



**BALTIC MEDICO-LEGAL  
ASSOCIATION**

**FORENSIC MEDICINE CONFERENCE OF THE  
BALTIC MEDICO-LEGAL ASSOCIATION**

**BOOK OF ABSTRACTS**

Tallinn, Estonia  
21<sup>st</sup> – 22<sup>nd</sup> of September 2017

*Organised by EFSI*



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Professor of Forensic Medicine

Chairman of Institute of Forensic Medicine, University of Bonn

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Professor of Genetic Forensic Medicine

Professor in charge of teaching

Department of Forensic Medicine, University of Helsinki

Finland

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## *Dear colleagues and friends*

On behalf of Estonian Forensic Science Institute, I sincerely welcome all the participants of the Conference of the Baltic Medico-Legal Association here in Tallinn.

Tallinn is the capital city of Estonia and was established in the early medieval era and Tallinn Old Town is one of the best-preserved Hanseatic town centres in the world.

At the time of the BMLA 2017, Estonia is holding its first presidency of the Council of the European Union. This means that Estonia will be responsible for defining the Council of European Union positions while considering the interests of all member states, including the legal-medical and forensic science area.

It is great honour for EFSI to organize this meeting and the organizing committee has done its very best to ensure the smooth course of the scientific and social program.

Since now, over 100 international participants have registered their attendance to the conference and 55 abstracts have been received for oral and poster presentations. The highlights of recent outstanding achievements will be presented by most professional keynote speakers Professor Burkhard Madea from University of Bonn, together with Professor Antti Sajantila and Professor Ilkka Ojanperä from University of Helsinki.

I am sure that the Conference will be a unique and best platform for the exchange of experiences in the fields of forensic pathology, clinical legal medicine, forensic radiology and virtual autopsy, forensic genetics, forensic anthropology, forensic toxicology, forensic odontology. I truly believe that being in Tallinn at BMLA 2017 will launch a lot of co-operation opportunities between the various professionals in forensic domain of different countries.

I invite all the participants to visit different parts of Medieval Tallinn, to smell the history and enjoy the attraction of Estonian Presidency of EU.

Wishing you all useful, enjoyable and memorable days together with us.

A handwritten signature in blue ink, appearing to read 'Marika Väli', written in a cursive style.

Professor Marika Väli  
President of the BMLA Conference 2017

## ORAL PRESENTATION

### *Forensic evaluation of child sexual abuse*

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Children who are sexually abused often present with a history long after the abuse itself. A forensic interview is most important, but the medical examination may reveal residual findings in a small percentage of cases. Teenagers may more often be victims of acute sexual assault and have a somewhat higher incidence of physical findings.

This session will explore the dynamics of sexual abuse at various ages and concentrate on the normal anatomy often seen in such examinations and the findings that are most significant supporting the diagnosis of sexual abuse. Examination techniques will be described. Some conditions that might be confused with sexual abuse will also be presented.

#### Objectives:

At the conclusion of the presentation, the participant will be able to:

1. Describe normal female genital anatomy
2. Recognize examination findings consistent with sexual trauma
3. List several conditions that cause parental concern but are not diagnostic of sexual abuse.

## *NPS and heroin related deaths in Budapest between 1994-2014*

Zsófia Almádi<sup>1</sup>, János Bokor<sup>1</sup>, Gabriella Sára-Klausz<sup>1</sup>, Kálmán Róna<sup>1</sup>, Éva Keller<sup>1</sup>

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As trends in drug usage changed in the last decades, so did the presence of different substances involved in drug related death cases. As an institution having a full insight on violent death cases in Budapest, we experienced these changes first hand, and collected data throughout the years. Our group at Semmelweis University, in the Department of Forensic Medicine used these records to compare and contrast two of the past's and present's most prominent substances, heroin and the new psychoactive substances (*NPS*).

While heroin played a fundamental role in drug related death cases from 1996 until 2009, we found that its place was slowly taken due to the appearance of new, easily accessible substances, the *NPS*. After 2012 *NPS* show a constant presence in our data, a trend that we expect to continue. However the differences of this two groups of drugs pointed to further conclusions apart from their separate appearance in time. Ratio of male and female victims, the presence of different age groups and the cause of death also varied, not only between the groups related to one substance or the other, but also between heroin related cases in the past and present.

Constantly monitoring the death cases where drug usage was involved is the only way to keep an up-to-date picture of drugs having a currently active role in the matter. Knowing the characteristics of death cases where drug usage was involved provides an expertise for people working in this field to recognize these patterns and request the required laboratory tests, proving the case's connection to drug abuse.

## ORAL PRESENTATION

# *Determination of cyanide metabolite ATCA in whole blood by LC-MS-MS*

Tarmo Barndõk<sup>1</sup>, Aime Riikoja<sup>1</sup>

<sup>1</sup>Estonian Forensic Science Institute, Estonia

Cyanide (CN) is rapidly acting toxic chemical that can be readily absorbed by inhalation, ingestion or dermally. After CN is absorbed, it is rapidly distributed throughout the body. Cyanide is volatile and reactive leading to a short half-life (0.34-1.00 hours). Toxic levels of cyanide in tissues may diminish significantly immediately after death making it difficult to determine by direct CN analysis.

After absorption, about 80% of a cyanide dose is metabolized to thiocyanate and about 20% to 2-amino-2-thiazoline-4-carboxylic acid (ATCA). ATCA is stable in biological samples for months at freezing and ambient temperatures and it does not metabolize further. Therefore, ATCA can be useful for determination of cyanide exposure.

ATCA was determined in whole blood by LC-MS-MS. For sample preparation both SPE (two modifications) and protein precipitation + phospholipid removal was tested. The advantages and disadvantages of each preparation technique remain under discussion. Total four post-mortem samples were analysed: 2 cases involved intentional ingestion of KCN and 2 suspicious asphyxiations in oil shale mining.

**Keywords:** cyanide, ATCA, sample preparation, LC-MS-MS

## *Developing a next-generation sequencing (NGS) platforms applications in forensic and legal medicine use: new approach in practical and scientific research*

Marija Čaplinskienė<sup>1</sup>, Jūratė Jankauskienė<sup>1</sup>, Rima Baranovienė<sup>1</sup>

<sup>1</sup>State Forensic Medicine Service, Lithuania

**Introduction.** Next-generation sequencing (NGS) technology, with its high-throughput capacity has developed rapidly in recent years and became an important analytical tool for many genomics researchers. The developing of a project with applying a next generation DNA sequencing, used in the State Forensic Medicine Service, Serology and DNA laboratory for wide range of forensically relevant genetic markers, helps to resolve challenging cases. As well, it could be useful in developing the cooperation on actual issues as in the last year more efforts focused on personalized medicine scientific-technological innovation and epistemological perspectives.

**Research aims.** New opportunities in the research domain of the forensic studies emerge by incorporating the power of NGS technology, which can be applied to simultaneously analyzing multiple loci of forensic interest in different genetic contexts, such as autosomes, mitochondrial and sex chromosomes. NGS technology can also have potential applications in many other aspects of research. These include DNA database construction, ancestry and phenotypic inference, monozygotic twin studies, body fluid and species identification, and forensic animal, plant and microbiological analyses. The review of application of NGS technology in the field of forensic and legal medicine science with the aim of providing a reference for future studies and practical set up at present.

**Conclusions.** The developing a NGS platforms applications in forensic and legal medicine have got a new approach in practical and scientific research in Lithuania.

**Keywords:** forensics, legal medicine, next-generation sequencing (NGS), applications, scientific research, Lithuania

## *The Effects of Alcohol in Antiseptic Oral Sprays on Breath Alcohol Level*

İsmail Mehmet Demirci<sup>1</sup>, Yasemin Balcı<sup>2</sup>, Gülsüm Kadı<sup>2</sup>, Çetin Seçkin<sup>3</sup>, Kürşad Tosun<sup>4</sup>, Muzaffer Demir<sup>5</sup>

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**Objective.** The aim of our work was first to determine whether the breath alcohol examination values measured with a breathalyzer could be higher than the legal upper limit following oral antiseptic spray use in healthy subjects who had not consumed alcohol prior to the test, and then, in the event of detecting misleading high results, to determine their elimination rates.

**Patients and methods.** This study involves results from 30 healthy volunteers, 14 females and 16 males, with a mean age of  $37.73 \pm 8.40$  (min=26, max=58). Three ethanol-containing oral sprays and a portable electrochemical sensorized breathalyzer with disposable mouthpieces are used in our work. Breath alcohol concentration (BrAC) value before spray use was used as a reference for each person. Subjects sprayed 3 puffs of oral antiseptic spray into their mouths. Following 3 puffs, the subjects kept their mouths closed and immediately underwent a breathalyzer examination to evaluate BrAC ( $T_0$ ). Two more examination was conducted 3 minutes later ( $T_3$ ) and 5 minutes later ( $T_5$ ).

**Results.** The highest BrAC value (4.25 permille) was attained at  $T_0$  in 12 subjects; all BrAC values (before spray use) were, as expected, negligible and under 0.08 permille. Friedman Rank Sum Test was used to evaluate whether there is any difference between BrACs at times  $T_{\text{before}}$ ,  $T_0$ ,  $T_3$ , and  $T_5$ . P-value <0.05 was considered statistically significant. The BrAC median values decreased down to almost zero as time passed by from  $T_0$  to  $T_3$  and  $T_5$ .  $T_3$  values were lower than the corresponding  $T_0$  values for all three medications and all  $T_5$  values were lower than corresponding  $T_0$  and  $T_3$  values (all  $p < 0.001$ , Wilcoxon Rank Sum Test).

**Conclusions.** This research study shows that ethanol containing sprays may alter the results of a single breathalyzer test. Based on our results, the BrAC values are indeed affected by residual ethanol in the oral cavity due to prior use of oral anti-septic sprays and this explains why BrAC decrease rate is really remarkable.

**Keywords:** breath alcohol level, oral antiseptic sprays, breathalyzer.

*\*This study was supported by Muğla Province Police Directorate.*

## ORAL PRESENTATION

### *A case of medical malpractice in bariatric surgery*

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Medical malpractice happens when a doctor or another medical professional whose actions fall below the appropriate standard of care hurts a patient. There are several cases every year in Estonia, when forensic-medical expertise is appointed due to the medical malpractice. These expertises are laborious and complicated, because it is often difficult to offer clear answers.

The concept of medical malpractice is not defined in Estonian law, but there are some general principals and broad categories of rules that apply to most medical malpractice cases. The majority of litigation following medical malpractice is brought under the tort of negligence, which comprises three components: the professional who is being sued owed the patient a duty of care, the professional breached the duty of care, and the breach of duty of care caused the patient loss. Common types of medical malpractice are failure of diagnose, improper treatment and failure to warn a patient about known risks.

This study is based on one medical malpractice case where bariatric surgery was performed and which ended lethally. The patient was 45-year-old woman; bariatric operation was performed on 22.05.2012. On 30.09.2012, the patient died of complications of surgical treatment. In the post-operative period, ileus arose followed by acute pancreatitis, multiorgan failure, sepsis, septic shock and suppurated extensive hemorrhage in the abdominal and pelvic cavities. Autopsy finding was little informative because of the healing process. Forensic-medical expertise was conducted involving surgeons like members of the commission of experts.

Forensic-medical investigation was thoroughgoing and time-consuming, included questions about surgical competence, informing the patient of the risks and the appropriateness of the methods of treatment. The final decision of the commission of experts was that it is the case of medical negligence, where the surgeon breached the duty of care.

## *5-year (2011–2015) analysis of medical negligence cases in Latvia*

Sergejs Dubencovs<sup>1</sup>, Aleksandra Kissina<sup>1</sup>, Grigorijs Vabels<sup>1</sup>, Darja Repina<sup>1</sup>, Aleksandra Alikperova<sup>1</sup>, Ilona Markeviča<sup>1</sup>, Jana Kamiševa<sup>1</sup>, Inga Martinova<sup>1</sup>, Nadežda Skidenko<sup>1</sup>, Jolanta Vamze-Liepiņa<sup>1</sup>

<sup>1</sup>State Centre for Forensic Medical Examination, Latvia

**Introduction.** Integral part of forensic medicine is medical negligence or malpractice cases, when the assessment of actions or inactions of medical professionals takes place. Taking into account the complexity of these cases, expert commissions are organized.

**Materials.** We have analysed malpractice cases that were examined in State Centre for Forensic Medical Examination (Latvia) during a 5-year period (2011–2015).

**Results.** Eighty-nine cases were analysed, of them 34 – living persons, 55 – deceased. An autopsy was performed in 41 cases. Medical care was provided mainly in large Latvian city hospitals; in some cases, a patient received medical treatment in more than one medical institution. Medical professionals from different specialities were involved in these malpractice cases, mostly surgeons (14), emergency medicine professionals (14), general practitioners (13), gynaecologists and obstetricians (10). There is a certain difficulty in selecting and engaging necessary specialists for participating in the expert commissions in malpractice cases. Frequently very narrow field specialists are required. Most doctors are reluctant to participate in such examinations and to take the responsibility of an expert. In the above-mentioned cases, the number of members examining each case ranged from three to nine, including forensic medicine experts – from one to four in each case. Doctors of other specialties were mostly surgeons (27), neurologists (19), cardiologists (19), anaesthesiologists-reanimatologists (18) and others, a total of 27 different specialties. One of the major question the expert commission had to address was whether the diagnosis, examination and treatment were correct. In 66% of 87 cases the commission found that there were no errors in the diagnosis, examination or treatment. Another issue was “Have the doctor’s actions or omission affected the outcome?” Answering this question, in 57% of 69 cases we can observe that experts have not detected any causal relationship between the actions of medical personnel and the outcome, in 35% it was not possible to give a definitive conclusion or the causal relationship was deemed to be probable, in 9% a causal relationship was confirmed.

**Conclusions.** As a result of our study of malpractice cases we have found that in most cases the causal relationships between the medical personnel actions and the outcome was not detected; however, there are certain cases when the causal relationship could not be proven.

## ORAL PRESENTATION

### *Fraudulent Forensics*

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A group of 'nonscience' forensic sciences have developed over the last century. They are not applications of established sciences, they have not systematically tested their own hypotheses, and they make unsupported assumptions and exaggerated claims. One example has been the errors perpetrated by FBI microscopic hair comparison analysts. Other examples include the comparison of fingerprints, handwriting, bitemarks, voiceprints, toolmarks, firearms, tyre prints, and footwear marks.

Nowadays forensic science has ventured into areas such as DNA analysis, often with remarkable results. But there have been dramatic mistakes. The ordeal of Adam Scott, who was arrested over an attack in Manchester, UK despite never having been there, and who spent five months on remand because his DNA was mixed accidentally with samples from a complainant whilst undergoing analysis, is a case in point. Human error was blamed, although the procedures themselves were not adequate, leading to no records being maintained by the technicians and nothing done to mark used trays.

Things are no better in the US. In 2012, a chemist who had worked in a Massachusetts laboratory was arrested for falsifying evidence used in criminal cases. Annie Dookhan claimed to have tested about 60,000 samples involved at least 34,000 criminal cases during a 10-year career. Despite her work rate far exceeding that of other employees, her supervisors never suspected that she was 'dry-labbing' (simply guessing as to the contents of) submitted packets. She was sentenced to 3–5 years in jail, but the ramifications rumble on. Retired judges had to be recruited to preside over special investigations and the laboratory was shut down. The whole thing should never have happened, but no-one thought to check her claimed qualifications when she was first employed.

The cause of the underlying problem is clear to me at least – over-reliance on 'test ordering' and the desire to cut costs at all costs in the belief that an analysis is the same no matter who does it. Is the remedy more regulation? No, regulation clearly fails time and time again, as in the case of Annie Dookhan. What is needed are systems that combine public service and professional integrity with research and development. Appropriate laboratory regulation and inspection has a part to play, but personal training and certification, and continuing professional encouragement and development, are also vital if there are not to be further serious failures.

## *Sexual Assaults in a foreign country – a study in Lisbon*

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<sup>1</sup>South Branch of the National Institute of Legal Medicine and Forensic Sciences, Portugal

**Introduction.** Sexual violence is a widespread public health issue that can take many forms and be perceived and treated in different ways throughout the world. According to a 2013 WHO study, prevalence rates of intimate partner violence and non-partner sexual violence against women can range from 27.2% to 45.6%. Whether moved by personal or socioeconomic reasons, globalization has made it easier for people to live, work and travel abroad. As a result, societies are becoming even more heterogeneous and, in order to prevent sexual violence, we must understand the context in which it occurs and the interaction between individual, relationship, community and societal risk factors.

**Objectives.** To characterize a sample of acute sexual assault cases in non-Portuguese victims, examined by medicolegal professionals of the South Branch of the National Institute of Legal Medicine and Forensic Sciences (DS-INMLCF), between 2012 and 2015.

**Material and methods.** We performed an observational, retrospective and descriptive study. The data was obtained from the DS-INMLCF database and archive. We collected the variables sex, age, victim's nationality, reason for being in Portugal and relationship with the aggressor. Microsoft Office Excel® was used for statistical analysis.

**Results.** We identified a total of 594 alleged acute sexual assault cases. We excluded 23 cases in which we were unable to determine the victim's nationality. From a total of 571 cases, 84 (14.7%) corresponded to non-Portuguese nationals, 82 (97.6%) being female. Victim's ages ranged from 3 to 53 years, with a median of 23 years. The majority of victims were nationals from the 5 Portuguese-Speaking African Countries (PALOP) (38.1%), followed by Brazilian citizens (33.3%). The remaining individuals were distributed between 14 different nationalities, 6 (13.1%) of them from the Schengen Area. Among the analysed subjects, 67 (79.8%) were residing in Portugal and 13 (15.5%) were in the country for holiday purposes. Finally, 40 (47.6%) victims knew the aggressor and 25 (29.8%) did not.

**Conclusions.** As shown by scientific literature, the vast majority of the non-Portuguese victims examined were female and, in those residing in Portugal, most of the victims knew their aggressor. The predominance of citizens from PALOP and Brazil in our sample is in agreement with the information gathered by the 2011 National Census, that shows those are the largest communities of foreign citizens living in Lisbon.

## *Vehicle-pedestrian collision circumstance impact on pedestrian injury pattern.*

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<sup>1</sup>State Centre for Forensic Medical Examination of the Republic of Latvia, Latvia

**Introduction.** Road traffic accidents with vehicle – pedestrian collisions are important problem in Latvia. After vehicle-pedestrian collisions, pedestrian forensic medical examination and vehicle technical examinations are performed. To fully understand circumstances of vehicle-pedestrian collision, especially in hit and run cases, one needs to know relationship between pedestrian injury pattern and collision circumstance.

**Aim of the study.** To research pedestrian injury pattern relationship with vehicle-pedestrian collision circumstance (pedestrian position, type of vehicle, impact direction, vehicle speed etc.).

**Materials.** Data from “Valsts tiesu medicīnas ekspertīzes centrs” (Latvia’s State Department of Forensic Medicine) and “Valsts tiesu ekspertīžu birojs” (Latvia’s State Bureau of Forensic Expertise) was collected. In total 75 forensic medical expertises and 27 vehicle technical expertises were used in study.

**Results.** Cars more often than trucks cause subdural haemorrhage (60.6% of cases) and intraventricular haemorrhage (36.4% of cases). Trucks cause perineal soft tissue injury, heart and pericardial sack ruptures, spleen ruptures, thoracic spine injuries statistically significantly more often than cars. Pubic bone fractures vary between different age groups: 20–40 year old had pubic fracture in 10% of cases, 41–60 year old had pubic fracture in 31% of cases, 60+ year old had pubic fracture in 66% of cases. Spine, skull, leg long bone fractures appeared at impact speed of 30 kph, pelvic fractures at 40 kph, skull and atlas luxation at 50 kph.

**Conclusions.** Acquired data fully or partially matches with other author’s data. Cars and trucks have large shape variety and are constantly changing, so larger data pool with different vehicle models is needed for complete research between pedestrian injury pattern and collision circumstance assessment. To fully understand accident circumstances in each case forensic medical expertise and vehicle technical expertise data has to be combined.

## ORAL PRESENTATION

### *Death investigation system in Japan*

Kenji Ishihara<sup>1,2</sup>, Suguru Torimitsu<sup>1,3</sup>, Daisuke Yajima<sup>1</sup>, Hirotarō Iwase<sup>1,3</sup>

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Japan adopted the death investigation system from Germany more than 130 years ago, which was a judicial autopsy system. The acts for the judicial system remain valid to date without any amendment. After World War II, the United Nations Headquarters ordered the Japanese Government to establish a new death investigation system similar to the medical examination system in the USA, which was a public health oriented system. Since then, Japan has two different systems in operation. However, the medical examination system is currently in operation in only a few cities.

In the early 2000s the discussion to solve the problems of death investigation started in the National Diet. Every expert said that the autopsy rate in Japan was too low, and crimes were easily overlooked. A dead body, except one from a definite natural death, was notified to the police. A police officer inspected the body, and a medical practitioner examined the body. An officer called the inspector decided whether the death had been due to a crime or not. It took only one or two days for this procedure, except in difficult cases. In 2012 two new acts were passed in the National Diet. One was the 'Act on the Investigation of Cause of Death and on Identification of Bodies Handled by the Police', in which the process of investigation, examination, and autopsy was prescribed, and allowed the police to conduct an autopsy even if the death was not supposed to be due to a crime. The other was the 'Act on Promotion of Death Investigation'. In this act, the significance of death investigation and identification of unidentified bodies, and fundamental policies were prescribed. In 2014, the Cabinet of Japan implemented a program to promote death investigations. Based on this program, the committee on the promotion of death investigations was going to be established in every prefecture.

Chiba Prefecture is located next to Tokyo Metropolitan. It is the sixth largest in Japan and has a population of 6.2 million. At the Department of Legal Medicine at Chiba University, which is only one autopsy facility in Chiba prefecture, we perform approximately 300 medico-legal autopsies per year. Although the rate of autopsies is very low, CT examinations are conducted prior to the autopsy in all cases, and regarding laboratory examinations, drug and poison tests, pathology organization inspection, and blood biochemical tests are performed on all corpses from which a specimen can be obtained.

## *The comparative study of alcohol concentration in postmortem specimens of blood, urine and bile*

Marija Jakubeniene<sup>1</sup>, Leonas Gogelis<sup>1</sup>

<sup>1</sup>State Forensic Medicine Service, Lithuania

**Objectives.** The analysis of the alcohol in postmortem material in Lithuania during the over past twenty years showed that about half of the victims were under the state of inebriety at the time of death. The determination of alcohol concentration in body fluids remains of major importance in forensic analysis but is not always easily established due to various postmortem situations. The comparative analysis of alcohol concentration in different biological specimens may provide valuable information evaluating results of alcohol determination.

**Methods.** Alcohol (ethanol) concentration in blood (BLAC), urine (UAC), and bile (BAC) was determined by applying the headspace gas-chromatographic technique. Biological specimens were collected from 89 persons who died due to intoxication with ethanol (n=15), acute myocardial infarction/ischemia (n=20), asphyxia (n=22), mechanical injuries (n=10), alcohol related damage of liver (n=8), and other (n=14).

**Results.** The mean concentration of ethanol in investigated specimens was: in blood 251 mg/dL (range 0–584), urine 328 mg/dL (range 0–571), and bile 271 mg/dL (range 0–608). The high correlation was obtained for BLAC and UAC ( $r = 0.977$ ), BLAC and BAC ( $r = 0.947$ ). Alcohol concentration in bile was on average 9.5% higher in comparison to BLAC. The 95% confidence interval for relation BAC/BLAC was 0.55–1.68.

**Conclusions.** The relationship between blood, urine, and bile alcohol concentrations might give a valuable clue about the stage of alcohol distribution at the time of death. The biological specimen as bile can provide valuable information estimating a blood alcohol concentration when blood is unavailable.'

**Keywords:** alcohol (ethanol) concentration, postmortem material, blood (BLAC), urine (UAC), bile (BAC).

## ORAL PRESENTATION

### *Sharp force trauma on bones – possibilities of weapon identification (archaeological and recent cases)*

Giedrius Kisielius<sup>1</sup>

<sup>1</sup>State Forensic Medicine Service, Lithuania

The analysis of toolmarks on bones as a result of sharp force trauma is presented in this presentation. Toolmarks on bone provide an essential information for estimating the class and type of weapon. In particular cases toolmarks can reflect specific characteristics of injuring weapon. Sometimes it is possible to identify particular weapon. The most valuable injuries for identification are those in cartilage and bone injuries with fixed dynamic traces of the weapon. In some recent cases, even in the absence of traces, identification of the injuring weapon is possible according to other characteristics having been fixed in bone injuries. In archaeological cases, focus should be on the class of weapon rather than a particular weapon.

## *Study of exhumation protocols of people killed by communist regime in Riga Central prison, 1941*

Aleksandra Kissina<sup>1</sup>, Sergejs Dubencovs<sup>1</sup>, Grigorijs Vabels<sup>1</sup>, Artūrs Grise<sup>1</sup>, Maksims Ivanovs<sup>1</sup>, Nadežda Skidenko<sup>1</sup>, Inese Dreimane<sup>2</sup>

<sup>1</sup>State Centre for Forensic Medical Examination, Latvia

<sup>2</sup>Museum of the Occupation of Latvia

**Introduction.** During the 2<sup>nd</sup> World War 99 civilians were slaughtered at the Central Prison of Riga from 27<sup>th</sup> to 29<sup>th</sup> of June 1941. From the 4<sup>th</sup> of July to the 7<sup>th</sup> of July the bodies were exhumed. Forensic medical experts Jānis Kocers and Paulis Cukurs performed the examination of dead bodies and recorded their findings. In 2014, investigation was made to identify the deceased, reasons of the arrest and circumstances of execution. State Centre for Forensic Medical Examination (Latvia) received request to analyze and evaluate historical data from the forensic point of view.

**Materials.** Data (person's age, description of the body, clothing and various injuries) was obtained from exhumation and examination protocols.

**Results.** Two bodies were described as decomposed. There were no post mortem changes described for other bodies. 90 people died from single gunshot injury to the head; 7 – from 2 or 3 gunshot injuries in different body parts; 1 – from chest gunshot injury; 1 – from blunt head trauma. Gunshot injury direction was back to front in 80 cases, front to back in 8 cases, left to right in 5 cases, various other directions in remaining cases. In 54 cases there was only entrance wound, in 41 cases – entrance and exit wounds, in 3 cases – combination of gunshot injuries with and without exit wounds. 9 bodies had been shot from very close range, 6 of those shot in head, 2 – in chest, 1 – in abdomen. 8 bodies had gunshot injuries in combination with blunt force trauma (3 of those had facial bone fractures). Entry wound was measured in 32 cases, 22 of those had 7 mm diameter entry wound.

**Conclusion.** The most commonly used method of execution in these cases was to shoot small caliber gun at the back of the head, mostly from some distance. Some deceased also suffered blunt force trauma. Unfortunately, exhumation and examination protocols were incomplete and no autopsies were performed; only external body examinations. That is why these records cannot be used as appropriate forensic evidence to make definitive conclusions about circumstances of death. Nevertheless, they hold significant historical value as unique documentation of the 2<sup>nd</sup> World War.

## *Glycated haemoglobin (HbA1c) for post-mortem diagnosis of diabetes*

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**Aim of the study.** The aim of our research was to investigate undiagnosed diabetes and diabetes risk in post-mortem cases based on increased values of glycated haemoglobin.

**Materials and methods.** The study was conducted at the Estonian Forensic Science Institute in 2008–2014. Autopsy data from 504 cases of male deaths (ages 19–79) were collected and samples for glycated haemoglobin, liver enzymes, and alcohol concentration were analysed.

**Results.** HbA1c was within the reference value (4.8–5.9%) in 88.1% (n = 444) of cases, below reference value in 2.4% (n = 12). In the risk group of diabetes (HbA1c 6.0–6.4%) were 5.8% (n = 29) of the cases, and HbA1c result of  $\geq 6.5\%$  manifested in 3.8% (n = 19). The higher the age, the more cases with HbA1c value  $\geq 6.0\%$  occurred. In the group of deaths from external causes (n = 348), the HbA1c value of  $\geq 6.5\%$  HbA1c occurred in four cases. The HbA1c value was  $\geq 6.5\%$  in 78.9% of 156 cases in the group of diseases, of which ~58% were cardiovascular diseases. The prevalence of diabetes and diabetes risk was found lower compared to population-based study, as majority of the deceased were young and middle-aged males and no females were included. In the case of poisoning with narcotic substances, HbA1c was within the reference range. A negative correlation occurred between alcohol intoxication and HbA1c value. A positive correlation between ALT and HbA1c was found — the higher stage of liver damage correlated with the higher HbA1c level.

**Conclusion.** Since the diabetic complications are often involved in the causes of sudden death or contributors to accidental casualties, post-mortem diagnosis of diabetes mellitus is important in routine forensic autopsy. It is useful to investigate HbA1c in blood, not only in diabetes mellitus but also in other causes of death, including alcohol-induced deaths.

**Keywords:** post-mortem, diabetes, glycated haemoglobin

## *Autopsy. Why do we need the autopsy and why should we perform autopsies?*

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There are three types of autopsy (anatomic autopsy, clinical autopsy, forensic autopsy) which developed especially in Italy since the 13<sup>th</sup> century. The autopsy was in the 19<sup>th</sup> century *the main research method in medicine. Many diseases have been discovered or critically clarified through autopsy.* Autopsies are still today the gold standard for clarifying the cause and manner of death. However, autopsies lost in the last 50 years their important role in exploring morphological conditions of virtually every disease. Long before the implementation of forensic imaging into daily forensic practice decline of autopsies was observed. Systematic limitations of the classical autopsies are f.i. no complete autopsy from top to toe, destructive method, no three-dimension presentation of results etc. However, even in the era of high tech medicine low technology autopsies have not yet lost their significance. Autopsies have to be performed to:

- establish the cause of death;
- assist in determining the manner of death (i.e., homicide, suicide, etc.);
- compare the premortem and postmortem findings;
- produce accurate vital statistics;
- monitor the public health;
- assess the quality of medical practice;
- instruct medical students and physicians;
- identify new and changing diseases;
- evaluate the effectiveness of therapies such as drugs, surgical techniques, and prosthesis;
- reassure family members, and
- protect against false liability claims and settle valid claims quickly and fairly.

*(Lundberg, 1998)*

The evolution, importance and decline of traditional autopsy will be addressed.

## *Quantification of drug metabolites without authentic reference standards: application to the stimulant drug $\alpha$ PVP*

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There are several reasons why analysis without reference standards is sometimes indispensable. Standards for new psychoactive substances (NPS), metabolites or rare substances may not be obtained in a reasonable period of time, and their availability is also hindered by extensive administrative requirements. Standards are usually costly and may exhibit a limited shelf-life. Finally, many compounds are not commercially available and sometimes not available at all. Drug metabolites play a key role in analytical toxicology, both in facilitating substance detection and identification in urine samples and in providing additional information for toxicological interpretation based on blood or urine metabolite/parent drug concentration ratios. Moreover, some common drugs form pharmacologically active metabolites.

$\alpha$ -Pyrrolidinovalerophenone ( $\alpha$ -PVP) is a stimulant type of NPS with a cathinone structure. The drug is one of the most persistent NPS on the transient illicit drug market. In the present study, we applied a novel instrument platform to identify and quantify  $\alpha$ -PVP metabolites in urine. The instrumentation consisted of gas chromatography (GC) coupled to nitrogen chemiluminescence detection (NCD) and atmospheric pressure chemical ionization quadrupole time-of-flight mass spectrometry (APCI-QTOFMS). In this concept, the GC flow was divided in appropriate proportions between NCD for single-calibrant quantification, utilizing the detector's equimolar response to nitrogen, and QTOFMS for accurate mass-based identification. APCI allowed the detection of protonated molecules unlike in electron ionization GC-MS. Large-volume injection technique was tested for sample introduction to further improve the limit of detection by NCD. Sample preparation consisted of liquid-liquid extraction with a mixture of ethyl acetate and butyl chloride at a basic pH.

The accuracy of the quantification of  $\alpha$ -PVP metabolites, representing various chemical structures, was generally better than 30%, when the parent drug was used as a single reference standard. This level of accuracy is comparable to that obtained by conventional calibration with individual reference standards. Post-mortem samples previously found positive for  $\alpha$ -PVP were analysed and the metabolite concentrations reported. The present analytical approach was found feasible and possessed great potential for further development.

## *Forensic sciences of the Republic of Kazakhstan: priorities and prospects*

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Nowadays the crime has a high technical equipment and organization, and the process of investigation and disclosure of crimes becomes complicated and evidentiary role of different expertise is growing. Forensic examination activity serves as an integral part of law enforcement and judicial system in Kazakhstan, the main function of which is meeting the needs of law enforcement agencies and courts in expert studies. Under these conditions, there is an objective need for the introduction of new methods of organization of the forensic medical examination, designed to meet the needs of law enforcement agencies and the public, which requires additional resources, the improving the organizational and methodological work in changing of the staff-titular service structure, the introduction of new technologies of expertise and material incentives.

An important epoch in the development of Kazakhstan, including examination activity, is determination of priorities listed in the program of development of the "Strategy Kazakhstan -2020" by the head of our state. This is a high level of performance, initiative and efficiency, increase of competitiveness and modernization. It should be noted that the full potential of forensic examination bodies is aimed at improving the material and technical base, increase of the level of expert staff, on the introduction of new types of expert research and improving the quality of the examinations in accordance with international standards.

The need for objectification of proof process contributes to greater use of judicial expertise: new types of forensic examinations (phonoscope, computer engineering, genetics, etc) are developed, the ability to perform examinations in the state and non-state expert institutions as well as by private experts is provided and actively implemented. However, the realities of today indicate that the examination carried out in full does not meet modern challenges and threats. Wherefore the judicial examination in Kazakhstan should set up new challenges associated with the study of intellectual property as selection achievements, trade secrets, utility models, industrial designs and others.

The decisive purpose in this process at the present stage is served by integration and differentiation of scientific knowledge, the development of integrated research, supplying expert practice.

The article considers the key objectives of improving forensic activity of the Republic of Kazakhstan.

## ORAL PRESENTATION

### *Old and New Drugs in Forensic Toxicology*

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Forensic toxicology has seen many changes during the last thirty years. The discipline is now more diversified than ever, including post-mortem toxicology, driving under the influence, drug-related crime, child welfare, drug testing at workplace etc. Most notably, the repertoire of toxicologically relevant drugs and poisons involved in forensic cases has undergone great changes, and the current illicit drug scene is in continuous movement.

Therapeutic drugs are today much safer than before. We have no barbiturates or chloral hydrate anymore. The toxic tricyclic antidepressants and the first generation antipsychotics cause now less fatal poisonings as they have been largely replaced in therapy by the selective serotonin reuptake inhibitors and the second generation antipsychotics, respectively. The same is true with cardiovascular drugs, as many beta-adrenergic blocking drugs and digoxin have been replaced by a range of less toxic medicines. This favourable trend in poisonings is compensated by an increase in the non-medical use of prescription opioids. The drugs used in the opioid maintenance treatment, buprenorphine and methadone, are commonly diverted and abused parenterally. Today, prescription opioids form the most important group of drugs causing fatal poisonings in many countries. For a toxicology laboratory, new therapeutic drugs are usually more difficult to analyse than the old ones. Thanks to modern drug discovery, new drugs are less toxic but they are also more water soluble, and consequently difficult to extract from biological matrices. New drugs may also possess low blood concentrations, which necessitates the use of liquid chromatography – tandem mass spectrometry for analysis.

The major illicit drugs in the Baltic and Nordic countries until early 2000s consisted of amphetamine, ecstasy, cannabis, GHB and heroin, while the continuing Estonian fentanyl epidemic is a special feature of this country. Since 2005, hundreds of new psychoactive substances (NPS) have emerged. The NPS in the north have been largely amphetamine-like stimulants, such as the cathinones methylenedioxypropylphenone and alpha-pyrrolidinovalerophenone. NPS are often acquired from the Internet and originate from the Far-East, being often very pure when seized on the border. Potent opioid NPS, like the designer fentanyls and U-47700, constitute a new threat to both drug addicts and recreational users, and they pose a challenge to the toxicologist for analysis and interpretation.

## *Olanzapine: challenges in toxicological results interpretation*

Miguel Costa Lopes<sup>1</sup>, Ana Abreu<sup>1</sup>, João Nascimento<sup>1</sup>, Mário Sardinha<sup>1</sup>, Antonio Castañera<sup>1</sup>, Susana Fonseca<sup>1</sup>, João Franco<sup>1</sup>, Dobrila Nikolić<sup>1</sup>

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Fatal intoxications are a topic of great relevance in today's society and a massive challenge for pathologists all over the world.

In post-mortem investigations, it is often difficult to determine if and which drug(s) caused the death, due to multiple factors, such as the post-mortem changes and interpretation of toxicological blood concentrations tables.

The aim of this study is to characterize forensic fatal cases with positive blood levels for the antipsychotic olanzapine and to correlate the concentrations of this drug with the manner of death and the cause of death attributed in the reports.

We performed a retrospective, observational and descriptive study, analysing the reports of forensic autopsies where olanzapine was detected by toxicological blood examinations, performed in the South Branch of the National Institute of Legal Medicine and Forensic Sciences, in Lisbon, Portugal, between 2013 and 2015. Besides olanzapine concentrations, we collected the variables sex, age, place of death, death confirmation date, autopsy date, clinical history, signs of putrefaction, cause of death, manner of death, and ancillary tests performed, namely toxicological and histological exams.

We found a total of 53 cases, 66% male, with median age of 54 years. Blood olanzapine concentrations ranged from 10 ng/ml to 4363 ng/ml.

This study alerts for the most common limitations that forensic pathologists face in the interpretation of toxicological results and raises the need to create a reference table for different substances, namely olanzapine, using the Institute's case numbers.

**Keywords:** forensic autopsy, olanzapine blood concentrations, fatal intoxications

## ORAL PRESENTATION

# *Post-mortem concentrations of vitreous potassium, xanthine and hypoxanthine in estimating time since death*

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**Introduction.** Post-mortem biochemical analyses can aid in estimating time since death. We compared vitreous potassium, xanthine and hypoxanthine levels with post-mortem interval (PMI) estimated based on body temperature, rigor mortis and post-mortem lividity among various groups of causes of death.

**Material and methods.** A total of 358 cases were grouped according to cause of death. Post-mortem interval was estimated using changes in body temperature, rigor mortis and post-mortem lividity. Potassium, xanthine and hypoxanthine concentrations were measured from vitreous humor. A laboratory method for determining hypoxanthine values was developed within the research.

**Results.** Statistically significant correlations were established between PMI and potassium and hypoxanthine values. No statistically significant correlation was established between the causes of death and potassium, xanthine or hypoxanthine values. Among various causes of death, our analysis showed strong positive correlations between PMI and the analysed markers in carbon monoxide poisoning and traumatic deaths and between PMI and potassium in asphyxia. No statistically significant correlation was established between the levels of alcohol and narcotic substances and the analysed markers.

**Conclusion.** Outcomes of the research are used daily in forensic medical examinations in estimating time of death.

## ORAL PRESENTATION

### *No (physical) harm done*

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Regardless of it being a criminal offense, domestic violence exists worldwide. Portuguese law crudely defines domestic violence as the act of inflicting physical or psychological harm upon someone who the aggressor has or has had an intimate relationship with. The Portuguese Association for Victim's Support (APAV) took notice of 53,997 alleged domestic violence offenses between 2013 and 2015, the majority (37.7%) being related to psychological distress. The assessment of bodily harm, for judicial purposes, is carried out by medical doctors working at the National Institute of Legal Medicine and Forensic Sciences (INMLCF). Assessing psychological harm is highly complex, often demanding a multidisciplinary team.

In the case at hand, a 38 weeks pregnant 27-year-old woman at the time of the first forensic exam, with no known psychiatric history, reported emotional pressure and threats by her ex-boyfriend. This behaviour began by the end of their 4-year relationship, after she confronted him with his adulterous episode, and continued for about a year. As she teleworked for the company he managed, he tried to fire her, getting her suspended for a few months, before a court finally overturned the case. When she told him about her pregnancy, he coerced her into having an abortion, which she refused on religious grounds. Then he offered her money to leave the country, and threatened to physically hurt her. She consulted a psychiatrist and was diagnosed with major depression, starting medication. Later, she began psychological care at APAV.

The case was analysed by medical doctors and a forensic psychologist at INMLCF. It was concluded that there was a causal relation between the alleged facts and the psychiatric diagnosis.

In court, the plaintiff was unable to prove her allegations (even ending up being accused herself of criminal offenses by the defendant). As such, no criminal charges of domestic violence were pressed by the State Department. In the end, criminal proceedings were terminated, as both the plaintiff and the defendant dropped their charges against each other.

Cases involving psychological harm should be granted special attention and be handled by a multidisciplinary team. Bodily harm assessment, especially in this type of situations, largely depends on the testimony the subject provides the expert with. As such, the medico-legal conclusions are elaborated in accordance to a testimony that might not be able to be proven in a court of law.

## *Fatal consequences of tramadol use/abuse*

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**Introduction.** Tramadol is centrally acting analgesic with a multimode of action. Tramadol is used to treat both acute and chronic pain of moderate to severe intensity. Tramadol is generally considered to be a relatively safe analgesic and a medicinal drug with low potential for addiction relative to morphine. At supra-therapeutic doses and rarely at therapeutic doses, intoxications may occur. Fatal intoxications are rare and appear to be associated with large overdoses of tramadol and co-ingestion of other drugs (including ethanol). There is growing evidence of abuse of tramadol in some European, North and West African and West Asian countries. In Slovakia, tramadol is a prescription-only medicine. The aim of the work was retrospective study of tramadol-related deaths in Slovakia.

**Patients and methods.** The analysis of all deaths related to tramadol use/abuse in Slovak republic in the years 2004 and 2015 was performed. The autopsies and additional laboratory examinations were performed in all the cases reported. According to the EMCDDA method the cases were divided into two groups: direct and indirect tramadol-related deaths. Statistical analyses were made by means of SPSS software.

**Results.** The criteria matched 106 cases. There were 70% of direct deaths and 30% of indirect deaths. Males comprised 67% of all cases and females 33%. Most cases (21%) were reported in the year 2013. The age categories from 35 to 59 years represented 63% of cases. Combination of tramadol with ethanol was detected in 25% and with benzodiazepines in 17% of cases. In the group of direct deaths, tramadol overdose in suicidal ideation was found in 46% of cases. From all deaths 54% occurred at home. In capital city, Bratislava and its vicinity there were 28% of all cases.

**Conclusions.** The results of the study showed expressive increased occurrence of fatal consequences of tramadol use/abuse in Slovak republic - 64% of all cases - in the period of years 2012–2015.

## *High-resolution mass spectrometry enables broad-spectrum urine drug screening in analytical toxicology*

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In addition to traditional illicit drugs, prescription drugs and new psychoactive substances (NPS) are widely abused. Conventional immunoassays possess a limited scope and are thus unsuitable for the detection of NPS. Similarly, the methods relying on analyte pre-selection may also be inappropriate for NPS which show transient movement on the drug market. A multi-drug screening method allowing the detection of unlimited number of substances with different physicochemical properties over a wide concentration range is necessary to meet the challenges of today's illicit drug scene.

A drug screening method based on ultra-high performance liquid chromatography-high-resolution quadrupole time-of-flight mass spectrometry (UHPLC-HR-QTOFMS) is an attractive option for the simultaneous analysis of traditional drugs of abuse, prescription drugs, and NPS. The feasibility of the screening method for drug testing was evaluated and compared with conventional approaches. The method offered the necessary sensitivity, selectivity, and flexibility required for the detection of a range of substances that exhibit low urinary concentrations. The ability of the method to collect data on both precursor and fragment ions without analyte pre-selection allowed the tentative identification of NPS metabolites for which a reference standard was unavailable. Moreover, the collection of all data enabled the correct identification of co-eluting isomeric compounds. Contrary to the conventional drug testing approaches, the HRMS method yielded more substance identifications and fewer false results than the others. The method allowed accurate assessment of drug abuse patterns of drug users. Such assessment is crucial for the successful treatment of drug dependent patients.

Incorporation of the continuously emerging NPS into drug screening is essential. Contrary to the conventional two-stage drug testing scheme (initial immunoassay testing followed by mass spectrometric confirmation), the new UHPLC-HR-QTOFMS method is anticipated to revolutionize drug testing in terms of scope and speed. The method allows the detection of true unknowns and retrospective analysis of stored data when searching for new previously unanticipated targets. The fields of application include cause-of-death investigation, driving under the influence of drugs, treatment of drug addicts and emergency toxicology.

## ORAL PRESENTATION

### *Once more about residenture in forensic medicine*

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Observing several programs of postgraduate education in Forensic Medicine (FM) we can see remarkable difference in study program subjects and duration of studies. This allows suspect that knowledge and practical skills of young specialists are different in countries of EU.

Even in our Baltic states there are significant differences in study programs of FM residents. So, program in Estonia with one year previous studies in pathology is similar to Germany, but study program in Lithuania with big amount of clinical disciplines and minimal time for forensic pathology rises association with program of Italian universities. In Latvia postgraduate education in FM has developed from 1 year studies at internature in 90-ies to 4 year studies since 2016. In 2009 the main producer of postgraduate education in FM was changed. SCFME took over finances and organization of practical studies from university depending on departments of SCFME: **forensic pathology and histology** with studies in pathology and child pathology; **clinical forensic medicine** with studies in traumatology, neuropathology, radiology, psychiatry, psychosomatics and forensic psychiatry; **forensic toxicology** with clinical toxicology, narcology, intensive care; **forensic biology; medical criminalistics; legal questions of FM**. Theoretical and practical training of residents is connected with duty to observe scene of death, scientific research, pedagogical activities, participation at court sessions. In the 2nd year of studies residents start work as a probationers at the departments of SCFME. SCFME collaborates with university to realize separation of new residents, development and accreditation of study programs, organization of common lectures, scientific conferences, observation of study program quality and final examination of residents. Final exam is connected with certification exam at Latvian Doctors association and includes examination of practical skills, report on four years studies, presentation of scientific research, revision of theoretical knowledge.

Tasks of postgraduate programme in forensic medicine give good balance among forensic medicine practice, theory, scientific researches and pedagogic skills, tight connection with further working place and colleagues from the first day of residenture. Higher quality and harmonisation of postgraduate education programs demands their international accreditation and acceptance of diploma in EU.

## *Stature estimation in a modern Japanese population based on clavicular measurements using multidetector computed tomography*

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The aims of this study were to assess the correlation between stature and clavicular measurements in a contemporary Japanese population using three-dimensional (3D) computed tomographic (CT) images, and to establish regression equations for predicting stature. A total of 249 cadavers (131 males, 118 females) underwent postmortem CT scanning and subsequent forensic autopsy between October 2011 and May 2016 at the department of legal medicine of Chiba University. Four clavicular variables (linear distances between the superior margins of the left and right sternal facets to the anterior points of the left and right acromial ends and between the superior margins of the left and right sternal facets to the left and right conoid tubercles) were measured using 3D CT reconstructed images that extracted only bone data. The correlations between stature and each of the clavicular measurements were assessed with Pearson product–moment correlation coefficients. These clavicular measurements correlated significantly with stature in both sexes. The lowest standard error of estimation value in all, male, and female subjects was 3.62 cm ( $r^2 = 0.836$ ), 3.55 cm ( $r^2 = 0.566$ ), and 3.43 cm ( $r^2 = 0.663$ ), respectively. In conclusion, clavicular measurements obtained from 3D CT images may be useful for stature estimation of Japanese individuals, particularly in cases where better predictors, such as long bones, are not available.

## ORAL PRESENTATION

### *Suicides in vulnerable age groups in Estonia*

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According to Statistics Estonia, there were 2598 suicides during the period of 2005–2015. The number of suicides fluctuated between 273–195 in these years being highest in 2005. The mean suicide rate per 100,000 deaths was 17.3.

In our study we focussed on self-intentional deaths of children and elderly as most vulnerable age groups. The study is based on data collected from Estonian Forensic Science Institute, Statistics Estonia and Eurostat databases.

Over this 10-year period there were 86 suicide cases of children (aged 10–18) registered by EFSI in Estonia, this accounts for 20% of all children's deaths recoded by Statistics Estonia. The youngest person to commit suicide was 11 years old. Usually girls are more likely to plan committing suicide, but boys make up the majority of deaths, which was 75.8% in our study. The main cause of death was mechanical asphyxia from strangulation and approximately quarter of deceased had consumed alcohol prior to death.

In the group of elderly people (aged 70+) the average number of suicides per year was 41 which is approximately 18% of all suicide cases.

## ORAL PRESENTATION

### *Illegal fentanyles – 15 years in Estonia*

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**Introduction.** Heroin disappeared from the Estonian illegal drug market in 2001, and was replaced by poppy straw during some years, but at the same time illegal fentanyl made its way to Estonia. Currently, poisonings and lethal cases by fentanyles are in the spotlight also in several other countries, e.g Germany, USA and Sweden.

**Aim.** The aim of this study is to provide an overview of deaths caused by fentanyles in Estonia from 2002 until 2016.

**Methods.** The data (age, gender and cause of death) was collected from the autopsy reports of the Estonian Forensic Science Institute in 2002-2016.

**Results.** According to the data, the main cause of fentanyl-related deaths was poisoning by fentanyles, followed by asphyxia from aspiration of gastric content, and only few cases due to other causes, i.e. falling from height or traffic accidents. The ratio of male to female has been consistent, but the mean age has increased during 15 years. The types of fentanyles on the market have varied during these years, however the largest part of illegal drug deaths has occurred due to fentanyl, followed by 3-methylfentanyl. Since 2016, new analogues of fentanyl have been circulating in Estonia.

**Conclusion.** Although fentanyl does not make as many headlines as it used to, its abuse is still a widespread problem with death rates being consistent over the years. The struggle against fentanyl addiction continues to create new challenges even today with ever more analogues appearing on the market.

## *Sudden cardiac death in younger than 40 and forensic medicine practice in Latvia, 2007–2016*

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**Introduction.** Despite of improvement on early diagnostic, the rate of sudden cardiac death (SCD) in young people remains relatively high and in most of cases, the death is the first manifestation of cardiac disease.

**The aim of study** was to evaluate the morphological structure of SCD of young individuals in Latvia in period of latest ten years.

**Material and methods.** We analysed data from the database of the State Centre for Forensic Medical Examination of Latvia and data from the Centre for Disease Prevention and Control of Latvia in period of 2007–2016. Analysis included all sudden cardiac death cases caused by cardiomyopathies and ischemic heart disease in younger than 40 both women and men.

**Results.** During the years of 2007–2016, 1371 cases of SCD of young individuals were evaluated. Mostly different types of cardiomyopathies as a cause of death were observed in this age group. SCD in populations of young individuals more often had been observed in men.

**Conclusion.** Coronary problems occur more in patients closer to age of 40 years, but cardiomyopathies remains as dangerous disease in all ages. Diagnostical algorithm may improve early detection of high risk and decrease mortality. Implementation of guidelines for autopsy investigation of SCD may improve morphological diagnostics.

**Keywords:** sudden cardiac death

## *Analysis of wastewater reveals day to day variation in the use of abused drugs in Finland*

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Daughton proposed in 2001 that untreated waste water can be considered as a diluted urine sample and can be utilized to estimate the use of abused drugs in a society. During the next few years several waste water epidemiological studies were conducted in Europe, the US and Australia. Studies have revealed a different pattern of abused drugs between countries. In Southern Europe typical findings are cocaine and heroin whereas in Northern and Eastern Europe amphetamine-type stimulants dominate. The variability is not limited to geography only but happens also temporally.

In our study daily samples from nine waste water treatment plants (WTP) were collected in 2012. WTPs represented the metropolitan area, university cities and rural towns. One main topic of our study was to investigate possible differences between weekdays and weekends.

The 24-hour composite influent wastewater samples were collected during eight days in August 2012. The samples were frozen without delay and thawed just prior the analysis. A LC-MS/MS method was utilized after solid phase extraction.

In most WTPs the concentration of amphetamine, metamphetamine, codeine, morphine, methadone and THCA were relatively constant during the eight day study. This finding tells us that the number of abusers of these drugs and the daily doses taken are relatively constant. On the other hand ecstasy and cocaine presented a completely different picture: they were detected mostly in Helsinki and Espoo and the rural towns showed very low concentrations. The concentrations during week days were low also in Helsinki and Espoo and increased during weekends.

An interesting and a novel feature was detected: in Helsinki the maximum concentration of these two recreational drugs was evident during Saturday-Sunday but in Espoo next day, during Sunday-Monday. An explanation for the phenomenon is that young people come to party from Espoo to Helsinki where the fashionable restaurants and clubs are located. The party animals bring the drugs in their body home and next day piss within an area of another WTP. In this respect Espoo seems to be a dormitory suburb of Helsinki.

## *Comparison of the Work of Forensic Medical Examiners in Estonia and the State of Florida (Duval County Jacksonville)*

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<sup>2</sup>Duval County Medical Examiner's Office Jacksonville, Florida, USA

**Introduction.** In this presentation, we compare forensic medical (examiner) systems in two countries, Duval County Medical Examiner's Office Jacksonville, Florida and Estonia.

The main objective of the project was to develop cooperation between forensic medical examiners in Estonia and the United States and to compare different investigative techniques/methods to improve the quality of case determinations.

**Results.** The professional training system of forensic medical examiners is very different in two countries. In Estonia the duration of residency is four years and the programme covers pathology, forensic medicine and clinical medicine (radiology, gynaecology, etc.).

In Jacksonville, the duration of residency is five years, four of which focus on general pathology and one on forensic pathology

In Estonia, forensic medical examiners are on duty round the clock and, if necessary (in most homicide events), participate in examinations of the deceased at the request of the organisation conducting proceedings (police). In the United States, it is attributed to lay investigators employed by the medical examiner's office, who decide whether a death is a medical examiner's case.

Examination reports are similar in both countries. The cross findings should be described in sufficient detail to support the diagnosis, opinions and conclusions. An examination report consists of an external examination, evidence of medical intervention (e.g. injuries), an internal examination, a toxicological examination, tissue submitted for histology and other examinations.

In Estonia, the conclusion of a forensic medical doctor should be very thorough and detailed. In Jacksonville, a forensic medical examiner only states the cause and manner of death in the opinion.

**In conclusion,** it can be said that forensic medical examiners follow the same principles in their work in both countries and the differences mainly arise from legislation.

The main differences are: the training system, the conduct of autopsies and inspection, the participation of forensic examiners in the examination in crime scene, and the formulation of forensic examiners' opinions.

## *An objective approach using three indexes for determining fatal hypothermia due to cold exposure; statistical analysis of oxyhemoglobin saturation data*

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There is no specific sign when we examine cases of fatal hypothermia. Although, the environment surrounding the victim is important, comprehensive investigation is needed for postmortem diagnosis of fatal hypothermia, including complete autopsy, histology, toxicology and biochemistry, excluding other causes of death. A color difference between the left and right heart blood (CDL/RHB) is a common sign characteristic of fatal hypothermia, for which the incidence is reported as around 95% in Japan. However, visual color discrimination is subjective. The color difference is caused by difference of oxyhemoglobin (O<sub>2</sub>-Hb) saturation level between left and right heart blood. Some studies have attempted to analyze the O<sub>2</sub>-Hb saturation level in hypothermia cases. Previous studies suggested the bilateral heart blood oxyhemoglobin level is useful as an indicator of death involving exposure to cold air; however, its diagnostic validity has not been statistically established. The present study analyzed postmortem oximetry data in 77 serial autopsy cases of fatal hypothermia to establish quantitative diagnostic criteria. We have devised three indexes for determining hypothermia; the O<sub>2</sub>-Hb saturation in left heart blood (L-O<sub>2</sub>Hb), the O<sub>2</sub>-Hb saturation gap between left and right heart blood (L-R gap) and the O<sub>2</sub>-Hb saturation ratio between the left and right heart blood (L/R ratio). We quantified conventional subjective visual evaluation of O<sub>2</sub>-Hb saturation levels and developed useful diagnostic criteria for fatal hypothermia: L-O<sub>2</sub>Hb was  $\geq 36\%$ , L-R gap was  $\geq 13\%$ , and L/R ratio was  $\geq 1.8$ . When we used L-O<sub>2</sub>Hb of  $\geq 36\%$  as a basic criterion and applied a further criterion of an L-R gap of  $\geq 13\%$  or an L/R ratio of  $\geq 1.8$ , these criteria registered a sensitivity level of  $\geq 86\%$  and specificity level of  $\geq 93\%$  for the diagnosis of fatal hypothermia. This method can be useful for determining fatal hypothermia together with conventional autopsy findings, as well as histological and biochemical markers.

## *Only the body knows: fall from height vs. traffic accident. A case report*

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**Introduction.** According to the World Health Organization, around 424,000 people die every year from falls. This is the world's second leading cause of accidental or non-intentional deaths, right after traffic accidents, making this a huge public health problem. Falls affect mainly the population over 65 years of age.

We present a case where the forensic autopsy was of massive importance to establish the circumstances surrounding death, namely the event that had happened.

**Case.** A 30-year-old male, with no relevant pathological background, was found dead in the driveway, just below a series of balconies of a building, later found to be where the victim was staying over.

A car was seen speeding away from the scene so, initially, the authorities did not know if they were dealing with a hit and run or a fall from height.

The forensic autopsy was performed and externally the corpse had clinical signs of multiple ribs fracture and open right arm fracture, with multiple bruises and abrasions on the thorax, abdomen, right upper extremity and thighs. The legs did not have external signs of injury. Internally, he had basal skull, facial, multiple ribs, supracondylar, dorsal and pelvic fractures, and lung, left hemidiaphragm and liver lacerations.

Toxic screening was negative for pharmaceutical drugs, drugs of abuse and ethanol.

**Discussion/Conclusion.** This case enhances the need for a thorough and wide investigation of the crime scene, and an open mind to all the possible scenarios. It is crucial to the forensic pathologist to be aware of these possibilities so that his investigation can address any issues or any doubts that arise. It presents a challenge to the forensic pathologist, as he should have great knowledge and experience that allows him to distinguish whether the victim died from a traffic accident or a fall from height, as both of them classically produce blunt force trauma injuries.

We established the cause of death as multiple blunt injuries due to fall from height. The manner of death remained unknown.

## *Forensic and social impact of accidental firearms death during Jordanian celebration*

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<sup>1</sup>The University of Jordan

**Objective.** Shooting firearms is a common practice among Jordanians during celebration. This popular phenomenon is spreading among the population, where it has resulted in several accidental firearms death (FAD) during these celebrations. It threatens peace and security of the whole community. This study shows the forensic and social impact of the FAD within Greater Amman city

**Method.** One hundred and sixteen medico-legal reports related to (FAD) were collected from the archives of three hospitals Jordan University Hospital (JUH), Prince Hamzeh Hospital, and Prince Faisal Hospital over a six-year period (2008 to 2013). Toxicology screens for psychoactive drugs and alcohol were conducted on biological specimens that were collected from these victims. The results were tabulated according to age, gender, and victim's status.

**Results and discussion.** Over the six year period, 116 FAD reports were reviewed, the largest incidents occurred in 2013 (n=35, 35.2%). The highest incidents (n=19, 16.4%) occurred during June, where the lowest (n=3, 2.6%) occurred during November. The age group of (20–29 years) was most commonly affected (n=50, 43.1%), followed by 30–39 years group. FAD manner of the death was homicidal (n=50, 43.1%), followed by accidental, (n=24, 20.7%) and suicidal (n=36, 31.0%). The majority of FAD (n=91, 78.4%) were due a single shot, followed by two shots (n=9, 7.8%), also the majority resulted from shooting from distant (n=64, 55.2%). Only 36.2% of FAD had immediate deaths and occurred primarily due to wounds that were located in head region.

The study had set several recommendations, having in mind, the power always seeks to control and spreading through two perspectives, the first legal and legislative, through its role to enact the necessary legislations for arms control and circulation, and the second is desensitized and guiding which aims to inform citizens about the seriousness of the weapon and using it, as well as activation moral and social sense among citizens.

**Keywords:** firearms, fatalities, accident, jordan

## POSTER PRESENTATION

### *The prevalence of blood borne viral infections among autopsy cases in Jordan*

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Autopsies can be associated with exposure to blood borne viruses. Knowledge about the prevalence of these infections among autopsies is prudent to appreciate any risk of transmission and to further enforce safety measures. Autopsies performed during the study period were tested for hepatitis B surface antigen, hepatitis C virus antibody, and human immunodeficiency virus antibody. Positive tests were subsequently confirmed by polymerase chain reaction. A total of 242 autopsies were tested. Age ranged from 3 days to 94 years (median 75.5 years, mean 45.3 (21.9 ± SD)). There were 172 (71%) males. The cause of death was considered natural in 137 (56.6%) cases, accidental in 89 (36.8%), homicidal in 9 (3.7%), suicidal in 4 (1.7%), and unknown in 3 (1.2%). Hepatitis B surface antigen was positive in 5 (2.1%) cases. Hepatitis C virus antibody was detected in 5 (2.1%) cases and the hepatitis C virus polymerase chain reaction was positive in 2 of them (0.8%). HIV antibody was not detected in any of the cases. There is low prevalence of infections with these viruses in our autopsy cases. However, the risk of transmission remains a threat. Healthcare workers in the forensic departments should adhere to standard precautions.

## *Alcohol related deaths in Lithuania in 1985–2016 according to medico-legal data*

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**Introduction.** Since the problem of excessive alcohol consumption in Lithuania still exists, in our opinion the data of medico-legal examinations could be more vastly used for estimation of alcohol prevalence in society, for determination of causal relationship between alcohol consumption and mortality rate and for working out prevention measures against alcohol abuse.

**Materials and methods.** We analyzed the medico-legal autopsies data of persons who had died after alcohol consumption during the period of 1985–2016.

**Results.** During the investigated period the average medico-legal autopsy rate in Lithuania fluctuated around 15.0%. 137 884 unnatural deaths (up to 98.0% of total number of registered accidents, suicides, homicides) underwent routine forensic autopsy procedure. In 56.5% of them, blood tests for alcohol were positive. In victims who died due to drowning the blood tests for alcohol were positive in 61.0% of cases; carbon monoxide poisoning in 69.3%, hypothermia in 65.8%, stab wounds in 65.0%, hanging in 58.6% and choking in 72.4%. During the period of 2012–2014 the total number of medico-legally investigated natural deaths in Lithuania was 9975. In 27.6% of them the blood tests for alcohol were positive. 28.8% of persons who died due to heart ischemic disease in a moment of death were alcohol intoxicated. The alcohol consumption prior to death in cases of epilepsy was confirmed in 29.2%, in alcoholic cardiomyopathy in 31.6%, in alcoholic liver cirrhosis in 39.0%. During the period of 2010–2016 a tendency of relatively decrease of deaths due to external causes was observed. Among them the number of confirmed alcohol consumption cases was decreased as well. The prevalence of deaths due to external causes in Vilnius region (28.0% of total population) comparing with rest part of the country can be observed. Vilnius regional forensic mortuary autopsied 40.2% of hypothermia cases (2010–2014), 57.5% of fatal alcohol poisonings (2016) and 66.3% of drags related deaths (2010–2014).

**Conclusion.** The high prevalence of alcoholization among unnatural deaths showed insufficiency and inadequacy of prevention measures against alcohol abuse in Lithuania. Our investigation supposes that including the blood alcohol tests data into the State Register of Causes of Death could be appropriate for enhancing the alcohol-induced health damage monitoring.

**Keywords:** alcohol related deaths, alcohol consumption, medico-legal data

## *Comparative analysis of suicide and alcohol use in Lithuania based on forensic medical data*

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**Introduction.** As the problem of the suicide rate still persists in Lithuania, the data of forensic medical examination of suicide cases and their assessment results could be more comprehensively used for revealing the suicide causation and prevention.

**Aim and methods.** Several studies on suicide in Lithuania have been conducted based on the forensic medical data of analysis on the causes of death.

**Results.** In Lithuania, the population has decreased by 20 percent since 1992, the rates of external causes of death and suicide have decreased as well. However, no essential factors determining the decrease in suicide rates have been established. The persisting high suicide ratio among the external causes of death, as well as a high suicide ratio among the cases of alcohol intoxication shows that in Lithuania, alcohol consumption reduction and suicide prevention measures have not been duly used and were ineffective. Suicide cases comprised more than one fourth of the total number of deaths due to external causes: in 2016 26.9%. In 1985–2016 the prevailing rate of suicide by hanging among the external causes of death was 24%. Among the total number of deaths due to external causes which included consumption of alcohol (intoxicated), in 2014, hanged intoxicated people comprised one third – 33, 5%. This is the highest rate since 1985. About 55–60% of men and 29–35% of women who committed suicide were drunk at the time of their deaths, a new study revealed in Lithuania. The persisting high suicide ratio among the external causes of death, as well as a high suicide ratio among the cases of alcohol intoxication shows that in Lithuania, the alcohol consumption reduction and suicide prevention measures have not been duly used and were ineffective.

**Conclusions.** Based on the data of forensic medical overview on suicides, it is not possible to connect a partial reduction in the suicide rate with particular prevention strategies implemented. A high correlation between consumption of alcohol and suicide rate is observed; so the forecasting of specific suicide prevention strategies requires a detailed study on the effects of consumed alcohol on suicides. Not all information on suicides is recorded in official statistics. Only the use of the pre-trial investigation data facilitates objectivisation of the suicide rate.

**Keywords:** suicide rate, alcohol (intoxicated), forensic medical data, Lithuania

## *Possibilities of forensic medical examination of gunshot injuries in Lithuania based on the case study*

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**Aim of the study.** Introduction of practical possibilities of forensic medical examination of gunshot injuries in Lithuanian forensic medical practice based on the homicide case study.

**Methods.** The assessment of findings of the examination of the dead body at the scene of crime, external and internal examination of the body, computed tomography (CT scan) and examinations conducted at the Medical Criminalistics Laboratory, using the results for determining the cause of death, shotgun injury characteristics and for considering other related issues.

**Results.** In Lithuania, deaths from gunshot injuries are not plentiful: in 2001–2012 they amounted to 0.7–1.4% of the total external causes of death (the number of cases 652). 28.2% of deaths from gunshot injuries included homicide, 50.2% were suicide victims. During the investigation of deaths caused by gunshot injuries, forensic medical examinations can reveal a lot of data which is very important in criminal investigation. Based on a particular practical case study we want to illustrate the use of examination methods that are applied in Lithuania for the examination of dead bodies whose death occurred due to gunshot injuries. Forensic medicine experts' actions in the investigation process of the murder case involved the following stages: the examination of the body at the scene of crime, external and internal examination, CT scan of the body, examination of gunshot injuries conducted at the Medical Criminalistics Laboratory. The CT scan method allowed specifying the tissue (organ) structures damaged by the channel injuries and restoring a three-dimensional (3D) image of the skull and chest bones' injuries. The received set of results enabled to provide comprehensive answers on major issues raised by the investigation of the murder case. The applied illustration of the findings method (photographs, images and diagrams, etc.) not only objectively justified the results but also facilitated their better understanding for the judicial process participants (not forensic medical professionals).

**Conclusions.** Forensic medical experts' involvement in all stages of the examination of a corpse, as well as the applied computed tomography and Medical Criminalistics Laboratory examination methods facilitated achieving faster and better results in the process of determining the cause of death from gunshot injuries.

**Keywords:** homicide, gunshot injuries, bullet, injury channel, computed tomography, medical criminalistics.

## *Micro vs Macro – Case Report*

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**Introduction.** Initially in medico-legal expertise, macroscopic findings are evaluated. However, based solely on the macroscopic findings diagnosis cannot be fully formulated, sometimes it may even turn out to be incorrect. Therefore, microscopic examination is equally important in medico-legal expertise. It not only helps design complete diagnosis, but also can change the course of examination and subsequent conclusions.

**Aim of the work.** To present the cases of State Centre for Forensic Medical Examination of the Republic of Latvia in practice, where the macroscopic picture has been different from the microscopic findings, which were the basis for changing diagnoses.

**Results.** The differences between the microscopic and macroscopic findings were observed in not only pathology and disease, where the accurate determination of diagnosis was made after microscopic examination, but in differential diagnosis between traumatic organ damage and organ pathological changes - when in the result of the microscopic examination, it was established organ damage type.

### **Conclusions.**

- The diagnosis cannot be completely accurate if it is based only on macroscopic picture.
- In cases, where the objects are also investigated microscopically medico-legal expert can fully understand the cause of death, because what is not visible macroscopically will always be seen in a microscope.
- There are some cases where macroscopically traumatic organ damage turned into the disease and vice versa.

## POSTER PRESENTATION

# *Mortality rate among homeless people in Budapest, Hungary*

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The concept of homelessness appeared in Hungary at the end of the 1980s. At first, only a few hundred people lived in the street, but since the 1990s their numbers have been increasing. Accordingly, their mortality statistics have also increased.

We have investigated the death of homeless people in the capital of Hungary. People were considered homeless, if it was stated in the anamnesis or declared on the death certificate.

The Department of Forensic and Insurance Medicine (DFIM) is part of the Semmelweis University. It is the primary forensic pathology center in Budapest and Pest county, conducting approximately 2600 autopsies a year. In Hungary in a case of a violent, unnatural death, or death without unknown circumstances a forensic autopsy is ordered by the police. All cases in this study underwent a forensic autopsy with macroscopic and microscopic examination of all major organs.

The cause of death was determined by the forensic pathologist on the basis of autopsy findings, toxicological analyses, circumstances of death, and if necessary other medical documentation from hospitalization before death.

In this retrospective study we examined all homeless people's death cases at the DFIM between 1987-2016.

During the 30 years examined, 2196 deaths occurred, 1971 male and only 225 female. The youngest homeless was 17, the oldest over 75. The death occurred in 40% of the cases on the street, fewer in hospitals, and even less in someone's home. Only in 20% of the cases, the blood alcohol was over 0.5%. Most of the death occurred, as it was expected, in winter time.

The cause of death in more than 60 percent of the cases was natural, followed by accidental, suicide and homicide cases.

In Hungary it's the first overview of mortality rate of homeless people what's based on objective data. Based on our findings, we would like to give a background for policy makers, healthcare providers, and social parties to have successful intervention, to eradicate homelessness, and give a better chance for a healthier life.

## *Prevalence of alcohol and other psychoactive substances in drivers: an issue for traffic safety in Lithuania in the EU content*

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**Introduction.** The critical issue of research is the analysis of current situation and dynamics on use of alcohol, drugs and medicines in drivers in correlation with a traffic safety policy implementation in Lithuania in the EU content. Lithuania is one of the countries with the highest fatality rates in the EU, despite the significant decrease that has been recorded since 2007. During the last period, the fatality rate in Lithuania has decreased by 62%, with a steep drop in fatalities per population. The majority of EU-recommended road safety laws are adopted by the country. The scope of the problem is that the highest shares of road fatalities in Lithuania are among car occupants and pedestrians and it is significantly higher than the EU average.

**Research aims.** The research aimed to combat the problem of driving under the influence of psychoactive substances by providing valuable data and solid scientific base on for policy makers on national level which initiative is based on the integrated European research project “Driving under the Influence of Drugs, Alcohol and Medicines” and is important for future surveys and policy implementation for traffic safety.

**Methods and results.** The findings show that alcohol is still one of the most dangerous psychoactive substances used by drivers. The biggest risk for a driver to be seriously injured or to die in a traffic accident arises from high blood alcohol levels or from combinations of alcohol, drugs or medicines. The results show that alcohol is by far the number one psychoactive substance on Lithuanian and European roads, followed by illicit drugs and medicinal drugs. For illicit drugs THC is the most frequently detected drug in traffic, followed by cocaine. Amphetamines and illicit opiates were less frequently detected. It is recommended that national surveys on the prevalence of substance use in traffic would be carried out on a regular basis to monitor the trend of drunk and drug driving.

**Conclusions.** In current days the most important issue of research is to support the implementation of EU legislation on new psychoactive substances by improving the capacity to identify and assess new psychoactive substances by sharing best practices on prevention and traffic safety policy implementation. The results of research done will be an important issue to be discussed based on traffic safety policy development in the EU content.

**Keywords:** alcohol, psychoactive substances, drivers, traffic safety

## *Chronic liver damage effect on lethal ethyl alcohol poisoning*

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**Introduction.** In forensic medicine practice, high blood ethanol concentrations are often detected and frequently forensic expert face difficulties with the interpretation of these results. It is well known that chronic alcohol consumption is associated with a variety of pathomorphological changes in different organs, particularly in liver. The aim of the study was to find out how lethal ethanol concentration is affected by changes in liver that are typical for chronic alcohol consumption.

**Materials.** We selected 560 cases (2012–2014) from the archives of State Centre for Forensic Medical Examination (Latvia), where high ( $\geq 3\%$ ) ethanol concentration was found in cadaver's blood and/or urine. Cases where other toxic substances were found in blood were excluded. We selected two groups of causes of death for the study: toxic effect of ethanol (n=145) and mechanical asphyxia by hanging (n=42); the latter was included in the study as a control group. We examined 134 and 27 microscope slides of liver, respectively, by light microscopy and evaluated the following parameters: degree of steatosis, degree of fibrosis, portal inflammation, lobular inflammation, presence of hepatocyte ballooning and Mallory-Denk bodies. Data about concentration of ethanol, sex, etc. were obtained from forensic examination reports.

**Results.** Median concentration of ethyl alcohol when death from alcohol toxic effects occurred was 4.17‰ (IQR=1.08) in blood, 4.83‰ (IQR=1.12) in urine. Statistically significant difference of blood ethanol concentration referring to each of the chronic liver damage parameters was not observed: depending on degree of steatosis (p=0.561), degree of fibrosis (p=0.925), portal inflammation (p=0.606), lobular inflammation (p=0.507), presence of hepatocyte ballooning (p=0.537), presence of Mallory-Denk bodies (p=0.796). All cases were divided into consecutive chronic liver damage stages – without chronic liver damage (n=12), steatosis (n=86), hepatitis (n=30), cirrhosis (n=6). The ethanol concentration in all the stages was approximately the same and statistically significant difference of ethanol concentration was not observed (p=0.828 for blood, p=0.769 for urine). In addition, there was no statistically significant difference when distributing cases, taking sex into account.

**Conclusions.** Liver damage typical for chronic alcohol consumption did not significantly affect the concentration of ethanol in the blood and urine at which death from alcohol poisoning occurred.

## *Identification of injury mechanism in the event of automobile trauma*

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**Introduction.** On the basis of preliminary data, the traffic accident took place in Ida-Viru County on 22 March 2006, in the course of which a VOLVO bus drove over a pedestrian who was lying on the road.

The inspection report of the scene showed that the traffic accident took place on a straight section of the road, the road surface was dry and there were skid marks of the minibus on the road. A black men's cap and a brown wallet, 2.6 metres away from the hat, were on the road as evidence. According to the bus driver's explanation, he saw a bicycle on the road and then realised that he had driven over a man lying on the road. He tried to brake, but could not prevent the accident.

**Results.** Multiple wounds on the face and on anterior surface of both lower limbs, skin abrasions on the face, the left side of back and on both lower limbs, haematomas on the back and on the limb surface were stated in the course of forensic autopsy. Fractures of the left fibula and of right femur, multiple skull fractures (ethmoid bone, frontal bone), pelvic fractures, bilateral fractures of ribs, fracture of left humerus, fracture of the second dorsal vertebrae and lumbar vertebrae with spinal cord injury and rupture of sternoclavicular joint were stated in the course of internal examination. The cause of death was a closed blunt trauma with fractures of the calvaria and the cranial base and haematomas in the brain.

Upon forensic chemical examination, 2.48 mg/g of ethyl alcohol was found in the blood.

As the injuries stated in the course of forensic autopsy were not typical of driving over a lying person and as the facial injuries were characteristic of some specific object, a new inspection of the bus and the accident scene was carried out at the forensic pathologist's proposal. In the course of the experiment it was found that the soft tissue injuries on the face fit with the shape and height of the wing mirrors of the bus.

**Conclusion.** Injuries stated by the forensic pathologist helped to identify the mechanism of the traffic accident. In this particular case, the person was not lying on the road. On the basis of the inspection of injuries and the accident scene it was identified instead that the person was hit at first in the facial area by the wing mirror of the bus that was followed by the person falling on the road and being driven over in the area of his hip and lower limbs.

## POSTER PRESENTATION

### *Large meningioma - a random finding during autopsy*

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Meningiomas are a diverse group of formation arising from the meningeal coverings of the brain that contribute for 1/3 of primary brain tumours. The majority of them do not cause any symptoms and are discovered accidentally during imaging or autopsy. The symptoms mostly depend on the localisation, however, head dizziness, weakening of the limbs are designated as frequent. Rarely, seizures, personality changes and disturbed eyesight are present. During 2015-2017, there were 3 cases, when large meningiomas were discovered. Case 1: a body of a 58-year-old man was discovered on the floor of his home. Anamnesis: the history of chronic alcoholism was present. During autopsy a 5x6x4 cm meningioma was found, forming a 7x8x2.5 cm indentation in the both frontal lobes. There was no alcohol found in the blood sample. Cause of death: chronic ischemic heart disease. Case 2: a body of a 72-year-old woman was found at home. During autopsy a 7x5.5x2.5 cm, 75 g, meningioma was found, forming a sag 7.5 cm deep. A 2.45‰ of alcohol was present in the blood sample. Cause of death: hypothermia. Case 3: a body of a 50-year-old woman was discovered in the woods. Anamnesis: a history of head dizziness, disturbed eyesight and ataxic walking, episodes of disorientation, feet defiance was present. A brain tumour was suspected. During autopsy a 5x5x5 cm meningioma was found, forming 6.5x5x3 cm indentation in the both frontal lobes. There was no alcohol found in the blood sample. Cause of death: hypothermia. Meningiomas discovered during autopsy are normally not the cause of a sudden and unexpected death. This happens due to a slow growth of the tumour and the brain's ability to adjust to the increased intracranial pressure and mass effect.

## POSTER PRESENTATION

### *The work of a forensic doctor years ago and now*

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Forensic medicine has been taught in the University of Tartu since 1802, which makes it one of the oldest subjects there. During that period court-policedoctors were engaged in forensic science. On the initiative of professor Afanassi Ignatovski the Institute of Forensic Medicine was founded in 1895 and the speciality became independent.

The first law of forensic medicine was passed in 1935. After the Second World War, forensic medical analysis was complicated due the lack of trained medical experts and therefore autopsies were carried out by doctors from other specialities.

The first textbook in Estonian was published by professor Gerhard Rooks in 1938, which is still in use today.

In 1958, Ministry of Health of the Soviet Union created the Forensic Medicine Supreme Bureau to which all city and county experts were submitted. Further educating of forensic medicine doctors took place in St. Petersburg until Estonia became independent. After Estonia regained its independence, forensic doctors began to establish contacts with others colleagues from Europe.

In 1993 the institution was renamed Estonian Bureau of Forensic Medicine. Besides forensic medicine doctors in the bureau, there were forensic chemists, biologists and -toxicologists. In 2000 the DNA Department commenced work. Today the Estonian Forensic Science Institute has four regional departments: the Northern Estonian Forensic Medical Examination Department located in Tallinn (covering Tallinn and Harju County); the Southern Estonian Forensic Medical Examination Department located in Tartu (covering the City of Tartu and Tartu, Viljandi, Jõgeva, Võru, Põlva and Valga Counties); the Eastern Estonian Forensic Medical Examination Department located in Kohtla-Järve (covering Lääne-Viru and Ida-Viru Counties) and the Western Estonian Forensic Medical Examination Department located in Pärnu (covering the City of Pärnu and Pärnu, Lääne, Rapla, Järva, Hiiu and Saare Counties).

The Estonian Forensic Science Institute started working on January 1st in 2008. Since then it has been possible to do a dead body scan and a virtual medical autopsy.

Since 1998 Estonian forensic doctors are united in Association of the Estonian Forensic Medicine Doctors, from 2009 they are also in European Council of Legal Medicine.

The quality system of the Estonian Forensic Science Institute is based on internationally recognized standard: ISO/IEC 17020:2012 and laws of the Republic of Estonia or in legal acts based upon them.

## *Microscopic dynamics of fibrin evolution as an indication of the time of hemorrhage appearance in soft tissue*

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**Introduction.** The determination of trauma age always was an important issue for forensic medical experts. Tissue histological staining methods and microscopic examination help to solve this problem. In this research, we have tested selective staining of fibrin – Zerbino method, which is not used now at State Centre for Forensic Medical Examination of Latvia. This method makes it possible to define the age of fibrin in traumatic hemorrhage area by its color and identify 3 groups of it: “the newest one” (0–6 hours), “mature” (6–24 hours), and “old” ( $\geq 24$  hours) fibrin.

**Methods.** We examined soft tissue samples, that were obtained during forensic autopsies from traumatic hemorrhage areas, in cases, when the time of getting injury was known and death came in a short period or later in a hospital. Hematoxylin and eosin (HE) and Zerbino staining methods were used. Data (victims gender, age, the mechanism and severity of damages, ethanol intoxication) were analyzed. The results of staining (tissue reactions) were compared with a known time of injury.

**Results.** 23 cases were investigated and divided into 3 groups by fibrin color and its age. The first group (n=7) corresponds to the “newest” fibrin (0–2 hours). In 6 cases fibrin was not found in HE and Zerbino staining, in 1 case it was found in both methods, and its color was orange-red, that does not correspond to injury time. The second group (n=6) corresponds to the “mature” fibrin (6–24 hours). The fibrin was found in all these cases and its color corresponds to the time of injury. The third group (n=11) corresponds to the “old” fibrin (24 hours–5 weeks). In all these cases fibrin, which was colored light grey as well as yellow-orange and purple-blue, was found.

**Conclusion.** Zerbino method can be introduced in histological laboratory daily practice as an additional examination method and it is necessary to take into account all available information (hemorrhage macroscopic characteristics, HE staining results, the known facts of the case, etc.). During fibrin color evaluating, subjective perception of color has a very important role. Giving an evaluation of the age of fibrin it is necessary to take into consideration only «the oldest» fibrin color, because of re-bleeding possibility in damaged tissue, which can mask the true age of lesion.

## *Effects of Von Recklinghausen's disease on the biological profile determination from human skeletal remains – case report*

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**Introduction.** In Estonia, approximately 20–25 cases each year require the reconstruction of a biological profile from human skeletal remains. This generally includes ancestry, sex, age and stature of the individual, and is an essential tool in the identification process. In all these cases, extensive knowledge and practical skills in forensic anthropology are essential. Additionally, expertise in forensic anthropology is necessary for a reliable estimation of the postmortem interval, and in the assessment of traumatic lesions and taphonomic changes on bones. Unfortunately, there are no specifically trained graduates in Forensic Anthropology in Estonia. Therefore, all these cases are solved by a specialist in Forensic Medicine who has completed a short course of medical criminalistics in St Petersburg, Russia, and who is currently employed in Estonian Forensic Science Institute (EFSI).

**Aim of the work.** To introduce a particularly interesting case study in Estonian forensic science practice, and to show how von Recklinghausen's disease affected the determination of the biological profile from human skeletal remains.

**Results.** According to Zvjagin's method for sex determination, the skull under examination had several masculine characteristics. Conversely, the results of the DNA analysis showed a profile compatible with a woman who was diagnosed with von Recklinghausen's disease, obstructive hydrocephaly, epilepsy, depression and paranoid schizophrenia.

**Conclusions.** Diseases affecting the musculoskeletal system can influence the outcome of the most common methods used in biological profile determination.

In order to reduce errors in sex, age, stature and ancestry determination in individuals with musculoskeletal disorders, there is a need for theoretical and practical improvements in forensic anthropology in Estonia.

## *Detection of $\beta$ -blockers in human urine and blood by GC-MS method*

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In the forensic laboratory, there is a great demand for the reliable analytical procedure for the first screening of samples, which has to cover a wide range of substances in a single analytical extraction. The aim of our investigation was to extend the possibilities of our screening method to detect the group of  $\beta$ -blockers in biological samples of interest (blood, urine). SPE method was used for sample preparation and GC-MS method for analysing. As these substances are non-volatile, derivatisation step was added to avoid the false-negative results. Eight  $\beta$ -blockers were studied in this work: metoprolol, propranolol, sotalol, bisoprolol, atenolol, carvedilol, labetalol and nebivolol as well as antiarrhythmic agent propafenon. Both pure standards as well as spiked blood and urine samples were under the investigation. Optimized derivatisation procedure, mass spectra obtained, limits of detection will be present.

## POSTER PRESENTATION

### *Combined homicide-suicide in Osijek County, Croatia*

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Homicide-suicide is the homicidal killing of one or more persons followed immediately or very soon by suicide by the homicidal offender. Often the two lethal acts occur within 24 hours, such that the homicide(s) and suicide appear to be part of the same act. Two classifications are proposed: one based on psychopathology; the other on the nature of the relationship between the perpetrator of homicide-suicide and their homicidal victim(s).

Classification based on psychopathology:

One of the most common disorders in homicide-suicide is depression. It is common in those who kill members of their nuclear family and themselves. Uxoridal men and filicidal parents who commit suicide are especially likely to have been depressed. Whether or not the individual is mentally ill, a core element of the motivation may be common to many. The individual can no longer endure life without what is perceived to be a vital element; spouse, a family, a job, physical or mental health, cult to lead but cannot bear the thoughts of the other carrying on without him, so he force the others to join him in death.

Classifications of homicide-suicide based on relationship are:

- A. Consortial homicide-suicide.
  - 1. Possessive subtype.
  - 2. Physically-ailing consortial subtype.
- B. Adversarial homicide-suicide.
- C. Filial homicide-suicide.
- D. Familicidal homicide-suicide.
- E. Pseudo-commandos.
- F. Cult homicide-suicide.

Homicide associated with suicide represented approximately 5% of homicides and 1% of suicides in the region. Active partner or perpetrator had been male (M=10:F=1) in all cases but in one. On the contrary female were predominant (F=11:M=4) among the victims. Perpetrators were on the average older (32.6 y) than their victims (27.2 y). Fatal drama occurred mostly on the scene of couple's domicile house. Husband, partner or boyfriend were typical offenders in consortial type of homicide-suicide. Filial homicide-suicide represented second frequent type. In each of one homicide-suicide event parent killed two of his/her children and in one case father killed his son. Children's age ranged from four months to fifteen years. As perpetrator was dead and unavailable for psychiatric analysis it was difficult to uncover his mental and emotional conditions. But suicide letters leaved in four cases manifested that the perpetrator after having lost the life sustaining element known as hope decided to commit homicide-suicide.

**Keywords:** forensic pathology

## POSTER PRESENTATION

### *Last beat or last breath (case report)*

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**Case report.** Male, 63 years old, with type 2 diabetes mellitus and chronic ischemic heart disease, suddenly turned purple and fell to the ground, while having an afternoon snack with his daughter. She initiated resuscitation manoeuvres and tried to remove a foreign body from her father's throat, but he kept breathless and froth started coming out of his mouth.

At the forensic autopsy, we observed a male body, with a BMI of 24.6 kg/m<sup>2</sup>, without any signs of external trauma. Internally, there was an anterior fibrosis ring in the trachea, occluding it by approximately 30%, a foreign body totally obstructing the right main bronchus (alimentary content) and white scar tissue with a haemorrhagic centre affecting the heart apex and the posterior left ventricle wall.

The forensic histology examination revealed an acute myocardial infarction, with at least 5 hours of evolution.

The forensic toxicology examination came back negative for pharmaceuticals, drugs of abuse and ethanol.

**Discussion.** In this post-mortem examination, we found an acute myocardial infarction and an obstruction of the right main bronchus. Although this obstruction may not impede the victim from breathing, we cannot exclude that the foreign body could not be located above the tracheal obstruction and then descended during resuscitation manoeuvres.

However, there could have been a moment of hypoxia, resulting from the main bronchus obstruction, which could have led to the worsening of the acute myocardial infarction, making this episode fatal.

Considering the facts mentioned above, we concluded that we could not separate these findings and established the cause of death as the acute myocardial infarction aggravated by the right main bronchus occlusion.

**Conclusion.** As an autopsy objective, the establishment of the cause of death can turn into a challenge, be it because we do not find any suitable cause or because we find more than one. In this case, we established the cause of death as an acute myocardial infarction aggravated by the right main bronchus occlusion, although the death could also be due to the acute myocardial infarction or to the probable complete obstruction of the trachea by themselves.

## POSTER PRESENTATION

### *Determination of propane and butane in blood and lungs. Case study*

Aime Riikoja<sup>1</sup>, Vardo Saarik<sup>1</sup>

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According to the preliminary data, a dead male aged 31, was found inside his car with 4 balloons of propane gas. It was supposed to be a suicide. Analyses were performed with samples taken from both blood and lungs. For analysis and detection, the headspace gas chromatography with flame ionization detector (HS GC FID) was used first. The results were confirmed by GC-MS after gas-phase sample collection with solid phase microextraction (SPME). Both blood and lungs contained propane and butane.

**Keywords:** propane, butane, SPME, HS GC-FID, GC-MS

## POSTER PRESENTATION

### *Development and validation of hypoxanthine and xanthine determination method in vitreous humor*

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This study was performed under the project of University of Tartu, The Estimation of Postmortem Time. Importance of Biochemical Studies. Grant of University of Tartu PUT 98

Hypoxanthine (Hx) is a degradation product of adenosine. Determination of Hx concentration is recommended as a new biochemical method for estimation of postmortem time. The results of Xanthine (X) support the ones of Hx. For the separation of Hx and X from the vitreous humor the solid phase extraction was used. LC-DAD-MS-MS was chosen for identification and quantification purposes of the studied substances where tandem MS detector was used for identification and DAD detector for quantification. Method was validated and measurement uncertainty was calculated.

**Keywords:** hypoxanthine, xanthine, SPE, LC-DAD-MS-MS

## POSTER PRESENTATION

# *Trends of illicit drugs use among living person in ESTONIA during 2013-2016*

Aime Riikoja<sup>1</sup>

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In this study, the samples of urine, sent to the EFSI Toxicology Lab by Police, were analysed. Samples were taken from persons who were driving a car, had a car accident or violated the public order while being under the influence of drugs. The main findings from these samples were metabolite of THC, fentanyles, amphetamine, benzodiazepines. There is no significant use of heroin in Estonia. 6-MAM, a marker of heroin, was found few times each year in the period of this study and in these cases the persons were Latvian or Russian citizens. Since spring 2016 in addition to fentanyl and 3-methylfentanyl, new synthetic fentanyles like acrylfentanyl, furanylfentanyl and carfentanyl started to appear. During the studied years, the positive samples for cocaine and MDMA have shown the rise tendency. Also very common is the simultaneous use of different drugs, including stimulants and depressants.

**Keywords:** illicit drugs, statistics

## *Y-Chromosomal Amelogenin test abnormalities revealed in DNA laboratory of Latvia State Centre for Forensic Medical examination*

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Determination of genetic markers for sex identification is a part of routinely performed procedures, such as paternity testing, unknown individual identification and DNA profiling of biological samples and reference samples from crime scenes. Amelogenin locus as a gender marker is included in majority of commercially available forensic STR kits. Current study involves data on 4 cases of Y-chromosomal abnormalities revealed in males during 2007-2016 in practice of DNA laboratory of State Centre for Forensic Medical Examination of the Republic of Latvia. The first case involves mutation in primer binding site; second – the complete absence of AMEL Y and DYS458 marker; third – deletions in both arms of Y-chromosome between AMEL Y location on short arm and DYS448 location on long arm; fourth – XX male syndrome with negative results in all markers represented in AmpFISTR® Yfiler® PCR amplification Kit („Applied Biosystems”). The presence of two X-chromosomes was confirmed by using Investigator® Argus X-12 QS (“QIAGEN”). Our study represents the first report of Y-chromosomal abnormalities in the Latvian population.

**Keywords:** amelogenin locus, amelogenin Y (AMEL Y), mutation, deletion, short tandem repeat (STR), XX male syndrome.

## *Determination of narcotic-psychoactive substances in the cadaver internal organs (liver) from small quantities of the sample by GC/MS method*

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**Introduction.** After conducting tests of 500 samples of cadaver liver, it has been observed that a new method for analyzing of small quantities of the liver sample (5 g) homogenate (1:1) is more efficient than the method used for conducting extraction from 50 g of the test sample.

**Methods and material.** A number of substances were determined which were not visible while applying the thin-layer chromatography. These include methadone, verapamil, diphenhydramine, and ibuprofen.

**Results.** The analytes' output of all substances normally visible by gas chromatography-mass spectrometry method (GC/MS method) was not below 50 percent. Also, a smaller quantity of the test sample results in a lower probability of formation of emulsions during the extraction and allows a simultaneous extraction of up to 10–12 liver samples.

**Keywords:** liver extraction, small amount of tissue, GC/MS method, narcotic-psychoactive substances

## POSTER PRESENTATION

### *Sudden death of 1.5-month-old girl (case report)*

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Asphyxia caused by aspiration of gastric content is a common cause of death in adults with alcohol intoxication.

However, it may occur in children.

The 1.5-month-old girl's body was found in her bed on March 13, 2013. An autopsy and further investigation revealed that the baby's death was caused by mechanical asphyxia due to aspiration of gastric content; ethanol was also found in her blood and chronic pathological changes in internal organs caused by chronic alcohol abuse were detected.

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## *1st EU Presidency for Estonians*

Estonia is holding the presidency of the Council of the EU over the second half of 2017. This means that Estonia is responsible for defining the Council's positions while taking into account the interests of all member states and remaining neutral at the same time. This is definitely a worthy task for Estonia as it celebrates its anniversary; the centenary of the Republic of Estonia is in 2018.

The presidency of the Council rotates among the EU member states every 6 months. Estonia has picked up the baton of the presidency from the Malta and will deliver it to Bulgaria 6 months later.

The three consecutive Presidencies agree among themselves which fields to turn more attention to on the European level. This ensures that important topics remain in focus over the course of 18 months. Estonia is in one Presidency trio with Bulgaria and Austria.



## *Themes important for Estonia*

The majority of the themes to be dealt with by the current presidency originate from the preceding one. However, each country holding the presidency can highlight in their presidency programme the themes which require more attention.

The programme is prepared shortly before the start of the presidency. An important starting point in the development of the programme is the Estonian EU policy, according to which the focal themes are the single and digital markets, the energy union and closer integration of our Eastern partners into Europe. We also want to focus on the promotion of e-solutions and the information society in EU policy areas.