The effects of the combination of ethanol and zolpidem on behaviour.
6. The effects of high concentrations of ethanol on behaviour and memory.
7. Calculation of likely volume of beer consumed when a blood alcohol taken some time later was 170 mg/dl.
8. Lethal overdose of codeine. At autopsy, the blood level of free codeine was 3.0 μg/ml and blood free morphine was 0.06 μg/ml. In the urine the values were free codeine 8.60 μg/ml and free morphine 0.06 μg/ml. Vitreous free codeine was 8.60 μg/ml and was positive for free morphine also.

2010

1. The relationship between cannabis smoking and acute myocardial infarction.[9]
2. Cocaine, alcohol, psychological stress and sudden death.
3. Report on post-mortem blood alcohol of 242 mg/dl.

2011

1. Physical and motor effects of a blood alcohol of 156 mg/dl in a road traffic accident.
2. Road traffic accident with blood alcohol of 229 mg/dl.
3. Death from severe acute alcohol poisoning.[10]
4. Report on haloperidol administration in custody in the context of opiate abuse.
5. Report on a patient poisoned with ethylene glycol.

2012

1. Mucosal reaction to 'Suma Grill D9' which is composed of sodium hydroxide, alkyl polyglucoside, 2-methoxymethylethoxy propanol and non-ionic surfactants.
2. Drowning with autopsy blood ethanol 221 mg/dl.
3. Request for back estimation of a likely blood alcohol level at a particular time point from an 'Intoxilyzer' reading. The case involved alcohol and driving.
4. Carbon monoxide poisoning.
5. Report on autopsy findings of pentobarbitone, mirtazepine, venlafaxine and desalkylfluorazepam in blood.
6. Report on the interpretation of blood ethanol measurement by alcohol dehydrogenase methods.
7. Advice to divers working in a polluted river which drains a mineral mine with regard to arsenic, lead, copper, and zinc intoxication.

2013

1. Accidental consumption of 50 to 100 ml of toluene associated with Wenckebach or Mobitz type 1 heart block, ataxia and disorientation.
2. Interpretation of biochemical tests in relation to drinking ethanol.
3. The legal issue was whether the laboratory communicated a raised serum creatinine 148 μmol/l to the requesting general practitioner through the laboratory information system or otherwise. The solicitor was informed that the requestor is phoned where the serum creatinine is >400 μmol/l in adults and > 200 μmol/l in patients under 16 years as a standard operating procedure. General Practitioners must provide personal mobile phone numbers for samples to be accepted by the laboratory.
4. Central pontine myelinolysis and liver disease from alcohol.

2014

1. Raised blood cobalt of 1390 nmol/l (82.0 μmol/l) and chromium of 715 nmol/l (37.2 μmol/l) following metal-on-metal hip replacement.
2. Lead poisoning.
3. Potential lead poisoning from water supply. Blood lead <2.0 μg/dl (0.10 μmol/l) (Reference <10 μg/dl (<0.48 μmol/l). Water supply had lead values >31 μg/l above the acceptable limit of 25 μg/l.

(continued)

Table 1. Continued

4. Steroid rage and possible paradoxical anger reaction to benzodiazepines.
5. Carbon monoxide poisoning.
6. Para-aminobenzoic acid and hepatitis.
7. Found dead with blood ethanol 174 mg/dl; urine ethanol 295 mg/dl; urine positive for cocaine, lidocaine and benzylecogonine.
8. Vitreous glucose and insulin in forensic medicine.
9. Effects of inhalation of kerosene on a group due to environmental oil pollution.

2015

1. Carbon monoxide poisoning.
2. Carbon monoxide poisoning.
3. Report on the performance of immunoassays for 6-monoacetyl morphine for the coroner.
4. Cobalt and chromium in blood following metal-on-metal hip replacement.
5. Cobalt and chromium in blood following metal-on-metal hip replacement.
6. Hypoglycaemia, insulin and C-peptide in a forensic case.

Note: The compounds which generated an expert opinion report in the area of medical toxicology in the period 1999 to 2015 are presented from the toxicological case files of a specialist in chemical pathology and general internal medicine. There were 132 different compounds from 86 cases. Alcohol was involved in 43%, drugs of abuse in 18.6%, volatile carbon compounds in 17.4%, metals in 9.3%, and carbon monoxide in 4.6%. Many compounds appeared once. The duty of the medical expert witness to provide an objective report for the court irrespective of the payer is stated. The addition of references from peer reviewed literature to substantiate the pros and cons of each case is recommended as a standard operating procedure in completing each report.

22% of deaths and was involved in 36%; 35% involved benzodiazepines and 25% methadone. In 2012, 75% of deaths involved alcohol and or prescription drugs only and 13% involved antidepressants; 37% had a history of mental illness.

The 2013 annual report from the Poisons Information Centre of Ireland lists the drugs of abuse and the most common therapeutic drugs that were the subject of telephone enquiry. There is an overlap of 11 drugs between those listed here and in that report. These are cannabis, cocaine, heroin, ecstasy, methadone, amphetamines, codeine, diazepam, flurazepam, venlafaxine and mirtazepine. Thus, medico-legal reports involved more rarely encountered compounds with the exception of alcohol and drugs of abuse.

The expert medical opinion on many of these compounds in the Irish context will be relatively inexperienced with regard to unusual compounds, many of which featured here on a single occasion. It is then a matter of organisation of a report in a systematic manner with each conclusion or opinion referenced to international peer reviewed journal articles. Where there are pros and cons, articles supporting each side should be cited. Such is my routine method of approaching each case. Doubts are expressly stated and a further case review by an environmental engineer or other appropriate professional may be suggested. It is likely that the data detailed here will not be much different from that from many small countries.

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