BOOK Of ABSTRACTS

KEYNOTE ABSTRACTS
(KN)

KN-01

Screening for Monoclonal Gammopathy of Undetermined Significance: The iStopMM Study

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Introduction and background

Monoclonal gammopathy of undetermined significance (MGUS) is a common, asymptomatic precursor of multiple myeloma and related plasma cell disorders. Despite its high prevalence, MGUS is typically diagnosed incidentally, and no population-based screening strategies have been implemented to date. The Iceland Screens, Treats, or Prevents Multiple Myeloma (iStopMM) study represents the first nationwide initiative to evaluate the feasibility, efficacy, and consequences of systematic MGUS screening and early intervention.

Methods

A total of 80,759 individuals aged 40 years and older—representing approximately 54% of the eligible Icelandic population—were enrolled and screened using serum protein electrophoresis, immunofixation, and free light chain analysis. Participants diagnosed with MGUS or other monoclonal gammopathies were randomized into three arms: (1) standard clinical care; (2) follow-up according to current international guidelines; and (3) intensive follow-up with early diagnostic and therapeutic procedures, including bone marrow sampling and advanced imaging. Longitudinal follow-up includes comprehensive data on clinical outcomes, disease progression, health care utilization, mental health, and quality of life.

Results and findings:

Initial results have demonstrated the feasibility of nationwide screening and identified a higher-than-expected prevalence of monoclonal gammopathies. Randomization enables a robust comparison of management strategies and facilitates assessment of the risks and benefits of early detection and intervention. The study also provides unique data on the psychological and societal impact of diagnosing precursor conditions in otherwise asymptomatic individuals.

Conclusion:

The iStopMM study offers an unprecedented opportunity to redefine early management of plasma cell disorders and serves as a model for future screening efforts in hematologic malignancies.

KN-02

Hereditary Cystatin C Amyloid Angiopathy: Understanding disease mechanisms and therapeutic interventions

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Introduction and background

Hereditary Cystatin C Amyloid Angiopathy (HCCAA) is a rare Icelandic disease that belongs to a group of heterogeneous amyloid disorders in the central nervous system known as cerebral amyloid angiopathies (CAA), leading to recurrent cerebral hemorrhages. HCCAA is caused by the L68Q mutation in the CST3 gene, leading to cystatin C misfolding and aggregation, resulting in widespread amyloid deposition in the cerebral vasculature, parenchyma, and peripheral organs such as the skin. HCCAA is highly progressive, with recurrent hemorrhages and early-onset dementia typically manifesting between 20 and 30 years of age, often leading to early mortality. No curative treatment currently exists.

Methods

A pilot study was conducted to investigate the effects of N-acetylcysteine (NAC) on cystatin C aggregates. The study assessed NAC's ability to break disulfide bonds and reduce amyloid aggregation. Based on these findings, a clinical trial was initiated in L68Q mutation carriers with NAC treatment. The study monitored changes in cystatin C aggregation, disease progression, and potential clinical benefits through biomarker analysis, imaging studies, and neurological assessments.

Results and findings:

The pilot study demonstrated that NAC disrupts cystatin C aggregates by breaking disulfide bonds, leading to monomerization. These promising findings led to a full clinical trial in L68Q carriers, which further supported NAC's potential therapeutic benefits in modulating disease progression. However, NAC has limited ability to cross the blood-brain barrier compared to its derivative, NAC amide (NACA), a more lipophilic compound with over tenfold greater efficacy in cellular models.

Conclusion:

Recently, an open-label clinical study was initiated to evaluate the safety, tolerability, and therapeutic efficacy of NACA in HCCAA patients. The results of this study may offer new therapeutic insights and hope for individuals affected by this fatal disease.

KN-03

Nationwide hepatitis C virus treatment program in Iceland

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Introduction and background

Hepatitis virus C infection (HCV) is a major cause of chronic liver disease worldwide. Injection drug use (IDU) is the main driver of the epidemic. WHO has set targets to eliminate HCV as a global health threat by 2030. To achieve these goals, WHO set service coverage targets of 90% of the infected population being diagnosed and 80% of patients being treated. In February, 2016, Iceland initiated a nationwide HCV elimination programme known as treatment as prevention for hepatitis C (TraP HepC), which aimed to maximise diagnosis and treatment access.

Methods

Patients with HCV infection were offered direct-acting antiviral therapy. The programme used a multidisciplinary team approach in which people who inject drugs (PWID) were prioritised. Nationwide awareness campaigns, improved access to testing, and harm reduction services were scaled up simultaneously. Cascade of care, cure rate as well as reinfection rate was monitored.

Results and findings:

During the first three years of the program IDU was reported by 84 %, recent IDU by 33 %. It was estimated that over 90% of all HCV infections had been diagnosed as early as January, 2017. During the 3 years, 95·3% of diagnosed infections were linked to care. Cure was achieved for 90·2%. There was a rapid reduction in prevalence of HCV among PWID from 48.7% to 10.2% within two years and continued drop to 7 % thereafter. A dramatic redution in the incidence of HCV related cirrhosis has occurred. High rate of reinfection among actively injecting has been observed.

Conclusion:

By using a multidisciplinary public health approach, a high cure rate of HCV can be achieved in in a patient population where PWID are majority and the core service coverage targets for 2030 set by WHO were reached within three years. Reinfection is a challenge to elimination of HCV.

ORAL SESSION
(S)

S-01-01

Flow cytometry diagnostics in follow-up of multiple myeloma precursors: Insights from the iStopMM study

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Introduction and background

Multiple myeloma (MM) is a hematological malignancy characterized by the proliferation and accumulation of malignant plasma cells (PC) in the bone marrow (BM). MM is consistently preceded by asymptomatic precursors, namely monoclonal gammopathy of undetermined significance (MGUS), and the more advanced precursor smoldering MM (SMM). While multiparameter flow cytometry (MFC) is an important tool for assessing measurable residual disease (MRD) in MM, its integration into routine diagnosis and monitoring of precursor conditions remains limited.

Methods

The Iceland Screens, Treats, or Prevents Multiple Myeloma (iStopMM) study is a population-based screening study for MM and its precursor diseases that aims to evaluate the benefits of early detection and intervention. In total, 75,422 Icelandic residents were screened by serum protein electrophoresis (SPEP) and free light-chain (FLC) assay. Participants positive for MGUS were entered into a randomized trial of follow-up strategies. A subset of participants underwent repeated BM and PB sampling for MFC analysis using the EuroFlow MM-MRD method. This analysis aimed to evaluate the clinical utility of MFC in diagnostic work-up and monitoring of MM precursors.

Results and findings:

We have introduced the bone marrow quality index (BMQI), a novel MFC-based metric for objectively assessing BM sample quality. The BMQI is calculated using quantification of specific BM-associated cell populations, correlating strongly with markers of sample adequacy. Additionally, our analyses identified a subset of MGUS individuals lacking detectable phenotypically abnormal (clonal) plasma cells by highly sensitive MFC, which demonstrated a stable clinical course with minimal progression risk.

Conclusion:

Our findings highlight the clinical utility of MFC for diagnostic work-up and monitoring in MM precursors. The BMQI provides a standardized method for ensuring BM sample quality. Furthermore, identifying clinically indolent MGUS through sensitive MFC analysis has potential value for improving risk stratification and guiding clinical decision-making during follow-up.

S-01-02

AI-Driven Development of Criteria for T-CUS Detection Using Preexisting Hematology and Laboratory Data.

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Introduction and background

T-CUS (T-cell Clones of uncertain significance) is a rare condition characterized by an imbalance in T-cell antibody expression. It is suspected to be a precursor to Large Granular Lymphocyte (LGL) leukemia, making early detection crucial. However, diagnosing T-CUS currently requires specialized tests, which are not performed routinely.

Artificial intelligence (AI) has the potential to identify hidden patterns in medical data, improving disease detection. This study aims to develop an AI model capable of screening for T-CUS using standard blood test results. By analyzing hematological parameters, the model could enable early identification, reducing the need for costly and invasive testing.

Methods

This study will use existing clinical data, including blood count results and differential counts, to train an AI model. Three machine learning algorithms—General Support Vector Machine, Linear Model, and TreeBagger (decision tree)—will be implemented in MATLAB to identify key hematological markers linked to T-CUS.

After training, the model will be tested on control samples from presumed healthy individuals. All samples will undergo flow cytometry to confirm or rule out T-CUS. The goal is to refine a non-invasive, data-driven approach for early T-CUS detection.

Results and findings:

We expect the AI model to identify specific blood test parameters that correlate with T-CUS, enabling early screening. Some control samples may meet the AI-derived criteria, requiring flow cytometry validation.

The study aims to demonstrate that AI-driven analysis can improve diagnostic accuracy and streamline hematological disease detection.

Conclusion:

This research explores AI's potential in identifying T-CUS through routine blood tests. By developing a machine learning model, we aim to provide a cost-effective, non-invasive screening method.

If successful, this approach could enhance early detection, reduce diagnostic delays, and be adapted for other hematological conditions. The findings will determine AI's viability in routine diagnostics, potentially transforming disease monitoring and patient care.

S-01-03

FlowDiff: a simple, flow cytometry-based approach for performing a leukocyte differential count

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Introduction and background

The leukocyte differential count is an extremely common laboratory analysis, and in most laboratories, it is fully automated with the help of cell counters, which provide fast and accurate results. However, approximately 10-20% of the analyzed samples are “flagged” by the instrument and require further inspection. Currently, these flagged samples are examined manually on a stained blood smear, a more expensive and time-consuming method, with a much lower analytical precision and high inter-observer bias. To overcome these challenges of a manual leukocyte differential count, we have developed FlowDiff, an 8-colour, single tube flow cytometry panel, and investigated whether it could potentially replace the manual differential in our laboratory

Methods

We used a Sysmex XF-1600 flow cytometer and created a panel consisting of eight fluorochrome-conjugated antibodies: CD45-Pacific Orange, CD16-Pacific Blue, CD5-FITC, CD1117-PE, CD123-PerCP-Cy5.5, CD19-Pe-Cy7, CD34-APC, and CD14-AP-Cy7. Our sample processing protocol comprised a stain-lyse no wash process, taking approximately 30 minutes of working time, without the addition of a toxic lysis reagent. We analysed a total of 248 blood samples collected in EDTA tubes for a direct method comparison of FlowDiff with the automated leukocyte differential (Sysmex XN) and the manual differential (CellaVision).

Results and findings:

We found a very good correlation for all leukocyte populations between FlowDiff the automated differential (N = 80) as well as the manual differential (N = 168). In addition, FlowDiff showed a very high diagnostic accuracy, correctly identifying all samples with acute leukemia (N=13) and differentiated all B-lymphomas (N=49) in samples with lymphocytosis. Importantly, we found that FlowDiff is faster, cheaper, and required minimal analytical expertise from our personnel.

Conclusion:

Our data suggest that FlowDiff, our 8-colour flow cytometry-based differential, is comparable to, and can successfully substitute the manual differential. Consequently, we have already implemented FlowDiff, hoping to inspire other laboratories to follow our example.

S-02-01

Antimicrobial Use and Resistance: The Situation in Iceland and International Cooperation

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Introduction and background

Antimicrobial resistance (AMR) is a growing global concern. Therefore it is critical to address its impact through national and international collaboration.

Total antibiotic consumption in Iceland remains close to the EU/EEA median, with usage divided between community and hospital sectors. The community sector accounts for 90% of total antibiotic use.

Methods

While overall antibiotic consumption has remained relatively stable in the past decade, a temporary decline was observed during the COVID-19 pandemic. The proportion of total antibiotic consumption in the WHO „Access“ category in Iceland is over 80%, whereas the EU goal is >65%. Notably, tetracycline use in Iceland is higher than the EU/EEA average, particularly among young females.

Results and findings:

The emergence of antimicrobial resistance is an increasing challenge. Iceland has witnessed a rise in notifiable AMR cases in the last ten years, particularly in extended-spectrum beta-lactamase (ESBL)/AmpC-producing bacteria and more recently in carbapenemase-producing Enterobacteriaceae (CPE). There has also been a gradual increase in methicillin-resistant Staphylococcus aureus (MRSA). In August 2024, the first National Action Plan (NAP) against AMR was confirmed by three ministers, the Minister of Health, the Minister of Food, and the Minister of the Environment. The NAP is based on a One Health approach, integrating human, animal, and environmental health strategies. The AMR NAP (2025-2029) focuses on six key areas, including infection prevention, surveillance, stewardship programs, and awareness campaigns.

Conclusion:

International collaboration is an integral part of the AMR NAP, including the Nordic countries, the EU/EEA, and the World Health Organization (WHO).

In conclusion, Iceland’s commitment to AMR mitigation involves strategic policy development, data-driven decision-making, and active engagement in global initiatives. Continued efforts are essential to safeguard public health and curb the spread of antimicrobial resistance.

S-02-02

Avian Influenza screening in Iceland

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Introduction and background

Highly pathogenic avian influenza viruses (HPAIVs) of hemagglutinin type H5 and clade 2.3.4.4b have widely spread within the northern hemisphere since 2020 and threaten wild bird populations, as well as poultry production.

Although low pathogenicity avian influenza virus (AIV) strains have been detected in sea birds around Iceland, outbreaks of HPAIV were not reported from Iceland until spring 2022.

Methods

Despite an appeal from the veterinary authorities in Iceland to the public to report finding of sick or dead wild birds only 17 birds came to be sampled in the first 9 months of 2021 where AIV was tested, and all samples were AIV negative. In the beginning of 2022, the veterinary authorities in Iceland enhanced active surveillance through reports from the public of sick or dead wild birds. In mid-April, a pink-footed goose (*Anser brachyrhynchus*) tested HPAIV H5N1 positive in east Iceland. Less than a week later HPAIV H5N1 were detected in common raven (*Corvus corax*) and backyard chickens on a farm in of south-Iceland.

Results and findings:

Surveillance for HPAIV in wild birds, found deceased or exhibiting signs of illness, is ongoing. In 2023, the first detection of HPAIV H5N5 in a white-tailed sea eagle was reported. Since the initial detection of HPAIV in Iceland, the Icelandic Food and Veterinary Authority (MAST) has closely monitored the virus's spread within wild bird populations. This surveillance aims to map the virus's distribution, mitigate the risk of transmission to poultry farms, and provide timely alerts to farmers.

Conclusion:

Each year, a limited number of samples from poultry have been tested for AIV, all yielding negative results until December 2024. During this time, a poultry farm reported birds exhibiting clinical symptoms consistent with avian influenza. Diagnostic screening confirmed the presence of HPAIV H5N5 in the samples.

S-02-03

Sarcocystis spp. in Icelandic Cattle

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Introduction and background

In early 2023, funding was obtained from The Ministry of Food, Agriculture and Fisheries to study which species of sarcocysts (Sarcocystis spp.) are found in Icelandic cattle. *Sarcocystis* is a genus of protozoan parasites. Its members have a two-host life cycle. Intermediate hosts are typically herbivores or omnivores, in which the parasite forms white cysts (sarcocysts) in the muscle tissue. Definitive hosts are primarily predators or omnivores who become infected by consuming raw, infected muscle tissue from the intermediate host. In the definitive host, the parasites reproduce in the intestinal mucosa, releasing oocysts or sporocysts into the environment via feces. The intermediate host becomes infected by ingesting sporocysts excreted in the feces of intermediate hosts. In cattle this can lead to symptoms such as fever, reduced milk production, and abortions.

Methods

Globally, at least seven species of *Sarcocystis* are known to infect cattle, one of which, **Sarcocystis cruzi**, has already been confirmed in Iceland through PCR testing. The goal of this project is to identify the *Sarcocystis* species present in Icelandic cattle. Samples will be collected from slaughterhouses where infections are suspected, and DNA is extracted from heart muscle tissue. The samples will be analysed by PCR and sequencing for species identification.

Results and findings:

The project results will improve understanding of the geographic distribution of *Sarcocystis* spp. infections in Icelandic cattle and identify which definitive hosts contribute to maintaining the parasite's life cycle.

Conclusion:

This knowledge can help in devising strategies to interrupt the cycle and reduce infection rates in both intermediate and definitive hosts. Reducing infections would, in turn, improve animal welfare by minimizing potential illness caused by the parasite.

S-02-04

Bringing Our Best Together Under One Roof

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Introduction and background

In 2013, the Southwest Jutland Hospital (University Hospital of Southern Denmark) in Esbjerg opened a new joint laboratory building, making it the only facility in Denmark where the biochemistry, immunology, microbiology, and pathology specialties are fully integrated under one roof and management. The aim was to create a unified laboratory function with optimized workflows to enhance patient care and increase collaboration among specializations.

Methods

The joint laboratory structure was designed to foster a cross-specialty professional environment through shared resources and spaces, including a unified sample and testing laboratory, shared break rooms, joined staff meetings, cross-specialty workshops, and social events. Staff roles and tasks were realigned to support interdisciplinary cooperation and skill-sharing, providing greater flexibility.

Results and findings:

Since the consolidation, we have observed a marked improvement in the 24-hour coverage of specific biomarkers. Staff have expanded their expertise across specialties, enhancing task coverage and streamlining workflows, resulting in more efficient patient-centered care. Biomedical technicians benefit from broader cross-functional training, and managers support each other in resource-sharing and workload distribution.

Conclusion:

As the only fully integrated laboratory in Denmark, we are uniquely positioned to meet future challenges with increased flexibility and a highly skilled, adaptable workforce. This setup has fostered a stronger team culture, improved qualifications among staff, and elevated understanding of interdisciplinary tasks and services. The approach enhances patient care and maximizes operational efficiency through cross-functional collaboration and shared resources.

S-03-01

Role of Artificial Intelligence in Enhancing Healthcare Diagnostics

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Introduction and background

The presentation provides an overall understanding of the intersection between artificial intelligence and healthcare, specifically within medical laboratory operations. Participants will first be introduced to essential terminology and foundational concepts of AI, enabling them to grasp the basic principles and language of the field. Attendees will gain insights into practical applications and the potential benefits of AI in improving diagnostic accuracy, workflow efficiency, and patient outcomes. Technical challenges will be discussed such as data privacy, algorithmic bias, and the need for robust IT infrastructure.

S-03-02

Implementing AI-Assisted Cytopathology in Norway: Experiences and challenges among cytotechnicians

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Introduction and background

This study examines cytotechnicians working in a laboratory at a Norwegian hospital and the effects of a system, that harnesses AI-based technology for pattern recognition imaging, on these employees. Their tasks underwent a digital transformation during the implementation of the innovative screening system. The transition process was part of a strategic move to enhance efficiency. The study explored the challenges and consequences of introducing machine learning technology and its impact on productivity.

Methods

The informants consisted of two groups: a group of seven cytotechnicians and a smaller group comprising a department manager and an IT advisor. The data collection methods used were: qualitative interview, dynamic observation, and document analysis.

Results and findings:

The findings suggest that the introduction of this technology has reduced the investigation time for non-pathological tests, bringing the department closer to achieving its goal of improving efficiency and reducing response times for patients. While the impact of this transition on the recruitment of biomedical laboratory scientists is yet to be assessed, reallocating other tasks will likely lead to a shift in human resource management. The data collected confirmed findings from previous studies and provided new valuable information for projects implementing technologies in healthcare.

Conclusion:

The study encountered two types of challenges - at the department level concerning intricate details of the project's progression, and at an individual level affecting the cytotechnicians. One important aspect emerged - allowing employees sufficient time to discover, learn, and explore the technology can significantly contribute to process implementation success. The department experienced a loss of productivity during the verification of the system but was a trade-off necessary for patient data security and result accuracy. The progress of machine learning generates new tasks related to the technology, creating symbiotic relationships between humans and machines, which does not seem to pose a threat to the job security of cytotechnicians.

S-03-03

AI-Based Image Analysis: Revolutionizing Tumor and Metastasis Diagnosis

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Introduction and background

Non-small cell lung cancer (NSCLC) frequently metastasizes to organs such as lymph nodes, liver, and brain, necessitating diagnostic evaluations to confirm metastatic origin. Traditional methods, including immunohistochemistry (IHC) and molecular analyses, are resource-intensive, time-consuming, and have a significant environmental impact. This proof-of-concept study evaluates whether AI-driven morphological analysis of digitized HE-stained slides can accurately identify and compare tumor cells in primary tumors and their metastases, offering a faster, more efficient diagnostic alternative.

Methods

The study analyzed 48 tumors, comprising 24 primary NSCLC tumors and their corresponding metastases located either in lymph nodes or the brain. High-resolution HE-stained slides were scanned at 40x magnification to ensure consistent image quality. From each tumor, a representative area containing tumor cells was carefully selected and verified by an experienced pathologist. Fine-tuning was performed before data extraction to refine cell classifications and minimize false-positive tumor cell identifications. Approximately 300 tumor cells were extracted, and 80 morphological features per cell, including color, granularity, and shape, were analyzed using Python.

Results and findings:

AI analysis effectively distinguished tumor cells from non-tumor cells based on selected morphological features, demonstrating that tumor cells possess unique morphological traits. Tumor cells from primary tumors and their metastases exhibited high morphological similarity, supported by RAF values below 0.05 for 32 features, indicating over 95% similarity between tumor cells in primary tumor and their metastases. t-SNE clustering showed that approximately 70% of primary tumors grouped closely with their metastases, highlighting AI's ability to visualize and quantify morphological relationships.

Conclusion:

This study demonstrates that AI-based morphological analysis can accurately classify tumor cells, distinguish them from non-tumor cells, and assess morphological consistency between primary tumors and metastases. These findings validate the concept and highlight the potential for AI-driven methods to complement or replace traditional diagnostics while reducing turnaround time, resource use, and environmental impact, paving the way for clinical implementation.

S-04-01

Update on biofluid-based biomarkers for Alzheimer's disease and related disorders

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Introduction and background

The past decade has seen enormous progress on amyloid-, tau- and neurodegeneration-related biomarkers for Alzheimer's disease and related disorders.

Methods

Currently available data on biomarker and assay performance were reviewed.

Results and findings:

AD is associated with beta-amyloid and tau pathologies which can be quantified using cerebrospinal fluid and imaging biomarkers and, more recently, using highly sensitive blood tests. While for the most part specific biomarkers of non-AD neurodegenerative dementias are lacking, non-specific biomarkers of neurodegeneration are available.

Conclusion:

This presentation summarizes recent advances in the neurodegenerative dementia blood biomarker research, and discusses the next steps required for clinical implementation.

S-04-02

APOE-ε4 dependent and independent serum protein signals in Alzheimer's disease

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Introduction and background

As the incidence of late-onset Alzheimer's disease (LOAD) increases, a deeper understanding of its underlying molecular processes is critical for advancing biomarker and drug target discovery. High-throughput blood proteomics holds strong potential for identifying biomarkers that meet this need as proteins in the blood can generally predict a variety of pathologies and have a regenerative function in both peripheral and central organs.

Methods

This study assessed the abundance of 4,783 serum-based proteins using SOMAscan in 5,127 older Icelandic adults (mean age: 76.6 ± 5.6 years) in the prospective, population-based Age, Gene/Environment Susceptibility–Reykjavik Study (AGES) cohort. The proteins were analyzed from blood drawn at the study baseline, and associations were assessed using linear and logistic regression, as well as Cox proportional hazards models, adjusting for key covariates.

Results and findings:

We identified 303 proteins associated with incident LOAD, with more than 40% being independent of APOE-ε4 carrier status and linked to neuronal processes. These proteins also overlapped with known LOAD signatures in the brain and cerebrospinal fluid. Notably, 17 proteins showed APOE-ε4–dependent associations, with four (TBCA, ARL2, S100A13, and IRF6) exhibiting a striking pattern of downregulation by APOE-ε4 but upregulation due to LOAD, suggesting counter-acting responses.

Conclusion:

These findings illuminate dysregulated pathways and proteins at the preclinical stages of LOAD, offering key insights into disease mechanisms both dependent on and independent of APOE-ε4, which may aid in the identification of potential biomarkers

S-04-03

Urinalysis: Iceland setting

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Introduction and background

Urinalysis is clinically effective in screening and managing wide range of disorders. It is non-invasive and cost-effective which makes it easily and widely available for clinicians to conduct in both urgent setting and patient management. A simple test but provides useful information adding coherence to other available tests carried out.

Methods

Macroscopic analysis

Chemical analysis

Microscopic analysis

Results and findings:

Automatic analysis as method of choice for high-volume laboratory setting and must be utilized to minimize manual microscopic examination which is labor-intensive and time-consuming. Nevertheless, certain urine samples need to be further evaluated with manual microscopic analysis.

A massive proteinuria in strip tests and no other detectable substances, the urine sample is subject for further manual microscopic examination.

Furthermore, the automated analyzer's limitation to fully identify urinary casts and other misidentified urinary elements are also reasons to perform manual microscopic analysis.

Conclusion:

Knowledgeable and skillful interpretation of automated analysis provides quicker results for early medical interventions such as in urinary tract infections.

Patient history and information assist in proper interpretation of results. Significantly, manual microscopy on urine samples suggestive of kidney diseases should be thoroughly checked.

S-04-04

Fecal Immunochemical test at Landspitali

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Introduction and background

The European Commission Initiative on Colorectal Cancer (ECICC) recommends screening asymptomatic adults aged 50-69 for colorectal cancer. Until now screening for colorectal cancer has not been part of Icelandic health care system. In 2024 work has been underway to prepare for screening under the auspices of the Icelandic Ministry of Health, with the involvement of various organizations including Landspitali, the national hospital of Iceland. Part of the screening process is Fecal Immunochemical test (FIT) that looks for traces of blood in feces.

Methods

During the preparation phase, it was identified that the Core Laboratory would need to do some changes to establish the FIT test. These changes included: new research equipment, increased funding, and locate suitable lab space, as well as train employees and perhaps make changes to the workflow at the sample reception. At this moment there has been a delay in the process of implementing the screening protocol. According to the initial plan the FIT was supposed to be ready at the Core Laboratory on October 1st. However, due to delays, the instrument has only just arrived, and the setup and training are scheduled to begin in the 1st week of December. Due to this the abstract will be updated before the NML Congress will it be accepted. The focus will be on the initial plan of implementation of the FIT testing at Landspitali compared to the actual implementation and an assessment on how well the process is going.

Results and findings:

The project has been delayed and the effectiveness of the project implication is not known yet but will hopefully be more established in the time for the NML congress in May 2025. The finalized abstract will present results of the situation at that time.

Conclusion:

Will be presented in the context of the situation at the time of the NML Congress.

S-05-01

Recent findings of protective genotypes against scrapie provide hope for a scrapie-free Iceland in the future.

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Introduction and background

Scrapie in sheep is endemic in Northern Iceland and has endured rigorous methods to fight the disease. The scrapie infectious agent is a misfolded protein and disease susceptibility is affected by polymorphism within the prion protein gene (PRNP). Breeding for scrapie resistance in Iceland has not been an option, since ARR, the main protective allele, has in the past not been found in Icelandic sheep.

Methods

We searched for protective prion protein variants in Icelandic sheep originating from different regions of the country, with specific attention to areas which had not been affected by large scale culling. Ear tag or brain samples were collected from ca. 30.000 sheep, DNA isolated and PRNP sequenced or genotyped at six codons of interest.

Results and findings:

14 sheep (0.05%), carrying ARR (R171), were found at one farm in the eastern part of Iceland. This is the first report of ARR in Icelandic sheep. Continuing search has resulted in two more findings of ARR in different regions of the country. A potentially protective polymorphism at codon 137 (AT137RQ), was found in 41 adult sheep (0.15%) from a total of eight farms located in different regions of the country. Another potentially protective allele, AHQ, was found in 7.65% of sheep. Results from PMCA studies support the protective effects of the identified variants against Icelandic scrapie strains.

Conclusion:

Although found at a very low frequency, the presence of the ARR allele offer the possibility of breeding for scrapie resistance in the Icelandic sheep breed. Additional use of potentially protective alleles like AT137RQ and AHQ can assist in keeping the diversity of the sheep population. A breeding program using sheep carrying these alleles is already in use and in due time will hopefully help with the eradication of this uncurable disease from the country.

S-05-02

Development of prophylactic and therapeutic treatment for allergy

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Introduction and background

Insect bite hypersensitivity (IBH) is an IgE-mediated dermatitis of horses caused by bites of *Culicoides* spp. It is characterized by intense itching and hair loss that greatly impairs their well-being. IBH does not occur in Iceland due to absence of the causative insects but has a high incidence in horses exported to *Culicoides* areas. We have identified and expressed as recombinant proteins the major allergens causing IBH. The major allergens are part of our vaccine under development. Our aim is to develop a prophylactic and therapeutic vaccine against IBH in horses.

Methods

27 healthy Icelandic horses were included in the prophylactic part; They were vaccinated 3 times in Iceland before export to Switzerland, received one booster every spring and were followed for three summers. In the therapeutic part, 9 horses received the vaccine and 8 the placebo. Clinical signs were monitored pre-treatment and two summers during treatment.

Results and findings:

Of the 27 horses 16 developed IBH after the three summers with *Culicoides* exposure. In a sulfidoleukotriene release assay, the vaccinated horses that developed IBH showed significantly lower response to the vaccine allergens compared to unvaccinated IBH horses.

The treated IBH horses showed a significantly stronger reduction of clinical signs compared to placebo after the first year and this difference was more pronounced during the second treatment year where 89% of the AIT horses showed 50% of more improvement as compared to 14% of the placebo.

Conclusion:

Our vaccine did not reduce the incidence of IBH in exported horses although it reduced the degree of sensitization to the allergens. Using our vaccine as a treatment for IBH significantly reduced clinical signs but larger studies of longer duration is needed.

S-05-03

Antimicrobial resistance in veterinary medicine

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Introduction and background

Bacterial resistance to antimicrobial compounds is an ancient phenomenon that has enabled their survival across time and in diverse environmental conditions. Through these evolutionary mechanisms, bacteria adapt to the selective pressures exerted by antibiotic treatments. Antimicrobial resistance (AMR) in bacteria has become an escalating global health threat, with significant consequences for both human and animal health. This growing issue results in increased morbidity, mortality, and substantial costs to healthcare systems and food production.

The development of AMR in animals is influenced by various factors, including agricultural practices, antibiotic usage patterns, and inadequate infection control measures. Resistant bacteria can be transmitted between humans and animals through the food chain, direct contact, and environmental contamination. Within the One Health framework, AMR is recognized as a cross-sectoral challenge that requires coordinated efforts across human, animal, and environmental health disciplines to address its root causes and limit its spread. Key strategies for combating AMR include antimicrobial stewardship, enhanced surveillance, and the implementation of stricter regulations on antibiotic usage.

In Iceland, the situation remains relatively favorable, with low levels of antibiotic use in animals and a low prevalence of AMR. However, in many other countries higher levels of antibiotic use in both human and veterinary medicine have resulted in higher AMR prevalence and increased concerns. In response to the growing concerns, The European Union has implemented measures, such as restrictions on the use of antibiotics for growth promotion and enhanced surveillance through the European Food Safety Authority (EFSA). Despite these efforts, AMR remains a persistent challenge, with some pathogens showing resistance to multiple classes of antibiotics, thereby limiting treatment options.

Tackling AMR through a One Health approach is essential for preserving the efficacy of antibiotics, ensuring public health safety, and safeguarding both animal and environmental health.

S-06-01

New national hospital project – the design and construction of the laboratory building

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Introduction and background

Landspítali the National University hospital of Iceland is at the forefront in Icelandic health services and some laboratories are the only one of its kind in Iceland. The hospital currently operates in seventeen locations in one hundred buildings, many of whom do not meet modern requirements and cannot accommodate operations and equipment needed due to lack of space, ceiling height and other requirements. In the first phase of the project there are four buildings. Patient hotel, technical and parking building, laboratory building and treatment centre.

Methods

NLSH, a government owned company oversees the design and construction. Design is in close collaboration with the staff of Landspítali which defined user requirements after many workshops, site visits and review of similar projects abroad. The requirements where registered in the dRofus database.

Results and findings:

All the hospital's laboratory activities will be in the six-story laboratory building. A centralized specimen reception and core laboratories, based on methodology and equipment, have been designed as well as specialized laboratories. Facilities are flexible and changes in room sizes and extension of technical systems are possible and relatively easy.

The laboratory building will be linked to the treatment centre and other hospital buildings with a pneumatic tube system which transport samples and blood products in a matter of minutes. Automated guided vehicles will transport supplies from a centralized reception and a waste transport system is connected to a centralized waste sorting station.

Conclusion:

The laboratory building will be the site of efficiently organized complex operations which are constantly evolving. It is the future workplace for 450 employees, including most of the biomedical scientists at Landspitali and will able them to meet the requirements of modern health care laboratory services.

S-06-02

Core Laboratory at the New Landspitali: Hopes and Dreams

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Introduction and background

The new buildings of Landspítali are under construction and it is planned to combine all the hospital's research services in one building at the new location. Currently, research services are spread out across the city. The merger creates opportunities for efficiency and hopes for a better working environment, better utilization of equipment as well as career development for employees.

Methods

The merger of all laboratory specialties in one building offers opportunities for increased automation, as well as creating possibilities for sharing equipment and greater collaboration. The new facilities will have laboratory cores and one of those will provide a 24-hour service. This creates an opportunity to expand the services provided and potentially increase the number of studies performed 24/7. Different specialties will have the opportunity to move some of their tests onto an automated line, however this will require consideration of various factors, such as workflow and responsibility of selected test. This study presents the main challenges and opportunities for this integration.

Results and findings:

Considerable amount of test can be transferred to a core laboratory that is open 24 hours a day. The selection of test to be transferred must be carefully considered, with care taken to ensure cost-effectiveness. In addition, the specificity and sensitivity of a test must be ensured if the methodology changes. The responsibilities of the specialties must be defined, and the costs and cost distribution between specialties must be analyzed.

Conclusion:

There are many challenges with merging and improving the research facilities at the new Landspitali and much work remains in analyzing processes and determining what to do where. However, this is a tremendous opportunity that must be taken advantage of.

S-06-03

The New Laboratory Medicine Centre – Opportunity to improve biobanking practices and optimize the use of biobanking resources

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Introduction and background

There are three operating biobanks at Landspitali- University Hospital and all part of the division of Clinical Laboratory and Support Services. According to plan all the academic clinical laboratories and biobanks will be united in a New Laboratory Medicine Centre, where the biobanks will be physically in one facility on the ground floor.

Methods

The aim of biobanking is to ensure that samples are fit for intended purpose and be of high value for research. A new centralized biorepository will give us the opportunity to make neccesary changes and improvements in that direction. The new biobank will be based on strong infrastructure comprising facilities, equipment and software solutions, such as latest technologies and the focus is on automation throughout the life cycle of the samples.

Conclusion:

We are engaged in the next few years preparing for an efficient biobank that will support clinical and research work at Landspitali better than before. This presentation will focus on the assessment analysis on how to improve the biobanking practices and optimize the use of biobanking resources for the New Laboratory Medicine Centre.

S-06-04

The New National Hospital in Iceland: The Impact of the Clinical Laboratory Centre on Laboratory Services

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Introduction and background

The New Hospital's Laboratory Center represents a milestone in Iceland's healthcare system and clinical laboratory services. The center aims to improve efficiency, collaboration, and diagnostic quality by consolidating all clinical laboratory services under one roof. The facility, with advanced technology, will focus on optimizing workflows, enhancing resource collaboration, and supporting the role of biomedical scientists in clinical diagnostic services and research.

Methods

Preparations for the new center include organizing Landspítali's laboratory services into four cores: Clinical Biochemistry and Haematology, Microbiology and Virology, Pathology, and Molecular Genetics and Immunology with Blood Banking. These cores will adopt new technologies and digital systems, which require adjustments to existing workflows. Efforts are underway to complete workflow integration as much as possible, before the transition to prepare staff for the changes and facilitate the adoption of updated practices.

Results and findings:

The consolidation is anticipated to improve operational efficiency, including faster sample processing and reduced turnaround times. Biomedical scientists will gain opportunities for training and access to updated technologies. Collaboration within and across the cores is expected to support teamwork and multidisciplinary efforts. The laboratory departments are working towards accreditation under ISO 15189 standards, which will strengthen the quality and reliability of services.

Conclusion:

Biomedical scientists will play a key role in the transition to the New Hospital's Clinical Laboratory Centre. The center is expected to modernize laboratory services and provide opportunities for professional development. Updated workflows, training, and accreditation processes will help staff adapt to future challenges and support innovation within the field.

S-07-01 / P-04

Introducing Point of Care equipment in hospitals

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Introduction and background

A good routine for introducing Point of Care (POCT) equipment in hospitals are important. At St. Olavs hospital in Trondheim, the Quality Service at the Laboratory Clinic is responsible for all introduction of POCT equipment at the hospital. Nevertheless, situations may arise where different departments purchase equipment without having consulted the Quality Service in advance. How can we avoid this happening and what are the routines for introducing POCT equipment at St. Olavs hospital?

Methods

We made a procedure that describes how departments should proceed when they want new POCT equipment at their department. The procedure indicates that the departments have a responsibility to contact the Quality Service for all possible procurements. It is important that the department first map their need for the equipment before they contact the Quality Service to clarify quality and follow-up routines. The Quality Service will make recommendations based on documented quality of equipment and measurement methods. When purchasing, the instrument has to go to the Quality Service for registration and verification before it will be delivered to the department. The department will receive training in use and maintenance and has to contribute as much as possible to the quality assurance of the instrument.

Results and findings:

By contacting the Quality Service for all acquisitions of POCT equipment, departments at the hospital receives an offer where both doctors and biomedical laboratory scientists carefully assess the quality of the analysis.

The Quality Service makes sure that the inspection of the equipment is documented to ensure that the quality of the analysis is acceptable. The departments also have someone to confer during troubleshooting.

Conclusion:

By having a separate service that has the responsibility for all POCT equipment at a hospital, the quality of the analysis carried out by healthcare personnel in various departments will be better and safer for the patient.

S-07-02

The development of POCT at Landspitali.

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Introduction and background

Point Of Care Testing (POCT) refers to laboratory medicine testing in the immediate vicinity of the patient. This is a relatively recent development in laboratory medicine for measurements of various fluids, usually blood or urine. Evolving technological advances have enabled the development of novel POCT instruments and the number of possible measurements has been increasing, making it possible to perform measurements in a user-friendly manner with results available rapidly. At the same time there have been increased requirements for accreditation. It is important that testing at the point of care meets the same accreditation and regulatory requirements as the central laboratory. Biomedical Laboratory Scientists should have the responsibility for leading the management, developing standard operating procedures, establish education, training and quality management, to ensure quality assurance of POCT.

Methods

This study examined the development of POCT at Landspítali and also evaluated the situation in three other hospitals in Scandinavia. The focus was on how POCT management is organized, the status of quality issues and accreditation, what type of instruments are being used, how training is being organized and how daily POCT services are operated.

Results and findings:

This investigation demonstrates that development of POCT at Landspítali show that success has been achieved, but not yet finished. A management system have been established, all instruments are under the supervision of professionals and the responsibility of the laboratory. Daily services, regular monitoring, quality management and organized training are under control. Accreditation has not been archived.

Conclusion:

In conclusion, significant progress has been made with POCT at Landspítali. The need for restructuring according to ISO standard 15189 is clear and is currently underway.

S-07-03

Poct: a bridge between continents

fabio como

landspitali, reykjavik, Iceland

Introduction and background

It was October 2002 when I had my first presentation about POCT. At that time our goal, as BS organizing that conference, was to try to stem the POCT spread. Ten years after I got my master degree as POCT Coordinator!

Methods

In these years the current and emerging trends in POCT devices are revolutionizing the way diagnostic information is obtained and utilized in healthcare settings.

Advancements in biosensors, nanotechnology, smartphone-based platforms, and applications in personalized medicine are paving the way for the future.

These trends suggest a future where POCT is not only more precise and versatile but also deeply integrated into both clinical workflows and daily life, fundamentally reshaping healthcare delivery.

There has been done a lot in Iceland the recent years but still there is much to do. The goal is to have a certified POCT system and maybe to connect all the Country with the main laboratory in Reykjavík.

Results and findings:

What awaits us in these next few years?

We find ourselves facing a new challenge:

We need to consider the impact of „expert patient“.

After the COVID-19 pandemic, patients have become significantly more informed and proactive about their health, including understanding blood tests and other diagnostic procedures. People realised what is possible to do by themself (self testing test). We need to be able to govern this new situation, the „new“ kind of patient.

Conclusion:

Which are the two Continents? The first is the Patient and the other one is the Laboratory.

Which is the Bridge? We, Biomedical Scientists, are the bridge that connect the patients to the Laboratory.

S-07-04

Relevant Quality Assurance of Point-of-Care Testing in Home Health Nursing: An Investigation of Promoting and Inhibiting Factors in Clinical Practice

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Introduction and background

Today, emergency home health nursing (EHHN) plays an important role in the Danish healthcare system when treating/monitoring patients in their homes. In this function, various Point-of-Care Tests (POCT) are essential, and therefore the quality assurance of POCT is an important factor. A study from 2024 indicates that many of the EHHN teams (63 out of 98) have not established collaboration with a biochemistry department to ensure the quality of POCT. EHHN teams must adhere to quality standards, but there are no clear regulations for how the quality should be performed. The aim of this project is to identify promoting and inhibiting factors in clinical practice related to the Quality Assurance (QA) of POCT analyses in EHHN teams.

Methods

Four EHHN teams in Denmark participated in the project. The knowledge is primarily based on participant observations from three different EHHN teams. The analysis of the field notes served as the foundation for a moderator guide, which was used for two focus group interviews. Finally, the knowledge was refined through an interview with two QA biomedical laboratory scientists. All three interviews were transcribed and processed through thematic analysis.

Results and findings:

The preliminary results showed that the following themes influence the nurses' involvement in QA of POCT analyses: Organization of QA, Leadership, Attitude towards QA, Collaboration, Qualifications, and Relationships with coworkers. All the themes have promoting and inhibiting factors that affect the nurses' involvement and work satisfaction.

Conclusion:

The preliminary conclusion indicated that an incentive to participate in the quality assurance of POCT must be established before collaboration between the EHHN team and those responsible for the QA of the POCT analysis can be initiated. This forms the foundation for effective collaboration on quality procedures, thereby enabling them to address the various promoting and inhibiting factors affecting the nurses' involvement in the QA of POCT analyses.

S-08-01

Evidence based practice in biomedical laboratory science education. A dedicated module to improve Danish BLS undergraduate students Evidence Based Practice (EBP) competences

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Introduction and background
Teaching Evidence based practice (EBP) competences to undergraduate healthcare students has been claimed to be important for their future development in clinical practice once they are employed. Biomedical laboratory scientists have a very important role in healthcare, but little is known about theses competences both at the school and clinical practice level.
This study investigates the effect in the knowledge, skills and attitudes towards EBP at University College South Denmark by a module designed to teach biomedical laboratory students the IMRAD format.

Methods
We describe the IMRAD module thoroughly.
In a quasi-intervention study without control group, two groups of students (BA19 n=23, BA20 n=32) completed two questionnaires Q1 (before, after IMRAD and after end of semester), and Q2 (after bachelor completion). The students self-reported their attitudes, knowledge, and skills towards EBP items (Q1) and their perception of the EBP five-step process competences (ask, search appraise, integrate, evaluate) and their importance for future job applications (Q2).

Results and findings:
The questionnaires showed a significant increased self-perception effect of the student´s attitudes (BA 19 p=0,0025, BA 20 $p=1,8*10^{-6}$) and skills and knowledge (BA19 $p= 2,9 *10^{-9}$, BA20 $p=2,9*10^{-14}$) after ending the module and more importantly, this increase was maintained after clinical placement at the end of their semester for both attitudes (BA19 $p=6,4*10^{-4}$, BA20 $p= 4,8*10^{-4}$) and knowledge and skills (BA19 $p= 5,2 *10^{-8}$, BA20 $p=2,9*10^{-9}$). The students reported a high self-perception of the EBP five-step process competences after completion of their bachelor project and their considerations to include these competences when searching for a future job

Conclusion:
The IMRAD module has given the students an improved self-perception of their IMRAD competences towards EBP and the ability to use them. They would like to look for a future job that values these competences and where they can contribute with them in praxis

S-08-02

A student-run echocardiographic clinic in Biomedical Science education – an opportunity with several advantages

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Introduction and background

In Sweden, Biomedical Scientist students specializing in Clinical Physiology must develop competence in performing and evaluating echocardiographic examinations. However, limited internships, supervisor time due to high patient flow often restrict hands-on practice. To address this, a student-run echocardiographic clinic was established at Clinical Physiology, Sahlgrenska University Hospital, Gothenburg, for patients with simple referral questions or mild cardiac pathophysiology.

Methods

The clinic was set up at the Department of Clinical Physiology with available space and equipment. Four students per internship period was accepted, totally 8 students. Supervision was provided by an experienced Biomedical Scientist, with a physician available by phone. Peer-learning pedagogy was employed, with students working in pairs to ensure high examination quality and mutual support.

Results and findings:

The clinic examined 120 patients. Key benefits included extensive hands-on training for students, reflected in improved performance in subsequent practical exams. Patients with simpler referral questions experienced shorter waiting times for echocardiographic examinations. The quality of examinations matched that of the regular clinic, as all student examinations were reviewed and completed by an experienced Biomedical Scientist if necessary. The clinic also increased patient throughput, significantly reducing the existing patient queue.

Conclusion:

Students demonstrated greater skill and required less “run-in time” when employed at a clinic. Patients with lower priority received quicker examination times, and the higher throughput led to shorter patient queues.

S-08-03

Biomedical science education at the University of Iceland

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Introduction and background

Education in biomedical science at the University of Iceland (UI) offers a theoretical and practical undergraduate program which consists of 180 credits (ECTS) and is a fully accredited examination leading to the degree of BSc (baccalaureus scientiarum). The admission requirement is a matriculation examination.

The main goal of the program is to provide basic education in biomedical science and further studies so that students can obtain Icelandic license to practice as a biomedical scientist from directorate of Health. The faculty also provides a higher educational degree such as MSc. If students choose to continue studying, they can apply to Medical LiveScience at the UI and pursue a doctoral degree (PhD).

BSc degree in biomedical science takes three years to complete, 180 ECTS. It continues with a supplementary year 60 ECTS credits i.e. a diploma program or a 120 ECTS MSc (magister Scientiarum) program. Both postgraduate studies are based on courses, internships, and research projects.

The Icelandic education for biomedical scientists is according to the Bologna agreement (since 1999), but domestic regulations have higher requirements for practice than many other European countries.

S-08-04

Biomedical sciences in Iceland: programme overview and a personal experience

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Introduction and background

Biomedical Sciences' education forms professionals able to perform in several fields. The most common examples being in the clinical analysis and scientific research. The Biomedical sciences studies in Iceland differ from the other Nordic countries especially in its professional focus and early practical training. This presentation talks about the academic structure of the programme at the University of Iceland and its unique features from the perspective of a graduate.

Methods

A descriptive presentation of the Biomedical Sciences BS and MS programs at the University of Iceland from a graduate personal experience. Information about the curriculum structure as well as the requirements needed to obtain licensure will be displayed alongside a concise discussion on how Biomedical Sciences education in Iceland supports both academic and professional growth.

Results and findings:

The University of Iceland offers a three-year BS (180 ECTS) degree, with an optional fourth year (60 ECTS) required for licensure. The curriculum combines theoretical studies with early pragmatic experience, that is, the program is oriented to combine academic knowledge and practical skills that, generally, meets the demands of the healthcare system. For this purpose, the students take part in supervised visits/training at the National University Hospital and other healthcare facilities throughout the whole course. From a personal perspective as a graduate, the University of Iceland's programme made possible a successful transition from a different background (BA in Law) abroad to a fulfilling career in Biomedical sciences.

Conclusion:

The Biomedical sciences programme at the University of Iceland provides a multitude of career options, especially a clear, profession-oriented route to the clinical work and scientific research. Its well organised academic foundation, pragmatism, early provision of the working field experience, and close integration with the healthcare system distinguish it from comparable programs outside Iceland, e.g. the other Nordic countries.

S-09-01

Development of biomedical laboratory scientists' collegiality guidelines

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Introduction and background

Biomedical laboratory scientists (BLSs) operate in environments where collegiality among coworkers is essential to accomplish the primary objectives of their work. Collegiality refers to cooperative interaction, shared responsibility, and respectful, considerate behavior between colleagues. While collegiality is frequently discussed in healthcare settings, it has received less focus in the context of clinical laboratory environments. In the autumn of 2023, the Finnish Biomedical Laboratory Scientists Association formed a working group to develop collegiality guidelines aimed at encouraging BLSs to demonstrate greater collegiality towards one another. The goal of this project was to create collegiality guidelines for BLSs.

Methods

In summer 2024, two online expert panels of Finnish BLSs, consisting of 28 and 29 members respectively, used the Delphi method to develop a framework for the guidelines. They revised items related to BLSs' collegiality, as identified by previous study, and evaluated them according to their importance using a 5-point Likert scale. Data was analyzed using content analysis and descriptive statistical methods, and the BLSs' collegiality guidelines were developed.

Results and findings:

In the first Delphi round, items were revised and added, leading to a total of 47 reformulated items. The second Delphi round produced a finalized list of 30 items for inclusion in the guidelines. The highest-rated item was 'Collegiality is the respectful behaviour of a colleague' followed by 'Collegiality is the appreciation of the work done by colleagues,' and 'Collegiality is acting according to common ground rules'.

Conclusion:

To implement collegiality in BLSs' working environments it is essential to disseminate collegiality guidelines among BLSs. We suggest the guidelines to be included in BLSs' education through modules addressing occupational ethics. BLS associations can also include information about collegiality in their communication channels. Importantly, laboratory supervisors play a key role in implementing the guidelines in laboratory working environments.

S-09-02

Job and job related attitudes among biomedical scientists

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Introduction and background

Biomedical scientists conduct important research and analyses of biological specimen in the healthcare sector, but there is little research and discussion in Iceland about the roles and attitudes of this professional group. The aim of this study is to gain insight into the nature and characteristics of the work and work-related attitudes of this group.

Methods

Recognized and reliable measurement tools were used to assess job design, job satisfaction, burnout, and plans for retirement. The study is a quantitative comparative study, and a survey was administered to practicing biomedical scientists at the beginning of 2023, with results compared to those of practicing nurses in the country who responded to the same questionnaires in an international study in 2018.

Results and findings:

The results are based on responses from 147 participants, including 65 biomedical scientists and 82 nurses. The findings suggest that the strengths in the job design of biomedical scientists lie in their perception of importance, specialization, diversity, and complexity. The results also indicate that the knowledge of biomedical scientists is well-utilized and that social support is present. Nurses and biomedical scientists perceive their jobs as similarly complex and requiring comparable levels of knowledge and social support. Biomedical scientists receive limited built-in feedback both from the work itself and from colleagues, and they have limited influence over how they perform their jobs.

Conclusion:

The results indicate that physical strain and the use of complex equipment are the main weaknesses in the work of nurses, while the use of complex equipment and a lack of feedback are the main weaknesses in the work of biomedical scientists. Job satisfaction in these professions is comparable and quite high, but biomedical scientists report fewer symptoms of burnout than nurses, and they are significantly less likely to plan for retirement.

S-10-01

KMT2D-deficiency impairs mitochondrial function, triggering ROS mediated precocious differentiation

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Introduction and background

Kabuki syndrome (KS), a rare Mendelian disorder of the epigenetic machinery caused by loss-of-function variants in the histone methyltransferase *KMT2D*. Postnatal growth retardation is seen in majority of individuals with KS but KMT2D involvement in chondrocyte differentiation remains unclear. Previously, we observed precocious differentiation of two disease relevant cell types, KMT2D-deficient neurons and chondrocytes, accompanied by elevated HIF1A in neurons. Hypoxia is a vital physiological factor in chondrocyte differentiation, so we hypothesized that KMT2D-deficiency similarly increases HIF1A in chondrocytes, driving premature differentiation.

Methods

ATDC5 cell line (*Kmt2d*$^{+/+}$ or *Kmt2d*$^{-/-}$) was differentiated in normoxia (20% O_2) or hypoxia (5% O_2) and differentiation assessed with Alcian Blue staining. Both Sc-RNA-seq and bulk-RNA-sew was performed throughout differentiation. Mitochondrial function was evaluated with Seahorse MitoStressTest, lactate secretion with amperometry and ROS levels using FACS.

Results and findings:

sc-RNA-seq revealed that even prior to induced differentiation *Kmt2d*$^{-/-}$ cells show advanced states of maturation and lack of cell cycling. *Kmt2d*$^{-/-}$ cells displayed elevated expression of *Hif1α* (padj≤0.0001) but knock-down with siRNA did not affect differentiation. *Kmt2d*$^{-/-}$ cells exhibit decreased maximal respiration (p≤0.001) and increased lactate production (p≤0.0001). Elevated O^{2-} production was observed before initiation of differentiation (p≤0.0001), coupled with enhanced antioxidant response (*Nfe2l2* expression) (padj≤0.01) which suppresses H_2O_2 accumulation (p<0.0001). Upon differentiation, the antioxidant system became overwhelmed, leading to H_2O_2 accumulation (p≤0.01), coinciding with precocious differentiation. This effect was observed in normoxia (p≤0.01) but not in hypoxia in addition that treatment with Rotenone or MitoQ rescued the precocious differentiation.

Conclusion:

KMT2D-deficient cells activate the hypoxia-response as a compensation to shift metabolism from OXPHOS to glycolysis, reducing mitochondrial oxygen consumption and mitigating oxygen toxicity. Lowering oxygen or drug treatment targeting mitochondria decreases ROS and rescues precocious differentiation, suggesting mitochondrial dysfunction and oxygen toxicity as the underlying cause for precocious differentiation of KMT2D-deficient chondrocytes.

S-10-02

Lineage tracing endometriosis lesions using somatic mutations

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Introduction and background

All cells of the body accrue somatic mutations with time, with mutations shared between distant cells implying shared ancestry. Endometriosis is characterized by the presence of endometrial cells outside the uterus but the developmental origins of the endometriotic lesions, and their mechanisms of spread within the pelvis continue to be debated.

Methods

We used laser capture microscopy to isolate individual endometrial glands from lesional tissue biopsies and matched normal endometrium. We performed whole-genome sequencing of hundreds of endometrial glands from 25 patients to identify the somatic mutations present and build the phylogenetic tree of endometriosis lesions within each patient.

Results and findings:

We show that endometriosis lesions are comprised of several groups of unrelated glands and have not been seeded by single cells. This is true of both superficial and deep-infiltrating lesions and of endometriomas. Furthermore, we show that lesions removed from different sites of the body are derived from distinct cells of origin, indicating that each arose through an independent seeding event as opposed to “metastasis-like” spread from a single founder lesion. Locally however, there is evidence of continued, post-seeding, growth, and Darwinian competition between mutant cell clones many of which harbour mutations in known drivers of uterine carcinomas such as *KRAS* and *PIK3CA*.

We apply methods developed to determine cell of origin for cancer samples to show that endometriosis cells do not arise through metaplasia from another cell type as has been proposed in the literature but have always been endometrial cells. We demonstrate a uterine origin for one endometriosis clone by executing a large-scale screen for the clone within the normal uterus of a patient who underwent hysterectomy.

Conclusion:

We provide unparalleled insights into the developmental origins of endometriotic lesions, providing functional evidence for theories of the aetiology of this poorly understood disease.

S-10-03

Novel asthma drug targets identified through human genetics

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Introduction and background

Drug discovery is a complex process that involves significant risk and financial investment. Human genetics combined with other large omics datasets can point to novel drug targets with enhanced success rate. Asthma is a heterogeneous syndrome, and despite several existing treatments, there remains a significant unmet need for novel therapies.

Methods

Genome-wide association studies (GWAS) were performed on large asthma cohorts. Identified sequence variants were annotated through their effect on amino acid coding, mRNA transcription and plasma protein levels. Carriers of two particularly interesting asthma protective variants were invited to donate blood for further functional readouts of the sequence variants.

Results and findings:

We identified a low frequency missense variant in *TNFRSF8* (rs2230624, p.C273Y) and a rare missense variant, in STAT6 (rs770378890, p.L406P), both of which protected against asthma. Functional studies showed that functional consequences of both variants were consistent with loss of function. First, the *TNFRSF8* variant reduced protein expression both on cell surface and in soluble form on activated Peripheral Blood Mononuclear Cells (PBMCs). Secondly, the *STAT6* variant associates with reduced STAT6 and IgE protein levels and dampened transcription of multiple downstream gene upon IL4 treatment of $CD4^+$ T-cells.

Conclusion:

We have identified TNFRSF8 and STAT6 as novel drug targets for asthma through human genetics and gained insight into the biological function of the sequence variants using various functional readouts and large transcriptomics and proteomics datasets.

S-11-01

Looking through the rear-view mirror - The development of biomedical science in Iceland

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University of Iceland, Reykjavík, Iceland

Introduction and background

Profession
After training in laboratory work at Rannsóknastofa Háskólans the first biomedical scientist in Iceland graduated as a "hospital laborant" in Denmark in 1935, and was then employed by Landspítali as the one and only permanent laboratory worker until 1952. The number of the laboratories and their employees gradually increased, and with it the need for an organization and formal education in the country.

Association
Félag Lífeindafræðinga, FL, was formally established as a professional association in 1967. The criteria for membership were either an exam in biomedical science, or a two-year training at a recognized laboratory before the school started. Licence to work as a biomedical scientist including these criteria was issued by health authorities, changing according to the development of the education.

The main projects of FL, besides salary and working conditions, have been related to education and the recognition of the responsibilities of the profession and its part in administration. Most of the steps have been taken to ensure this legally, but more biomedical scientists with education in administration are needed.

Education
A two-year programme held in collaboration between health laboratories and Tækniskóli Íslands, started in 1966. In 1982 it was changed to a three-year BS degree programme, the first in the Nordic Countries. Due to increased knowledge and technical progress, the study length gradually increased to four years. In 2005 a programme in biomedical science was established at Háskóli Íslands in a new Department of Biomedical Science within the Faculty of Medicine. It was based on former programmes, but organized as a BS degree in three years, followed by a one-year diploma, or a two-year MS degree.

Conclusions
Looking through the rear-view mirror I see enormous changes in the knowledge and technology in biomedical science, reflected by the development in education, work and recognition of the profession.

S-11-02 / P-32

Development of the role as a biomedical laboratory scientist

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Introduction and background

The background for this literature review is a desire to explore how biomedical laboratory scientists (BLS) can develop their role through practice and education. Research question: *"How can medical laboratory scientists develop their role through practice and education?"*

Methods

The method I have used for this in-depth assignment is a literature review, where results from primary sources are summarized in order to strengthen the findings made (Malterud, 2017).

Results and findings:

Only three relevant qualitative studies were included in this literature review. The first article (Ersvær et al., 2022) aims to highlight the wishes and needs of BLS in their role as practice supervisors. The second article (Tholen, 2019) explores how higher education can develop the qualities necessary for students' future careers. The third article (Frøland et al., 2020) contributes to a deeper understanding of new technology in the education.

Conclusion:

In this assignment, it is highlighted that guidance is central and an important aspect of developing the role. Guidance and reflection can allow students to develop through practice and education, and therefore allocated time is crucial. A lack of time can result in the inability to assess whether the students have developed during their practice period and whether they are on the right track in relation to the learning objectives of their education.

If education and practice are to bridge the gap between theory and practice, it is necessary to become more aware of improving communication and information, while also fostering greater collaboration across education and practice. Perhaps the implementation of new technology could facilitate better learning and development in the education and practice of BLS.

S-11-03

Advanced and Consultant Practice for Biomedical Laboratory Scientists – the UK experience

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Introduction and background

It is almost 25 years since the UK first considered the potential of using regulated biomedical scientists to undertake some of the roles and responsibilities of medically qualified pathologists. These first roles were in the specialism of cervical cytopathology in response to a shortage of medical pathologists in cytopathology.

A qualification was with the Royal College of Pathologists (RCPath) and the first scientists sat the examination in 2001. Since that time the number of reporting scientists has increased to considerably to outnumber the reporting medical pathologists. The use of experienced, trained and qualified scientific staff to undertake medical pathologist reporting proved to be a safe and highly efficient means of addressing some of the challenges of an increasing laboratory workload and a static or reducing medical pathologist workforce.

The medical staff pressures were also being felt in histopathology and the decision was taken to develop with the RCPath a new training programme and qualification that would enable scientists to dissect a range of histopathology tissue samples. Since that time more than 200 scientists have taken the examination and scientists are now almost universally accepted as an integral part of the dissecting workforce to the extent that in some laboratories the majority of dissecting is undertaken by scientists.

Results and findings:

Scientist histopathology reporting has now been an option for almost ten years. It is by no means universally accepted by pathologists but there is a steadily growing number of scientists reporting and they are increasingly seen as a safe option to support the pathologist reporting workforces.

Conclusion:

The use of scientists in advanced and consultant roles in histopathology and cytopathology is recognised across the whole UK and welcomed in many laboratories. In the other laboratory specialisms advanced practice opportunities for scientists tends to be more localised but are slowly increasing.

S-12-01

Next-generation sequencing of the bacterial *rpoB* and the 16S rRNA genes in complex infections.

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Introduction and background

Identification of bacteria in complex samples, like material from brain or liver abscesses can be challenging. Previous studies have showed that traditional cultivation detects only about 30% of bacteria present in such polymicrobial samples often caused by a multitude of facultative and anaerobe species. Therefore, culture-independent methods like next-generation sequencing (NGS) of bacterial DNA is needed for thorough characterizations. The bacterial 16S rRNA gene is commonly used for this purpose. Unfortunately, a low level of heterogeneity limits species-level identification. The *rpoB* gene represents an alternative target providing better resolution within many clinically important taxa with the potential to improve diagnosis of complex samples. The aim of this study was to evaluate NGS of *rpoB* on the Illumina platform, compere results to those of NGS of the 16S rRNA gene and assess the efficiency of *rpoB*NGS for bacterial detection and identification.

Methods

We performed next-generation sequencing of the 16S rRNA and *rpoB* gene on 25 polymicrobial samples from intraabdominal abscesses on the Illumina MiSeq System. We followed the Illumina protocol for sequencing the 16S rRNA gene as described previously and designed and evaluated a novel set of broad-range primers for the *rpoB* gene. We analyzed sequencing data (FASTQ-files) for both *rpoB* and the 16S rRNA gene sequencing using the RipSeq NGS software.

Results and findings:

rpoB provided improved resolution between closely related species as compared to the 16S rRNA gene, especially for species within clinically important genera like *Streptococcus*, *Enterococcus*, *Fusobacterium* and genera within the *Enterobacteriaceae* family. We observed some, but not much, cross-reactivity with human DNA for *rpoB* and no cross-reactivity for the 16S rRNA gene.

Conclusion:

A combination approach using next generation sequencing of both *rpoB* and the 16S rRNA, gives a more accurate description of polymicrobial samples with a higher taxonomical resolution as compared to sequencing of the 16S rRNA gene alone.

S-12-02

Serum from thrombin tubes - can it be used for infection serological analysis?

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Introduction and background

At our hospital, Vestfold Hospital Trust, there is a desire to use serum collected in thrombin tubes for infection serological analysis at the department of Microbiology. The aim of our study is to avoid repeated sampling when a serum has already been collected in a thrombin tube. This would benefit the patient, clinicians, and the laboratory and contribute to faster test results. The study correlates to an ongoing project at our hospital where we want to reduce unnecessary sampling of patients.

Methods

Literature Search: Our literature search shows no documentation that this has been validated before.

Thrombin tubes were collected by voluntary consent at the ordinary sampling round. In our study, we compared selected serological parameters in serum from these tubes with serum from standard gel tube.

Selected parameters:

EBV, anti-HBs and CMV were tested on Cobas e801.

Lyme disease was tested on Liaison XL

Parvo IgG and varicella IgG were tested on VirClia Lotus.

Results and findings:

The measurements shows approximately equal numerical values on our selected analyses, and the diagnostic outcome was the same.

Conclusion:

We have tested on all the instruments used for infection serology at our lab, and we have shown that the diagnostic outcome was the same. We can thus conclude that we can use serum from thrombin tubes when clinicians want to order serological analyses when only a thrombin tube has been collected.

S-12-03

Lin-R screening agar plates from CHROMagar™, experiences with detecting linezolid resistant enterococci from rectal swabs

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Introduction and background

Linezolid is considered the last line of defence in the treatment of infections with multidrug-resistant (MDR) enterococci, including vancomycin-resistant enterococci.

The prevalence of linezolid resistance among clinical enterococci (LRE) remains low (<1%) worldwide, but it is increasing in several countries. There is a need to detect gut carriage of LRE in risk patients and in outbreak investigations. CHROMagar™ LIN-R is a chromogenic medium designed for detection and differentiation of Gram-positive bacteria resistant to linezolid directly from the sample material.

In 2023-2024 the National centre for detection of antimicrobial resistance (K-res) in Norway, participated in the APPLE multicentre study spanning 17 countries. One of the study's aims was to evaluate the performance of the Lin-R screening agar plate from CHROMagar™.

Methods

A total of 154 rectal swabs from patients that were routinely examined for carriage of MDR bacteria were included in the study during October 2023 to February 2024. We used ready-to-use plates from CHROMagar™, with weekly quality control strains. LRE typically appears as steel-blue colonies with blue halos/shadows on the plate after 36-48 hours of incubation. For verification of linezolid resistance, disk diffusion was performed followed by whole genome sequencing (WGS).

Results and findings:

Nine of the 154 clinical screening samples showed growth of blue colonies with *Enterococcus spp* (5.8%).LRE was confirmed in five of those samples reaching a LRE carriage rate of 3.2%. The weekly control scheme results with strains of high- and low-grade linezolid resistance were approved throughout the study.

Conclusion:

Our findings showed good correlation between the growth of distinct blue colonies on the CHROMagar™ Lin-R plate and detection of LRE. The Lin-R plate also supported growth of other bacterial species and hazy blue coloured growth did also occur.

This growth did not turn out to be LRE. Reading the plate requires some experience.

S-13-01

Studying mtDNA in platelets using Northern Lights Assay

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Introduction and background

We present a simple method for isolating mitochondrial DNA (mtDNA) developed for use with the Northern Lights Assay (NLA). NLA is a two-dimensional, gel electrophoresis-based assay that reveals damage patterns of DNA samples including single-stranded DNA, intrastrand and interstrand crosslinks, single- and double-stranded breaks, and oxidative damage. Isolation protocols for NLA must produce DNA of both sufficient quantity and purity without using PCR, which obscures damage in the original sample. Protocols should also remain simple to allow for implementation in a wide variety of clinical and laboratory settings. Current protocols to isolate mtDNA do not fulfill these criteria. Therefore, mtDNA damage has not yet been well characterized, despite being of particular importance in the context of diseases where mitochondrial dysfunction is known to contribute to pathogenesis.

Methods

Platelet rich plasma was separated from whole blood samples via differential centrifugation then underwent high-speed centrifugation to pellet both platelets and mitochondria. DNA was extracted from the resuspended pellet using gentle methods to limit damage to the sample. Purified DNA samples were digested with a restriction enzyme, MboI, and analyzed using agarose gels and NLA.

Results and findings:

We developed a protocol that produces 150-250 ng of DNA. Restriction enzyme digests resulted in expected banding patterns for mtDNA with minimal background smearing. Limiting leukocyte contamination of the plasma proved to be essential in reducing the amount of smearing in the final sample. Preliminary NLA analysis found a significant amount of single-strand nucleic acids in the samples.

Conclusion:

The isolation protocol developed provides a simple, PCR-free method that produces mtDNA of sufficient quantity and purity for the purposes of NLA. Combining the protocol with NLA presents a promising tool to characterize damage patterns of mtDNA from both healthy individuals and individuals with mitochondrial diseases or degenerative diseases such as Parkinson's disease.

S-13-02

Androgens mediate sexual dimorphism in Pilarowski-Bjornsson Syndrome

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Introduction and background

Pilarowski-Bjornsson Syndrome (PILBOS, OMIM: 617682) is a neurodevelopmental disorder first described by our group, characterised by growth retardation, hypotonia, autism spectrum disorder (ASD) and intellectual disability, caused by variants in the chromatin remodeler gene *CHD1*.

Methods

We have collected clinical data from the largest PILBOS cohort to date (56 individuals) and analysed to characterise *CHD1* variants and define PILBOS phenotypes. We used CRISPR-Cas9 to generate a mouse model harbouring a patient-specific PILBOS variant (*Chd1*$^{R616Q/+}$). We manipulated testosterone levels in mice of both genotypes by orchiectomy of males and testosterone supplementation of females. Using embryonic neural progenitor cells (NPCs) isolated from these mice, we evaluated proliferation and performed RNA sequencing. Using the gnomAD and UK Biobank databases, we analysed human missense variants for sex differences in allele frequencies in *CHD1* plus 3139 additional highly constrained autosomal genes.

Results and findings:

Males were overrepresented in the PILBOS clinical cohort, but females displayed more severe phenotypic scores. Heterozygous *Chd1*$^{R616Q/+}$ mice displayed female-limited weight and motor deficits, and increased anxiety-like behaviour. Orchiectomy of male mice at postnatal day 15 unveiled a weight phenotype previously masked in mutant males. Conversely, testosterone supplementation in *Chd1*$^{R616Q/+}$ female mice led to rescue of the phenotype. Moreover, *Chd1*$^{R616Q/+}$ NPCs showed a proliferation defect *in vitro*, and testosterone treatment of pregnant dams normalised proliferation in the embryonic mouse cortex. *In vitro* treatment of NPCs with dihydrotestosterone induced a widespread rescue of the transcriptional changes caused by *Chd1*$^{R616Q/+}$, suggesting that androgens may counteract CHD1 dysfunction by promoting an opposing transcriptional program. Rare *CHD1* missense variants were overrepresented in males in the gnomAD and UK Biobank datasets. We identified 33 additional highly constrained autosomal genes that show similar missense variant overrepresentation in males.

Conclusion:

These findings unveil a novel sex-specific mechanism in PILBOS and pave the way for future investigations into sex-specific penetrance in autosomal genetic disorders.

S-13-03

Clinical workup of presumed new genetic syndrome in a mother-daughter pair comprising distal arthrogryposis, exostosis of manubrium sterni, eruption failure of deciduous and adult teeth, corpus callosum agenesis/hypoplasia, and mild developmental delay

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Introduction and background

A mother-daughter pair presented with an unusual phenotype consisting of distal arthrogryposis, exostosis of manubrium sterni, eruption failure of deciduous and adult teeth, corpus callosum agenesis/hypoplasia, and mild developmental delay. No other family members similarly affected, suggesting a *de novo* genetic variant in the mother with autosomal or X-linked dominant inheritance.

Methods

Clinical laboratory genomics workup consisting of G-banded karyotyping with FISH, aCGH, srWGS family study, Optical Genome Mapping (OGM), RNA sequencing, and Nanopore long-read sequencing (LRS).

Results and findings:

A balanced reciprocal translocation t(7;22)(q36.3;q13.32) was detected in both patients. aCGH and srWGS were normal. OGM showed the breakpoint on der(7) to be in the regulatory region of *SHH*, and the breakpoint on der(22) to be in *FAM118A*. LRS determined the precise breakpoint location (hg38 chr7:156,946,076 and chr22:45,309,078) which was consistent with OGM. RNA-seq. did not detect chimeric *FAM118A* fusion transcripts or abnormal expression of *FAM118A*. No other possibly causative variants were detected.

Conclusion:

The likely cause of the patients' phenotype is the de novo translocation t(7;22)(q36.3;q13.32) that disrupts the regulatory region of the *SHH* gene. This is the first reported case linking eruption failure in humans to the *SHH* gene. This is supported by published mouse studies which showed suppression of tooth eruption in neonatal mice following treatment with an Shh inhibitor. Further evaluation of the translocation's effects on 3D genome structure with Hi-C is planned.

S-14-01

Student supervision – are you up to the task?

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Introduction and background

Biomedical laboratory scientist (BLS) students are supervised by a number of different student supervisors during their clinical practice. Few of these supervisors have formal training and theoretical knowledge in student supervision. Both students and student supervisors have expressed a need for enhanced knowledge on the topic.

Aiming at providing basic knowledge about student supervision to present and future student supervisors in clinical laboratories in Norway, the Biomedical laboratory science education program at UiT the Arctic University of Norway developed a digital interactive course. The course was developed in close collaboration with a student supervisor from a clinical laboratory, as well as Center for Faculty Development at UiT the Arctic University of Norway.

Methods

Through digital seminars and surveys, we collected experiences, recommendations, needs and ideas from all collaborating clinical laboratories in North Norway. A digital interactive course in student supervision was developed based on the feedback from these seminars and surveys. The course was designed using the digital content creation tool H5P.

With support from Centre for Teaching, Learning and Technology a series of videos depicting different situations related to student supervision were produced. The videos were used as a basis for questions to promote reflections and discussions on different topics related to student supervision.

Results and findings:

The result is a digital course consisting of 4 modules, containing theory, videos of realistic supervising situations in clinical laboratories, questions and useful tips for student supervisors. The digital course was shared with all collaborating clinical laboratories in North Norway, as well as nationally through all BLS study program leaders in Norway. The project has also been presented at national meetings and conferences.

Conclusion:

Several clinical laboratories, including The Department of Microbiology and Infection control at The University Hospital of North Norway, are planning to integrate the course presentation into their internal mandatory training program.

S-14-02

Supervising students in blood sampling digitally with Teams - Possibilities for flexible study programs using digital technology

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UiT, Tromsø, Norway

Introduction and background

Students want flexible education programs that can be tailored to accommodate work, personal responsibilities, and geographic location. Meanwhile, the demand for more Biomedical Laboratory Scientists (BLS) in Norway is growing. Due to large distances in North Norway, students in these areas currently need to relocate to Tromsø to attend the BLS study program. Flexible study options are essential to recruit students that cannot relocate, and secure the education of health personnel in the smaller cities. Digital tools and online learning will enable students to study at their own pace while remaining in their hometowns, aligning education with their personal circumstances. However, the BLS program involves extensive skills training, making it challenging to implement flexible programs. Digital skills training offers a potential solution to reduce the need for frequent campus attendance.

Methods

We performed a pilot study where BLS students in their last year of their BLS education at UIT - The Arctic University of Norway, planned and performed skills training in venous blood sampling procedure digitally in real time using Teams. One student group (4 students) demonstrated and supervised a different group (4 students) through all the steps in performing a venous blood sample draw without being physically present, communicating only through cameras and microphones using Teams. The receiving group had to perform a blood sampling with instructions from the supervising group. The session was supervised by authorised health personnel at both sites.

Results and findings:

In all the groups, the receiving groups successfully performed a venous blood sampling procedure under digital supervision from the supervising groups. Students evaluation revealed that the students experienced deep learning by having to supervise and demonstrate the skills to other students, as well as having to account for the digital element, and digital communication.

Conclusion:

Skills training using Teams may be a tool for reducing the need for attending campus.

S-14-03

Suitability Assessment of Biomedical Laboratory Science Students: A Growing Concern

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Introduction and background
Suitability assessment is an important part of the overall assessment of all health care profession students, including BLS students, in order to ensure they are fit to practice their future profession.

Since 2014 there has been a five fold increase in reported cases of doubts and concerns regarding suitability in Norway, and BLS students are part of this increase.

Methods
Suitability assessments include both evaluations during “in house training” at the university and during practical placements, where students' abilities to apply their knowledge in real-world scenarios.

When a doubt report is received, it is handled by the suitability officer at the institution and can lead to assessment interviews or review by a suitability committee. In the most serious cases students may be expelled from the university, either for a semesster og for some years.

Results and findings:
All institutions educating BLSs reported increased numbers of doubts and the need for special suitability assessments. Doubt and concerns are reported by teachers and instructors, fellow students, or others, and concern anything from academic skills or linguistic challenges to personal suitability and behaviour.

In 2023, 487 cases were reported, and 263 cases were handled by local committees. Seven cases concluded that the student was not suitable for the profession in question, and expelled from the institution. One of these was a BLS student.

The increase shows a growing awareness of the importance of ensuring that future healthcare workers are well-suited for their professions. The increase can be attributed to several factors such as increased awareness and improved procedures and systems, changes in student populations, pandemic effects, general stress, and increased focus on patient safety.

Conclusion:

Suitability assessment is important to ensure that students are well-prepared to meet future challenges and reflects a growing awareness of the importance of this educational aspect.

S-14-04

How can learning outcomes in *quality audit* be achieved by biomedical laboratory science students?

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Introduction and background

Quality control and quality assurance are crucial to ensuring the accuracy of test results and are therefore essential components of biomedical laboratory scientists' training. Regular audits are mandatory in accredited medical laboratories; however, this is not an experience typically encountered by our students during their training in hospital laboratories.

How can students be trained in auditing and managing quality systems without imposing an additional burden on medical laboratories? Is on campus Student Active Revision (SAR) the answer?

Methods

The Student Active Revision (SAR) learning-activity has been developed in collaboration with partners from LMK, St. Olav's University Hospital, and Norsk Akkreditering (the accreditation authority in Norway). SAR includes eight different contextual materials, such as videos and documents from various medical laboratory specialties, illustrating different scopes of the audit. These materials, including the videos, contain several selected non-conformities. SAR is conducted as an intensive, mandatory on-campus learning-activity over one week, during which students carry out an audit.

Results and findings:

The SAR learning-activity has been conducted three times, with a total of 180 student. Data from feedback has been gathered after each session.

Feedback from students, experts from the hospital, and Norsk Akkreditering has been positive following the implementation of SAR into our BLS-study program.

As one student remarked: "It's nice to see how it works in practice; I feel I gained a better understanding of the auditor's tasks and challenges than I would have from just a lecture."

A focus group interview with selected experts revealed that newly appointed biomedical laboratory scientists exhibit a greater understanding and insight into quality work at the system level following the introduction of the SAR program into our BLS-study curriculum at NTNU, Trondheim.

Conclusion:

The SAR learning-activity demonstrates that it is possible to provide students with contextual training in auditing on campus, without imposing an additional burden on medical laboratories.

S-15-01

What's up in Icelandic aquaculture? A veterinarians perspective

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Introduction and background

The aim of the talk is giving the listener insight into the Icelandic aquaculture industry and furthermore, the work of a veterinarian in the industry. Where is Icelandic aquaculture headed? What diseases are present in Icelandic fish farming and where do we stand compared to other aquaculture nations? What can we do to prevent introduction of new pathogens to Icelandic aquaculture, both at sea and on land? What to do when disease outbreaks occur and how to limit the impact?

S-15-02

Parasite Under Pressure: Tackling *Parvicapsula pseudobranchicola* with the ParviLife Project

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Introduction and background

Parvicapsulosis is a significant disease affecting farmed Atlantic salmon (*Salmo salar*), caused by the myxozoan parasite *Parvicapsula pseudobranchicola* (*P. pseudobranchicola*). First described by Karlsbakk et al. in 2002 in Norwegian aquaculture, the parasite primarily infects the pseudobranchs, with clinical manifestations including surface dwelling, erratic swimming, lethargy, and potential blindness. Since its initial detection in Iceland in 2019, *P. pseudobranchicola* has posed a recurring challenge to the Icelandic salmon farming industry. This study aimed to assess the distribution and prevalence of *P. pseudobranchicola* in Icelandic salmonids, both farmed and wild, and to identify its definitive host.

Methods

Screening of fish from multiple locations across Iceland was conducted using PCR, histology, and in situ hybridization.

Results and findings:

Results indicate a low prevalence of the parasite in wild salmonids, regardless of proximity to aquaculture sites, whereas prevalence in farmed salmon is high and location-dependent. The parasite follows a two-host life cycle involving salmonids and an annelid, with recent identification of the previously unknown definitive host.

Conclusion:

This discovery presents novel opportunities for disease mitigation.
As part of ongoing efforts to address parvicapsulosis, we introduce the *ParviLife* project, a three-year initiative launched in 2024 and funded by the Norwegian Seafood Research Fund (FHF). Building upon prior research in Iceland and Norway, the project aims to improve the understanding of *P. pseudobranchicola*'s epidemiology and develop effective mitigation strategies for aquaculture. Key objectives include refining diagnostic tools, evaluating environmental risk factors, and exploring potential control measures to reduce parasite transmission. The insights gained from *ParviLife* will contribute to more sustainable management of *P. pseudobranchicola* in farmed salmon populations.

S-15-03

Infectious salmon anemia outbreak in farmed Atlantic salmon (Salmo salar L.) in Iceland, first detection of an ISAV HPRdel variant

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Introduction and background

Infectious salmon anemia (ISA) is a serious viral disease of Atlantic salmon (*Salmo salar* L.) caused by the ISA virus (ISAV) and is notifiable to the World Organization for Animal Health (OIE). Virulent strains ISAV-HPRdel have deletions in a highly polymorphic region (HPR) of the hemagglutinin-esterase (HE) gene on segment 6, whereas avirulent strains ISAV-HPR0 have none.

Routine targeted samplings for Real-time RT-PCR analyses have been performed since 2009. Icelandic Atlantic salmon broodfish farms are formally declared free of ISA by the fish health authority of the European Union.

Methods

ISAV screening with RT-qPCR started at Keldur in 2011. The few samples that have been ISAV positive from broodfish are HPR0 genotype. A research project carried out at Keldur from 2015-2018 screened both wild and cultured salmon juveniles, cultured salmon in sea pens and wild salmon from rivers for ISAV, which was not detected.

In November 2021, an increased mortality was experienced in farmed Atlantic salmon in sea pens in Reyðarfjörður, East Iceland. The fish showed macroscopic clinical signs suggestive of ISAV. Tissue samples and organs were sent to Keldur for diagnosis, using ISAV RT-PCR and histopathological analysis.

Results and findings:

The histopathology of the diseased fish was consistent with previous descriptions of ISAV-del infections in Atlantic salmon, i.e., characterized by extensive hemorrhage and congestion in most organs, associated with pathological changes. Erythrophagocytosis was commonly observed, due to extensive immune reaction.

Conclusion:

RT-qPCR results for ISAV were positive with Ct. values ranging from 14-27. Sequencing of the ISAVseg6 PCR amplicons showed that it was an ISAV HPRdel variant. This is the first time that an HPRdel variant of ISAV has been detected in Iceland. The complete HE-gene was sequenced and when aligned with published sequences it showed greatest similarity to HPR0 and HPRdel sequences from northern Norway and HPR0 sequences from The Faroe Islands.

S-16-01

Understanding Metabolic Disease Through Biomedical Pathways

Kristján Þór Gunnarsson, Vignir Sigurðsson

HSU, -, Iceland

Introduction and background

In this lecture, Dr. Kristján Þór Gunnarsson and Dr. Vignir Sigurðsson will explore the critical role of biomedical pathways in understanding obesity and metabolic diseases. Emphasis will be placed on the biochemical and physiological mechanisms by which fructose and ultraprocessed food with added sugar contribute to the development of metabolic dysfunction. The presenters will highlight how excessive fructose intake influences hepatic metabolism, promoting de novo lipogenesis, increased uric acid levels, increased triglyceride levels, and insulin resistance—key drivers of obesity, cardiometabolic risk and non-alchoholic fatty liver disease (NAFLD).

The biomarkers that provide the most insight into metabolic health will be reviewed.

To bridge the gap between theory and clinical practice, the lecture will feature a series of real-world pediatric cases that demonstrate how early identification and management of metabolic abnormalities can impact biomedical measurements and weight. Attendees will gain insights into practical strategies for diagnosing and treating metabolic disease in children, emphasizing the importance of early lifestyle interventions, biochemical monitoring, and personalized care.

This session is intended for biomedical professionals seeking a deeper understanding of metabolic pathways and their application in clinical settings. By focusing on the interplay between diet, biochemical markers, and metabolic outcomes, Dr. Gunnarsson and Dr. Sigurðsson aim to equip attendees with actionable knowledge to better support patients at risk for or living with obesity and related metabolic disease.

S-17-01

Comparison of methods for elution of IgG antibodies bound to erythrocytes

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Introduction and background

IgG antibodies bound to erythrocytes may be involved in various disease processes. Identification of these antibodies and antigen typing of patients with a positive direct antiglobulin test is relevant both for transfusion therapy and follow-up of patients during pregnancy. We have compared elution efficiency and concordance of results for various CE (Communauté Européenne)- and IVD (In vitro Diagnostic)-labelled methods and heat elution.

Methods

Methods for elution of direct antiglobulin test (DAT) positive red cells and for detection of antibody in eluate were compared. McNemar's test was used to compare the effectiveness of the methods. P-values < 0.05 were considered statistically significant and Holm-Bonferroni's method for multiple comparisons was used. The proportion of matching results between the methods was calculated as a percentage.

Results and findings:

We demonstrated significant differences in diagnostic sensitivity between the different methods. Concordance of results between methods ranged from 64 % to 90 %. In antigen typing of DAT negative red cells after antibody stripping, both false negative and false positive results were observed.

Conclusion:

Methods for elution of IgG antibodies from erythrocytes should be included in routine investigations for various problems. Different methods do not provide consistent results for all problems; therefore, alternative methods should be available.

S-17-02

Challenges in blood bank service in Iceland

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Blood bank, Reykjavik, Iceland

Introduction and background

Iceland is 103.000 km2 sparsely populated island with 400.000 inhabitants. Majority of the people live around the capital city or about 255.000. Around 2 million tourists visit the country annually. There is only one national blood bank in Iceland, with 2 fixed collection sites and one production site and then there is one mobile collection unit.

The national blood bank has extensive role. From marketing and planning donations, blood collection, production, and serology to processing autologous hematopoietic Stem Cells, tissue typing and R&D. All under robust quality system with ISO 9001 certification.

Around 11.000 whole blood units are collected annually. The blood bank is self-sufficient regarding all blood components. Around 20.000 patients' samples are processed yearly and around 18.000 donor samples.

Methods

The challenges in Icelandic Blood Bank service were evaluated from geographical threats and known factors such as increasing numbers in tourist each year. Since December 2023, 8 volcanic eruptions have occurred in Reykjanes peninsula

Results and findings:

The Blood bank is obligated to evaluate risks, assess them and plan accordingly for different situations. Utilizing tools from the quality management system such as the Plan Do Check and Act cycle are used for guidance in creating these plans. However, stronger support is needed from the health authorities regarding the importance of blood supply contingency and emergency plan.

Conclusion:

An active and robust quality management system is a key element to maintain blood bank service. Effective communication and agreements with stakeholders are also important. By focusing on stock management and constant review of stock numbers, meeting the demand and keep the discard rates at acceptable levels is achieved. Implementing international standards to facilitate cooperation and to maintain good relationships and cooperation with other blood establishments and organizations. A coordinated IT system is an absolute necessity.

S-17-03

Cartilage: Lipidomic Insights and Possible Future Role of the Blood Bank

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Introduction and background

Regenerative medicine is an increasingly popular field focused on the repair or replacement of organs such as bone and cartilage. Diseases of the cartilage, such as osteoarthritis, often cause debilitating symptoms with little options available for treatment. To develop treatments for cartilage injury and disease, what makes up and maintains healthy cartilage needs to be understood.

Methods

A pilot study into the lipidomics of chondrogenically differentiating mesenchymal stem cells was conducted, along with a testing of a simpler method of 2D chondrogenic differentiation. hES-MP cells were chondrogenically differentiated in a 2D environment using 6 well plates and a 3D environment by seeding into pellets. At days 0, 7, 14, 28, and 35 cell cultures from both environments were preserved for mass spectrometry analysis and MTB and H&E staining.

Results and findings:

Evidence of chondrogenic differentiation was observed in the MTB staining at day 28 by the presence of collagen fibres and lacunae formation in both types of staining. A large portion of the lipids were glycerolipids, with monogalactosyldiacylglycerols identified in both conditions. Another majority lipid group identified was sphingolipids, with three sphingomyelins identified in both conditions. Two lipids were identical in the 2D and 3D conditions. In the 2D cultures, the majority of lipids had an increased abundance on days 14 and 28, with both monogalactosyldiacylglycerols and sphingomyelins following that same trend. In the 3D cultures most lipids had a high abundance on days 14 and 28, with no trend in abundance of monogalactosyldiacylglycerols or sphingomyelins . Across both conditions, most lipids had a low abundance on day 35.

Conclusion:

Lipids did not behave the same way in the 2D and 3D conditions, some lipids were more prevalent such as sphingomyelins and monogalactosyldiacylglycerols lipids. A potential pattern was observed in lipid behaviour during chondrogenesis, however, more investigation is needed into lipids in MSC chondrogenic differentiation.

S-18-01

Can AI be a useful tool in preparing grade justifications?

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Introduction and background

Students are increasingly requesting explanations for the grades obtained. This is rather resource-intensive, and comes in addition to the grading itself. In a pilot project, examiners tested whether AI can make the work more efficient.

Methods

Eight subjects from various academic fields participated in the project, but only one BLS-subject.

A language model was used to generate a first draft. A script feeds the exam question, the examiner's guide, the student's answer, and the grade into a language model. Based on this, the language model wrote a first draft of the justification.

The drafts are intended as support for the teachers and are always reviewed and adjusted according to the examiner's assessments before being communicated to the students in order to ensure human assessment and academic quality.

Some justifications could be used almost unchanged, while others needed significant changes.

Students were not informed that AI was used as an aid in preparing the justification.

Results and findings:

AI can analyse large amounts of data quickly and efficiently in a time-saving manner.

By standardizing the algorithms, AI can ensure consistent and fair assessment for all candidates provided that the examiner's guide is accurate and comprehensive.

However, AI lacks the ability to understand the context and nuances in the students' answers, which can lead to incorrect assessments.

Use of AI raises questions about privacy and ethics. It is important to ensure that students' data is handled securely and responsibly.

A justified concern with using AI in this way is that the human interaction between teacher and student may be reduced. Legal implications must also be taken into consideration.

Conclusion:

The use of AI in preparing grade justifications has advantages and disadvantages. AI can improve the efficiency and objectivity of grading, but it is important to be aware of the ethical, privacy, and legal challenges.

S-18-02

Virtual online elements - supplement in BLS education program

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Introduction and background

For BLS students internationalization as part of the education is challenging. Wee have a population of students with greater domestic responsibilities e.g. financial and families. Many students at University College Absalon (PHA), live far from campus, thus we experience an increase in students studying at home, to accompany both their domestic responsibilities but also their study-related work life at the hospital laboratories.

To accommodate the desire to study at home and to have the possibility to incorporate internationalization at home, we have added virtual elements to the BLS education.

Methods

We have participated in 2 virtuel international elements, with a group of students and teachers (n=25). The evaluation is conducted upon the feedback and overall impression from students and teachers that participated.

Second we planned an virtual element in histochemistry for 2 semester BLS students (n=40). The course is a 2-week course, with theoretical and practical simulation. The students choose to participate in the online virtual element for the theoretical part of the course. This includes video and virtual teaching elements with relevant assignments, combined with a team-online meeting. To evaluate all students did a mandatory theoretivcal evaluation.

Results and findings:

We compare the groups that have choosen to have theoretical class at campus and the students who participated in the online virtual element. We also compare the students academic entry level and other relevant student competencies.

The overall feedback has been positive as long as the virtual elements are grounded in the curriculum, and the students have a clear understanding of the relevans.

Conclusion:

Virtual elements can be a good supplement for BLS students at PHA.

S-18-03 / P-38

Quality Assurance of Pipetting: Development of an e-learning Course

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Introduction and background

Effective pipetting is a fundamental skill in laboratory work, but traditional training can be time-consuming, resource-intensive, or even lacking. To meet the need for flexible and accessible training, we have developed an e-learning course that covers the theory of pipette use, control, and calibration.

Methods

The course was developed through an interactive design process involving subject matter experts and laboratory personnel. The content includes interactive modules, video demonstrations, and tests to evaluate understanding. The user experience was continuously evaluated and improved based on feedback from test users.

Results and findings:

The development process resulted in a comprehensive e-learning course covering various aspects of pipetting, from basic techniques to control and calibration methods. The course is designed to be user-friendly and accessible for both pipette users and biomedical laboratory scientists responsible for quality assurance.

A total of 374 participants registered for the course, with 345 successfully completing it. Analyzing the distribution of participants, 195 individuals were from Helse Bergen, with 185 passing the course. Additionally, 164 participants were from other parts of the country, with 153 successfully completing the course.

Conclusion:

The e-learning course in pipetting represents an effective and cost-efficient method to improve pipetting skills. Further implementation and evaluation in various laboratory environments will help optimize the course and ensure broad application.

S-19-01

Epidemiology of invasive bacteria vaccinated against

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Introduction and background

Vaccination has during the last decades lead to significantly lower incidence of invasive infections caused by the bacteria *H. influenzae, Neisseria meningitidis* (meningococci) and *Streptococcus pneumoniae* (pneumococci). Vaccination against *H. influenzae* type b (Hib) was in the year 1989 implemented into the childhood immunization program in Iceland, in 2002 against *Neisseria meningitidis* (meningococci) group C (MenC) and in 2011 against the 10 most common serotypes of *Streptococcus pneumoniae* (pneumococci), PCV-10). It is known that vaccination has also, due to herd effect, an impact upon unvaccinated population. The aim of this study was to monitor the incidence of invasive infections of the above mentioned bacteria in different age groups in the years from 1975 to 2024.

Methods

All documented cases of invasive infections of *H.inf.*, *meningococci* and *pneumococci* in Iceland were recorded in FileMaker. The files cover date of birth, gender, date and type of infection and date of possible death as well as serotype or serogroup of the bacteria. Population statistics were obtained from statice.is.

Results and findings:

Total number of invasive infections of *H. info.* were 388, of meningococci 603 and 1656 of pneumococci. Age specific incidence of *H.infl*. in children < 2 years dropped after vaccination from 118 to 3.5 cases/100.000, for meningococci it dropped from 36 to 4.4/100.000. For pneumococci it dropped from 91 to 14 in the youngest age group and from 60 to 29 cases/100.000 in the population > 65 years. Vaccine failure was neither seen after Hib nor MenC vaccination in fully vaccinated children. Only one case of vaccine failure was seen after PCV-10 vaccination.

Conclusion:

The results presented here and in the upcoming lecture show important effect of childhood vaccination against invasive respiratory bacteria in Iceland and has hindered serious illnesses and death due to *H. influenzae,* meningococci and pneumococci.

S-19-02

Prevention and Management of HIV - Recent Advances and Future Challenges

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Introduction and background

Despite advances in drug treatment, timely diagnosis, prevention and antiviral treatment of HIV remains challenging.

Methods

In this talk recent developments in antiviral drug development will be reviewed.

Results and findings:

Long-acting capsid inhibitors and attachment inhibitors have already been proven to be a valuable addition to the current armamentarium of drugs. Antiviral resistance and high cost may however limit the adoption of these novel classes in many circumstances.

Conclusion:

Although most HIV infections respond well to combined antiviral treatment social, political and economic barriers may be the greatest challenge facing patients in many parts of the world.

S-20-01 / P-31

Verification of sample transport using pneumatic tube system.

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The Norwegian Radium Hospital, Oslo University Hospital, Oslo, Norway

Introduction and background

In hospitals, blood samples are often sent through pneumatic tubes to save time. Such transport forces may cause hemolysis, leading to inaccurate results in some analyses. At our hospital, a pneumatic tube system, was implemented in 2024. As Biomedical Laboratory Scientists we are concerned with the quality of the results we provide and wanted to conduct verification tests to ensure that test results are not negatively affected.

Methods

Different blood test tubes were collected from healthy volunteers. Samples were either manually transported to the laboratory, or sent from pneumatic tube stations. The samples were visually inspected for hemolysis and analyzed for hemoglobin, platelets (Sysmex, Siemens) INR (CS-5100, Siemens), lactate dehydrogenase, phosphate, potassium, and calcium (Cobas 6000, Roche) and neuron-specific enolase (NSE, Cobas 6000/ Cobas Pro, Roche).These were chosen because hemolysis can lead to inaccurate results. Acceptance criteria were set to A) no samples with results too uncertain to be released due to hemolysis, and B) no samples with a clinically relevant difference from reference samples.

Results and findings:

The acceptance criteria for were met for all analyses. For NSE criteria B was initially not met, with three pneumatic tube samples showing clinically relevant higher results (11, 14 and 23 µg/L vs 8.6 – 9.1 µg/L (min-max) in reference samples). A follow-up test showed that such discrepant results can also occur in samples not transported using pneumatic tube system, indicating that discrepant NSE results are unrelated to pneumatic tube transport.

Conclusion:

Phosphate, potassium, calcium, LDH, INR, hemoglobin, platelets and NSE were not negatively affected by transport in pneumatic tubes. Our study indicates that random discrepant NSE results may occur, but is unrelated to pneumatic tube transport.

S-20-02

Improvements to sample flow

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Introduction and background

Incident recording is part of Landspítali's safety culture. Incidents are examined and processed within the relevant units to determine probable causes. Landspítali's incident recording is also used to shed light on necessary remedial projects. One such project was initiated in 2024 when significant delay and poor quality was observed in the deliveries of samples, taken within Landspítali, to the research departments. Additionally, many samples arrived at the lab from the public without a request form. The project will address work processes related to the transport and reception of samples within the support services.

Methods

Landspitali's incident registration contains a high number of unmarked or lost samples, or samples without requests. A group was formed with members from Landspítali's Research Services, Landspítali's Transportation Services, and contacts from the clinical departments to review these incidents, register and assess sample flow within Landspitali, and evaluate risk. At the end of its review certain remedial projects were recommended, both what is called just-do-it projects, as well as other and more extensive projects. One of those projects is to have only one sample reception in each building, i.e. one in Fossvogur, and one in Hringbraut. After implementation of the new work processes, the number of registered incidents regarding the sample flow and labelling should decrease.

Results and findings:

Changes to sample reception are underway but not completed. Once they are completed, data from the incident and deviation recording system will be reviewed.

Conclusion:

It will be assessed whether the reforms have been successful.

S-20-03 / P-26

Impact of a minor change in workflow on patient waiting time

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Landspítali, Reykjavík, Iceland

Introduction and background

The outpatient ward of the Clinical Chemistry department does not require patients to make appointments for blood sampling. The waiting time can therefore be quite long at times, especially during rush hour. Minor changes were needed for the receptionist's facilities, and changes to the workflow were adopted with the hopes of reducing patient waiting time during the busiest times.

Methods

Sampling procedures were reviewed, and potential bottlenecks were highlighted. It was decided to make a minor change to the workflow, i.e. the patient's request is now printed by the secretaries and handed to the patient, instead of being printed at the sampling station. The aim of the study is to compare the effect of this change on the patient's waiting time during peak hour. Ten comparable days will be selected and patient waiting times will be examined before and after implementing the new workflow.

Results and findings:

The new workflow is currently being implemented but data is not available yet. The abstract will be updated for the NML25 conference, and the results will be published at that time.

Conclusion:

At the end of the study, an assessment will be made of the impact of this specific change on the wait times and estimated whether it should be continued or withdrawn.

S-21-01

NK cells play an important role in resolution of inflammation

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Introduction and background

Inflammation-associated degenerative diseases are on the rise in Western societies. Failure of resolution of inflammation (ROI) can result in uncontrolled or chronic inflammation, which is considered a key element in the pathogenesis of many of these diseases. Therefore, increased emphasis is now being put on targeting the resolution phase of the inflammation.

The overall goal of our research is to find means to strengthen ROI.

Methods

A murine model of antigen-induced peritonitis was used to determine the effects of dietary fish oil on hallmarks of ROI and whether NK cells are important for ROI. Human NK cells were cultured with/without omega-3 polyunsaturated fatty acids (PUFAs) and stimulated with a cocktail of anti-inflammatory and pro-resolution compounds (RES), cocktail of inflammatory compounds or IL-15 alone and phenotype and function of NK cells determined. The NK cells were also co-cultured with neutrophils and the effects of the NK cells on neutrophil apoptosis determined.

Results and findings:

Dietary fish oil enhanced ROI in antigen-induced peritonitis in mice and led to an early peak in NK cell numbers at the inflamed site. Depletion of NK cells in this model resulted in an increase in peritoneal neutrophil infiltration and reduced neutrophil apoptosis. Omega-3 PUFAs affected human NK cells' function and phenotype in culture, including their potential for production of specialized pro-resolving mediators (SPMs). In addition, treatment of NK cells with RES increased their production of the SPMs lipoxin A4 and annexin A1. Co-culture studies showed that human NK cells induced neutrophil apoptosis.

Conclusion:

These results demonstrate that dietary fish oil increases ROI and that NK cells are necessary for ROI's occurrence. They also show that human NK cells can be modified to have increased resolution function. These findings support the developments of NK cell-based treatments for inflammation-associated degenerative and autoimmune diseases.

S-21-02

The immunomodulatory role of LL-37 in the pathogenesis of psoriasis.

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Introduction and background

Psoriasis is an autoimmune disease of the skin, and the most common form, plaque psoriasis, is characterized by raised, well-demarcated, erythematous plaques with adherent silvery scales. The immunopathogenesis has a mixed Th1 and Th17 inflammatory profile, and keratinocytes in the basal layer of the skin hyper proliferate and do not mature properly. LL-37 is an anti-microbial peptide of the innate immune system that has extensive immunomodulatory functions. In this project, we wanted to further define the immunomodulatory effect of LL-37 upon various immune biomarker secretion by keratinocytes and white blood cells.

Methods

Psoriatic peripheral blood mononuclear cells (PBMCs) were analyzed using flow cytometry and immune biomarkers were analyzed with multiplex.

Results and findings:

The impact of T17 cells in the pathogenesis of psoriasis was corroborated, as the percentage of Th17 and Tc17 cells was reduced following phototherapy. Within the skin, the number of T cells reduced with psoriasis treatment, and the intensity of immunofluorescent staining of IL-17 in the dermis correlated to severity of disease. Further phenotypic analysis of these skin-homing T cells in psoriasis patients was performed by measuring the expression of the chemokine receptors CXCR3, CCR4, and CCR6. Different chemokine receptor expression patterns emerged when T cells were subtyped based on the expression of CLA and CD103. When PBMCs were stimulated *in vitro* with two distinct stimulations mimicking the Th1 and Th17 microenvironment, various biomarker secretory patterns emerged, particularly in association with the presence of LL-37. Finally, keratinocytes were cultured in the same immunomodulatory microenvironment, as previously described for the PBMCs, and their secretory profile analyzed.

Conclusion:

The results demonstrate that primary keratinocytes and PBMCs secrete a wide array of immune biomarkers that can be significantly affected by Th1 and Th17-driven stimulation. Furthermore, their immune biomarker fingerprinting was frequently altered in the presence of LL-37.

POSTER SESSION
(P)

P-01

Fecal Microbiota Transplantation as a Treatment for Severe Obesity in a double blinded, randomized, placebo-controlled trial

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Introduction and background

Obesity is a global health challenge, associated with an increased risk of type 2 diabetes, cardiovascular disease, and cancer. Research suggests that a dysbiotic gut microbiota may be a contributing factor in the development of obesity. The gut contains trillions of microbes that play a crucial role in key metabolic processes, such as the production of short-chain fatty acids, vitamins and regulation of hunger hormones. Fecal microbiota transplantation (FMT) aims to replace an unhealthy gut flora with a healthy one and has shown promising results in animal studies for treating conditions such as obesity and metabolic diseases. This study was designed to investigate whether FMT can lead to weight reduction in individuals with severe obesity.

Methods

This was a double-blinded, placebo-controlled study conducted at the University Hospital of North Norway, Harstad, with a 12-month follow-up period. A total of 60 patients with severe obesity (BMI ≥ 35) were randomized to receive either FMT from a donor or placebo (autologous transplantation). All participants followed a lifestyle intervention program alongside the study. The primary outcome was ≥ 10% weight loss at 12 months in the FMT group, while secondary outcomes included ≥ 7.5% and ≥ 5% weight loss 12.months post FMT.

Results and findings:

Of the 60 participants, 55 completed the study. There were no significant differences between the FMT group and the placebo group in terms of weight loss of ≥ 10%, ≥ 7.5%, or ≥ 5% 12 months post intervention. Average weight loss in the FMT group was 3,4% compared to 3,3% in the placebo group.

Conclusion:

The study results show that a single FMT via enema does not lead to clinically significant weight loss after 12 months in individuals with severe obesity. Further research is needed to explore the effects of repeated treatments and identify bacterial strains relevant to weight regulation.

P-02

Method comparison for platlets between AtellicaHEMA, Advia2120i and CelldynSapphire CD61

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Introduction and background

At Nordland Hospital in Bodø, Norway, we analyze hematology samples using the Celldyn Sapphire (Abbott) and Advia 2120i (Siemens) instruments. As the Celldyn Sapphire is no longer being produced, we aim to replace it in the near future. In October 2024, we had the opportunity to test the Atellica HEMA instrument from Siemens. It was particularly interesting to examine the platelet technology on this instrument to compare Atellica HEMA with Advia 2120i and Celldyn Sapphire CD61. The Celldyn Sapphire has the unique capability to measure platelets immunologically using CD61, which is utilized for low platelet counts in our laboratory.

Methods

A method comparison was conducted, including 73 samples simple analyzed, with platelet results ranging from 5 to 1300 x 10^9/L. Statistical analyses were performed between Advia 2120i and Atellica HEMA for these samples. Additionally, platelet results < 30 x 10^9/L (n=28) were analyzed on Celldyn Sapphire using CD61 and on Atellica HEMA using optical PLT (PLTo). A method comparison was performed using simple regression.

Results and findings:

The results demonstrated a strong correlation between platelet results from Atellica HEMA compared to Advia 2120i and Celldyn Sapphire CD61. The regression equation for platelets across the entire analytical range (Advia 2120i vs. Atellica HEMA) was $y = 0.96x + 3.96$, with $R^2 = 0.993$. The regression equation for platelets < 30 x 10^9/L (Celldyn Sapphire CD61 vs. Atellica HEMA PLTo) was $y = 0.92x + 4.12$, with $R^2 = 0.855$.

Conclusion:

In conclusion, there is a high degree of concordance in platelet results between Advia 2120i and Atellica HEMA. This also holds true for the comparison between Celldyn Sapphire CD61 and Atellica HEMA PLTo at low platelet counts. Atellica HEMA PLTo appears to be a suitable alternative for the immunological analysis of platelets using CD61.

P-03

Blood to the People

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Introduction and background

The blood bank in Bodø supplies local hospitals and primary healthcare services in Nordland county with blood products: erythrocyte concentrate and platelet concentrate. 24/7, 365 days a year – Blood is transported by air, scheduled boat services, and bus, as well as a dedicated pickup and delivery service. Packing and shipping are done in specially designed boxes validated for this purpose, with temperature control.

Nordland county is a very elongated region, stretching 500 km from north to south, and makes up about 11 percent of Norway's total area. Due to the weather conditions, patients may have to wait unnecessary long for a transfusion.

Samhandlingsreformen came into effect in 2012. The goal was to improve collaboration between primary healthcare and specialized healthcare services.

We want to examine the developments since the reform came into effect, as well as how much blood is actually sent out from Bodø.

Methods

The method used is historical data and visual presentation.

Results and findings:

Bodø started cautiously in 2006 by sending 2 erythrocyte concentrates to primary healthcare. Approximatly 200 transfusions are performed anually in primary healthcare

Bodø has in 2023 conducted a total of 4,358 whole blood collections. There have been 791 buffy coat platelet concentrates and 168 platelet apheresis produced. In total, 1,129 platelet concentrates have been produced.In 2023, 1,176 erythrocyte concentrates and 400 platelet concentrates have been sold.

Statistics from 2006 until 2024 will be presented.

Conclusion:

Transportation of blood has increased steadily from 2006 until today. Despite challenges with long distances and weather the blood almost arrives on time at end destination, we see that primary healthcare greatly benefit from receiving blood in the districts. For local hospitals, it is absolutely necessary to receive supplies from Bodø to maintain emergency preparedness. Moreover, it prevents patients from having to be transported long distances to receive transfusions.

P-05

Strengthening Pipette Performance Through External Quality Control (EQA)

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Introduction and background

Labquality established an EQA program for pipettes in 2023 to support clinical laboratories in meeting the ISO 15189:2022 requirements. The function and practice of the program are similar to other EQA programs. Sample materials are sent out from Labquality, and participating laboratories submit weighing results for specific volumes of pipetted liquid. EQA reports are produced where participants are grouped, and individual results are compared against the target value established by a reference laboratory. The study aims to convey experiences and challenges from the EQA program for pipettes, as well as to compare precision and accuracy regarding both volume and type of material.

Methods

Each participant has the opportunity to submit weighing results from five pipettes. It is recommended to submit the mean value (mg) based on N=5 pipettings. Participants must select the correct pipetting technique themselves. Additionally, participants answer questions about the calibration and control of both the balance and the pipettes. In the response report, results are grouped according to the type of sample material, volume, and the maximum volume of the pipettes. Deviations from the target value and the spread in weighing results are calculated. The results from the distributions have been compared.

Results and findings:

A table with descriptive statistics from the three distributions in 2023–2024 is presented. The results suggest that pipetting viscous liquids yields a higher CV % than pipetting water. The target values from the reference laboratory have been shown to vary between the distributions. With a low number of participants, individual results may influence the statistical calculations.

Conclusion:

Although there are generally many sources of uncertainty around pipetting and weighing that may affect participants' results, the EQA results clearly show differences in precision and accuracy when pipetting different sample materials. The EQA program is recommended for monitoring and maintaining pipetting quality.

P-06

Is Home-Based Capillary Sampling a Reliable Method for HbA1c Analysis?

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Introduction and background

The laboratory was invited to participate in a research project focusing on young women with type 1 diabetes, aiming to understand how their body image development is affected over time. The study involved a two-year follow-up period where each participant's HbA1c was analyzed four times. To enable remote participation, the laboratory designed a kit for capillary blood sampling, complete with equipment, an instruction guide, and a QR code linked to an instructional video.

The laboratory agreed to this arrangement under the condition that HbA1c results would only contribute to the research study, not for diabetes follow-up.

Methods

Kits were prepared and sent to study personnel, who distributed them to participants across Norway. Each kit included a procedure guide, equipment for capillary sampling and instructions for adding ID numbers and sampling times. Participants mailed the samples back in pre-addressed envelopes for analysis.

Results and findings:

A total of 157 samples have been received: six were rejected due to stability issues or inadequate sample quantity, 34 were too old upon arrival but analyzed at the researchers' request. 117 were analyzed within the acceptable stability period and 68 samples within this period were analyzed using an alternative method. Eight samples were missing sampling times.

Conclusion:

Transport posed significant challenges; samples often arrived late despite being sent as priority mail. Some were coagulated or contained insufficient material, suggesting difficulties with self-sampling. Missing information on requisition forms further complicated the process, as some lacked ID numbers or sampling times, requiring repeated follow-ups with study personnel. Although the laboratory's identification verification requirements were sometimes unmet, samples were processed under the researchers' responsibility.

The study highlights that while HbA1c can be analyzed from capillary samples collected at home, transport delays and sampling difficulties present substantial barriers. These issues must be addressed to make home-based capillary sampling a feasible option for patient follow-up.

P-07

Establishment of Mycobacterium Tuberculosis diagnostics in Vestre Viken Health Institution - A milestone

Fatima Chishti

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Introduction and background

The *Mycobacterium tuberculosis* complex (Mtb) is the cause of tuberculosis (TB). Infections caused by Mtb can be difficult to detect. There is a great need for new identification methods and, not least, reduce time in TB diagnostics.

The aim of this work is to establish Tuberculosis diagnostics (TB) in Vestre Viken Health institution.

Methods

A group of employees from the microbiology department was put together for verification of methods and material related to TB diagnostics, and mapping of operations related to the new

P3- lab at Bærum Hospital.

A driver diagram on the poster visualizes a brief summary of the various phases that the working group has used.

Results and findings:

TB diagnostics in Vestre Viken health institution is a milestone because now we have put in place both the safety laboratory P3-lab and part of TB diagnostics. A work flowchart on the poster illustrates work routines for TB samples at the microbiology department, Bærum Hospital.

Respiratory samples with suspected TB infection analysis on the Cephid Xpert® MTB/RIF Ultra PCR. Positive MTB-PCR is microscope and send on for further cultivation, and other non-respiratory sample material are send for cultivation to the collaborative laboratory. For microscopy of TB-positive clinical samples, Auramin, Fluorescent Stain Kit M color method (Becton Dickinson Norway AS) is used.

Conclusion:

The establishment of MTB diagnostics has brought great value to the institution. Now both patients and requesters from all over Vestre Viken Health institution get quick answers to MTB-PCR and microscopy from direct respiratory samples. This has led to a reduced time in TB diagnostics.

P-08

From Sweat to Smile: From manual Syphilis, reagin and TPPA test to automated Syphilis RPR and TPLA assay

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Introduction and background

The Rapid Plasma Reagin (RPR) test detects antibodies produced in response to a syphilis infection and helps differentiate between untreated and treated cases, as well as monitor the progression of the disease and treatment response, while the Treponema pallidum particle agglutination assay (TPPA /TPLA) identifies antibodies specific to *Treponema pallidum*, confirming exposure to the bacterium that causes syphilis.

Manual testing causes significant strain and wear on joints of several laboratory staff. Therefore, there was a strong desire for an automated analysis. When the production of TPPA was halted, both analyses were transferred to the automated platform , Cobas C503.

Methods

The syphilis reagin manual test detects cardiolipin antibodies that bind to the test antigen, which consists of cardiolipin-lecithin-coated cholesterol particles, causing macroscopic flocculation. TPPA is a manual indirect agglutination assay using antigen gelatin sensitized with TPA. Both analyses read as a titer.

RPR and TPLA is an automated (Cobas C503 – Roche) turbidoimmunoassay using polystyrene latex coated with TPA or RPR antigens.
TPLA results are in titer units (TU), while the results are in RPR units (R.U.)

Our goal is to improve workload and reduce pressure. To prove this, we compared the analysis time for both methods by evaluating patient samples over a 12 -day period .

Results and findings:

Using the automated Cobas instrument, we were able to process 45 samples in 45 minutes, compared to the manual process, which took 300 minutes for the same number of samples. This resulted in an 85% reduction in total work time, saving approximately 255 minutes for 45 samples. A different numbers of samples were analyzed on each of these 12 days.

Conclusion:

After transitioning to automated processing, we observed a significant improvement in the workflow, with sample analysis time reduced by 85-91% compared to manual testing. The total workload was reduced by three to four by using Cobas C503.

P-09

Cobas Pulse - Introducing a new glucose POC instrument

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Introduction and background

Point of care testing of glucose at St. Olavs hospital in Trondheim has in recent years been analysed on Accu-Chek Performa (Nano) from Roche Diagnostics. This instrument is no longer under production and we have to introduce a new instrument for point of care testing of glucose. Cobas Pulse is the newest instrument Roche Diagnostics has to offer, and this is the instrument we are planning to introduce at St. Olavs hospital. This method has not been verified at St. Olavs hospital previously, and it was therefore decided in consultation with the medical doctor in charge that the method needed to be verified before introduction at the hospital.

Methods

The verification was carried out by method comparison between Cobas Pulse and the mentor instrument for glucose. 36 patient samples in the range 2,9-18,7 mmol/L from both adults, children and newborns were analysed on both instruments. In addition, the instruments precision was examined by analysing a patient sample of 4,4 mmol/L 20 times on the Cobas Pulse. The suppliers CV for precision was 1,51 %, and had to be within the 90 % confidence interval for the CV found in this verification.

Results and findings:

Cobas Pulse measures glucose on average 2,6 % higher that the mentor instrument, which is within the allowed bias of 3,2 %. The quality target was therefore met.

The 90 % confidence interval for Cobas Pulse in this verification was 1,41-2,44 %. The suppliers CV for repeatability of 1,51 % lies within the 90 % confidence interval, and the requirement for precision is therefore met.

Conclusion:

The quality targets have been met. The analytical quality is considered acceptable and the method can be used in clinical work. When electronic result transfer and user-controlled access are established, the instruments will be introduced at St. Olavs hospital.

P-10

"Optimizing Pathology Operations: The Impact of the Auto Slide Preparation System on Efficiency and Quality at Fürst"

Natalia Kval

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Introduction and background

In 2014, Fürst, Norway's largest private primary healthcare laboratory, initiated a Lean project aimed at reorganizing laboratory operations. The project focused on improving professional competence, process monitoring, communication centralization, and sample transportation. Automation became a key priority, particularly in pathology, one of the least automated areas in laboratory operations. The manual process of cutting tissue samples was time-consuming and led to variable sample quality.

Methods

Fürst began exploring automation solutions and considered the use of the Auto Slide Preparation System to automate the tissue cutting process. This system automatically sections paraffin-embedded tissue blocks, which were previously cut manually.

Results and findings:

In October 2020, the first Auto Slide Preparation System was installed in the pathology laboratory. A statistical analysis was conducted to evaluate the benefits of the this system. The results showed that the robot could cut up to 90 blocks per run, with four runs per day, totaling 360 blocks daily. Based on these findings, it was recommended to introduce an evening shift. This led to a potential saving of 2.5 full-time equivalents (FTEs) per year per Auto Slide Preparation System. Additionally, the robot improved tissue sample quality, reduced the amount of gastric setup per slide and reduced turnaround time by 0.8 days per sample. Notably, fewer human errors in slide misidentification were observed.

Following the installation of the AS-410M robot, pathologists reported greater satisfaction with the quality of the cuts, fewer blocks were rejected during inspection, and resources were freed up for other laboratory processes

Conclusion:

Currently, two Auto Slide Preparation System are used in the histology laboratory at Fürst, specializing in cutting gastro- and large skin biopsy specimens. Today, fewer personnel are involved in tissue cutting, and a significantly higher volume of samples is processed in less time, benefiting both clinicians and patients

P-11

Choosing Wisely – Reducing pre-transfusion testing in hematological patients

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Introduction and background

'Choosing Wisely' is a growing international campaign to reduce unnecessary procedures, tests, and treatments in healthcare. In Denmark, the campaign is highly topical. At the Department of Clinical Immunology (DCI) in Region Zealand, there was a concern that some hospital departments ordered an excessive number of unnecessary pre-transfusion analyses (blood type and antibody screen). Unnecessary testing often occurs when another department has already ordered the analysis or when the patient's condition or treatment does not necessitate a blood transfusion. The Department of Hematology (DH), the region´s largest consumer of blood products, was identified as a key stakeholder in this project.

Methods

DCI and DH collaborated to investigate ways to reduce unnecessary pre-transfusion tests (PTT). A workflow analysis was performed to find measures for improvement, and the project followed the improvement model using Plan-Do-Study-Act cycles. The first improvement measure was to reduce the number of unnecessary tests performed for hematological patients at Roskilde Hospital by 50%. Blood samples were stored temporarily (referred to as "hold samples"), and PTT was only performed when a blood transfusion was required or as part of specific pre-treatment protocols. Data were monitored weekly using bar charts.

Results and findings:

The initial results showed that only a small part of the selected PTTs was performed.

After 11 weeks, the project was extended to include hematological patients from Holbæk Hospital. In Roskilde and Holbæk Hospitals, 757 of 1360 PTTs were not performed resulting in a 55.7 % reduction during a 17-week period.

Conclusion:

The "hold sample" approach led to a substantial reduction in the number of pretransfusion tests performed. The next objective will be to achieve a significant and sustained decrease in the number of ordered tests, as well as to include additional hematological patient sampling sites and other departments in Region Zealand that routinely use blood products.

P-12

Routine coagulation assays in capillary samples

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Introduction and background

Oslo University Hospital, Rikshospitalet, has national responsibilities for pediatric care. Children often undergo multiple blood tests during treatment and hospitalization. Capillary sampling is preferred for being less invasive and gentler, and requires less volume. This study aimed to validate the most common coagulation tests to expand the use of capillary blood sampling.

Methods

Certified personnel performed the capillary blood sample collection, in addition to the venous samples, from consenting patients. Venous samples were drawn into 3.5 mL tubes (Vacuette, Greiner Bio-One) and capillary samples into 0.5 mL tubes (MiniCollect Tube, Greiner Bio-One), both containing 3.2% sodium citrate. Venous samples were centrifuged at 3000g for 5 minutes (Cobas 8100), while capillary samples were centrifuged at 4602g for 3 minutes (Eppendorf Centrifuge 5424). INR, APTT, fibrinogen, and D-Dimer were analyzed using the Sysmex CS-5100.

The absolute percentage difference for each analysis (mean and 95% confidence interval(CI)) was calculated and compared to predefined acceptance limits. Validation criteria were established based on the state-of-the-art and available literature.

Results and findings:

A total of 169 comparisons were included. The absolute percentage difference and 95%CI was 2.1%(1.1 – 3.1%) for INR(n=46), 4.6%(3.1 – 6.0%) for APTT(n=42), 3.99%(2.6 – 5.4%) for Fibrinogen(n=36), and 3.6%(2.2 – 5.1%) for D-Dimer(n=42).

Conclusion:

The average difference and 95%CI of the absolute percentage difference shows good results for INR and APTT. Regarding fibrinogen, the difference is larger at low levels, but the absolute discrepancies are acceptable. For D-Dimer, the capillary samples are generally higher than the venous samples, though the bias and its 95%CI are within the required limits. While some samples show a large percentage difference at low levels, these are not expected to be clinically significant. The accuracy is satisfactory for all tests. The validation criteria for INR, APTT, fibrinogen, and D-Dimer were met, and the analyses have been implemented.

P-13

A strategy for complying with in house regulation under the IVDR

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Introduction and background

In May 2024, requirements in EU 2017/746 (IVDR) regulating in house *in vitro* diagnostics (IVD) went partially into effect. IVD-equipment manufactured and used within a health institution must now comply, at least partially, with IVDR including several specific requirements only applicable to manufacturers of in house devices (IVDR article 5 number 5). Our laboratory uses in house devices (immunoassays) to measure biological drugs for the purpose of therapeutic drug monitoring. Herein, we present the strategy our laboratory has used in order to meet the new requirements for these devices.

Methods

First, we identified what components physically constituted our in house devices and what were considered additional products required, but not part of the devices. Then an "intended use" was stated and risk class (A-D) set according to IVDR Annex VIII. Further, applicable requirements in IVDR Annex I were identified and documents showing these requirements being met were produced. We created and implemented standardized operation procedures for the manufacture and quality control of devices. Our laboratory was already compliant with ISO15189. Finally, declarations about the devices were made publically available.

Results and findings:

Using the strategy outlined above, we were able to publish declarations for ten in house devices. All were in risk class B. The new requirements were a novel challenge requiring the laboratory to gain considerable regulatory knowledge.

Conclusion:

A strategy for ensuring compliance with in house regulations in the IVDR has been presented.

P-14

Enhanced collaboration between the laboratory and the emergency department – experiences from a patient safety project

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Introduction and background

The medical biochemistry and blood bank department at Ålesund Hospital is responsible for collecting and analyzing blood samples from patients admitted to the emergency department (ED), averaging 45 patients per day, with peak hours from 11:00 PM to 8:00 AM, Monday through Friday.

Over the past few years, the laboratory has received some complaints regarding delays in the sampling and analysis processes. This study aimed to evaluate whether placement of a dedicated biomedical laboratory scientist (BLS) in the ED would enhance collaboration between the two departments.

Methods

The project was conducted over ten weeks (50 days) in the autumn of 2024. Ten BLSs were selected from the laboratory staff, each working approximately five days in the ED. The BLSs were stationed in the ED for the duration of their shifts and assigned a dedicated seat next to the ED coordinator.

Results and findings:

The BLSs stationed in the ED reported that their integration into the overall workflow enabled them to provide better advice regarding sample collection and analysis choices.

Nurses in the ED observed that the workflow became more efficient, as the BLSs were available to take samples sooner and prioritize patients when sampling was required concurrently on a number of patients.

Physicians noted that having direct access to the BLS was helpful when there was uncertainty about which samples to order. Additionally, the BLSs provided guidance on how to utilize the electronic medical record system for ordering supplementary tests on already-collected samples, thereby reducing the need for additional sampling.

Conclusion:

Placement of a dedicated Biomedical Laboratory Scientist in the Emergency Department during peak hours resulted in improved collaboration between the laboratory and the ED.

This intervention not only facilitated smoother processes but also provided valuable learning opportunities for staff in both departments, leading to improved patient safety and overall efficiency.

P-15

Digital interviews of emergency blood donors in walking blood banks - outside the comfort zone?

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Introduction and background

The reason for establishing walking blood banks (WBB) is the great distances between the WWB and the responsible blood banks (BB) in the hospitals. They are called mother blood banks to the WBB. The personnel in the WBBs is not trained to perform regular blood donor interviews, therefore it becomes difficult to perform them locally. Can we solve these challenges with digital interviews, and are we able to meet the high requirements for the blood donor interview? We tested Whereby, a secure video communication tool used for consultations in our hospital.

Methods

Personnel in the mother blood bank received training in Whereby and developed a procedure for performing a digital interview following the same structure as a normal blood donor interview. We asked emergency blood donors and interviewers how they experienced the interview and analyzed 20 interviews focusing on quality.

Results and findings:

Most of the donors were familiar with digital meetings, a few had initial difficulties accessing Whereby and one donor expressed discomfort with being on video. We solved technical issues, such as no internet connection, by making phone calls. The donors felt safe and felt that they had the opportunity to express themselves. The training of the personnel went smoothly, and no interviewers experienced difficulties, rather a good communication with the donors. We confirmed that it is important for both, to sit undisturbed. The use of Whereby is beneficial for verification of the donor ID, as identification can be shown on-screen.

Conclusion:

Whereby has proven to be a useful tool to perform interviews with emergency blood donors in WBBs. It provides a reliable and secure communication, that feels natural without compromising the quality of the interview process.

And we are all still inside our comfort zones.

P-16

Improving type I diabetes diagnostics by implementing a novel PCR-based method for antibody detection

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Introduction and background

Antibody Detection by Agglutination-PCR (ADAP) is a novel PCR-based method for antibody detection, developed by Enable Biosciences. Differing from conventional immunoassays, ADAP utilizes quantitative PCR (qPCR). The Hormone Laboratory, Oslo University Hospital, recently implemented ADAP to analyze three type I diabetes-associated autoantibodies. In this study, we compare the diagnostic sensitivity of ADAP with our previous radioimmunoassay (RIA) methods and evaluate melting curve analysis as an additional quality assurance step.

Methods

The diagnostic sensitivity of the ADAP and RIA methods were assessed by analyzing 80 samples from the Islet Autoantibody Standardization Program (IASP). The samples included 50 healthy controls and 30 individuals with type I diabetes. From the results, percentage sensitivity at 98% specificity was determined.

To ensure the accuracy of amplified qPCR products quantified using the nonspecific dye SYBR Green, we incorporated melting point analysis for result verification. A melt curve deviates if it exhibits multiple peaks or if the melting point is more than ±0.5 ^{o}C from the products target temperature.

Results and findings:

Based on the IASP samples the sensitivity for the ADAP method at 98% specificity was found to be 53.3% for insulin antibodies, 66.7% for IA-2 antibodies, and 70% for ZnT8 antibodies. For the RIA methods, the corresponding results were 20%, 70% and 50%, resulting in overall improved sensitivity with the new method.

Regarding the melting curve analysis, few cases of multiple peaks - implying unspecific binding - were observed. However, some cases of melting temperatures shifting towards lower temperatures were recorded, likely due to evaporation altering mixture concentrations.

Conclusion:

Introducing a PCR-based method for analysis of diabetes autoantibodies improved the diagnostic sensitivity for at least two out of three autoantibodies examined, compared to our previous RIA methods. Additionally, melting curve analysis provides an effective way to assess the results and improve their quality.

P-17

Faster blood culture sampling with dedicated biomedical laboratory scientists in the emergency department

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Introduction and background

Data indicate that most patients admitted to Ålesund Hospital's emergency department (ED) arrive between 11:00 and 20:00. In recent years, the Department of Medical Biochemistry and Blood Bank Ålesund (MBBÅ) has received complaints regarding prolonged waiting times for both blood sampling and test results. Biomedical laboratory scientists (BLS) at MBBÅ have similarly reported significant workload conflicts during this peak period.

To address these issues, patient safety funding was sought to implement the project "Faster Diagnostics, Clarification, and Treatment with Biomedical Laboratory Scientist in the Emergency Department." This project aims to evaluate the impact of a dedicated BLS stationed in the emergency department during peak hours. One of the goals of the project is to expedite blood culture sampling prior to antibiotic treatment in cases of suspected sepsis, a key focus area in patient safety efforts.

Methods

An additional BLS was assigned to the emergency department from 11:30 to 19:00, Monday through Friday, for a 10-week period in the autumn of 2024. This BLS was stationed near the ED coordinator, facilitating rapid access to patient information and enabling proactive decisions about blood cultures even before official orders were placed. During high-demand periods, additional support was available from MBBÅ staff.

Results and findings:

Average time (median) from order to blood culture sampling during peak hours:
Prior to the project:
August 2024: 31 minutes
September 2024: 34 minutes
During the trial period:
October 2024: 22 minutes
November 2024: 20 minutes
The data show timed savings during peak hours with a BLS in the emergency department.

Conclusion:

The project team hopes that these results will lead the healthcare organization to prioritize funding for a permanent BLS role in the emergency department to sustain these improvements in patient care and diagnostic efficiency.

P-18

Faster turnaround time with dedicated biomedical laboratory scientist in the emergency department

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Introduction and background

At Ålesund hospital, biomedical laboratory scientists (BLS) are responsible for the majority of blood sample collection. Outside established sampling rounds four times a day, two BLSs are assigned to collect every blood test ordered in the hospital. This includes blood draws from nearly all patients admitted to the emergency department (ED). For this patient group, rapid and accurate diagnostics are crucial to initiate timely treatment.

The limited number of BLSs and the heavy workload have occasionally resulted in long turnaround times for blood sample analyses, leading to delays and discrepancies. Therefore, it was decided to implement a project aimed at reducing the turnaround time for blood samples taken in the ED.

Methods

Statistics on patient admissions to the ED were reviewed to determine peak times for patient intake. A 7.5-hour time window, corresponding to a typical work shift, was selected, during which an additional BLS was allocated exclusively to the ED. The project was carried out over ten weeks, from late October to early December of 2024, and the following analyses were chosen as quality indicators for turnaround time pre vs during this project: CRP, creatinine, troponin T, haemoglobin, type-and-screen, and PT-INR.

Results and findings:

Median turnaround time indicator tests in minutes, pre-project:

August: 76

September: 76

Median turnaround time indicator tests in minutes, during project:

October: 67

November: 67

Conclusion:

The results show that the turnaround time of the indicator test has impoved. The laboratory has also recieved very positive feedback from the ED staff regarding shorter response times compared to before the project commenced. Faster results contribute to quicker treatment and resolution of pasient cases.

P-19

Three aHBe or not three aHBe?

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Introduction and background

Anti-HBe is an important marker in the investigation of HBV infection. It serves both as a marker during the chronic HBV course and, together with anti-HBc, to confirm previous HBV infection.

When our laboratory had to implement a new method for Anti-HBe, we performed a larger comparison of three different aHBe assays on different available instruments.

Methods

41 aHBe patient samples previously reported positive (17), negative (10) or borderline (14), and 6 EQC samples were collected. After collection, the samples were de-identified, stored, and kept until analysis at -20°C. Before analysis, they were thawed and mixed. The samples were analyzed once using the current method (Siemens (aHBe)), and in duplicate with the three methods Roche Elecsys Anti-HBe (R), Siemens Atellica IM Anti-HBe2 (S), Diasorin Liasion Anti-HBe (D). Three levels of controls were analyzed for precision study.

All results were compared with results from current method, with a goal of 100% PPA and NPA, together with clinical information and historical results. Samples that went from positive to negative or vice versa were considered as significant deviations.
Precision was based on repeatability (%CVAw) and internal reproducibility (%CVAt).

Results and findings:

All three methods met the NPA goal. For PPA we observed different results, 52.9% PPA (R), 58.8% PPA (S) and 76.5% PPA (D). Additionally, we found samples with significant deviations. 2 with method R, 6 with method S and 1 with method D.

All methods showed precision (%CVAt) of <5, which is considered very good according to the Norwegian Strategy Report for Serology.

Conclusion:

Choosing a new method was a difficult decision when no method immediately stood out as significantly better. The final decision was based on an assessment of clinical information and historical test results, statistics and general workflow in the laboratory. The Diasorin Anti-HBe assay was chosen for routine use.

P-20

Complementary diagnostic methods for dengue virus infections

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Introduction and background

Dengue is a mosquito-borne viral infection causing illness ranging from asymptomatic cases to severe disease. Diagnosis typically combines PCR for viral RNA detection, serology for IgM and IgG antibodies, and NS1 antigen (NS1) testing to identify active or past infections or determine vaccination status. This study, conducted at the Department of Microbiology, Oslo University Hospital, evaluated the value of these diagnostic methods.

Methods

An in-house multiplex real-time PCR was used to detect dengue virus (DENV) RNA, targeting all four serotypes on the AriaDx platform. Serology for IgM and IgG antibodies was performed using the CLIA method on the VirClia instrument, while NS1 detection by ELISA. Plasma and serum samples were analysed between November 2023 and October 2024, and data were processed in Excel.

Results and findings:

Of the 258 samples tested by PCR, 45 (17%) were positive. All four serotypes were identified: DENV-1 (13 patients), DENV-2 (19), DENV-3 (11), and DENV-4 (2). Among the PCR-positive patients, 36 (80%) were both IgM- and NS1-positive, with 21 of these also testing IgG-positive. Two NS1-positive patients were IgM-negative but had weakly positive IgG. Seven PCR-positive patients showed neither IgM nor IgG, suggesting very early stages of infection. NS1 was detected in three additional patients who were PCR-negative, maybe indicating resolved viraemia or early antigenic detection in the absence of detectable viral RNA.

Conclusion:

This study highlights complementarity roles of PCR, serology, and NS1 in diagnosing dengue infection. PCR is essential for detecting early infections and virus subtyping, while IgM serology adds evidence of recent immune response, IgG indicates current or past infection or vaccination, and NS1 testing confirms active viraemia. The combination of these methods enables detection of dengue infections across different phases of the disease. NS1 testing provides additional diagnostic value in PCR-negative patients.

P-21

Validation of new analyses for the diagnostics of import viruses

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Introduction and background

Chikungunya virus, Yellow Fever virus, West Nile virus, and Zika virus are zoonotic viruses transmitted via mosquitos, causing diseases ranging from mild to severe. Increased globalisation and travel have led to more imported infections in Norway. As the Norwegian Reference Laboratory for Import Virology, the Department of Microbiology, Oslo University Hospital, implemented PCR-based diagnostics for these infections, including validation of whole blood, urine, and cerebrospinal fluid (CSF) as sample matrices. This abstract presents the results of the 2023 validation.

Methods

PCR kits from Altona Diagnostics were selected, with one kit for each virus. Plasma and serum were used as reference matrices, while whole blood, urine, and CSF were spiked with cultured virus and compared to plasma and serum spiked with equivalent viral concentrations. Whole blood and urine were diluted 1:2 with ATL buffer. Validation parameters included sensitivity, specificity, reproducibility, repeatability, and detection limit. Although the PCR kits were not specifically validated for use with the AriaDx platform by the manufacturer, compatibility was verified as part of the validation process.

Results and findings:

Ct values from whole blood, urine, and CSF spiked with cultured virus showed minimal variation compared to plasma for all tested viruses, confirming their suitability for analysis.

Conclusion:

The validation parameters, including sensitivity, specificity, reproducibility, repeatability, and detection limit, were all acceptable. Whole blood, urine, and CSF were confirmed as suitable sample matrices. These analyses have now been successfully implemented in our diagnostic repertoire.

P-22

The ability to act on unexpected results in a routine laboratory.

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Introduction and background

Available tools, clear Standard Operating Procedures (SOPs), knowledge of morphology and confident biomedical laboratory scientists can reduce turnaround time in the laboratory. This will in turn reduce the time it takes for a patient to receive appropriate care when unexpected results arise.

Methods

A 19-year-old man was admitted to the emergency room shortly after midnight, presenting with a 4-day history of flu-like symptoms and brown urine. Routine blood samples were ordered and analysed using the Sysmex XN 9000-system. The platelet count was $5x10^9$/L, haemoglobin 11,9g/dL, leukocytes $4,3x10^9$/L, CRP 73mg/L, eGFR 70 mL/min/1,73m^2. The scattergrams appeared relatively normal, with only cytopenia-related flagging present.

According to the laboratory's SOP, the working biomedical laboratory scientist did a thorough examination of the low platelet count to ensure its correctness. Low platelet count is verified by estimation of blood smear, using the Cellavision Review Software.

Results and findings:

When examining the blood smear, the laboratory scientist noticed a severe degree of erythrocyte fragmentation: Schistocytes, including microspherocytes, helmet cells and keratocytes. This was immediately reported to the referring doctor, who responded accordingly.

Tentative diagnoses were Paroxysmal nocturnal hemoglobinuria (PNH), Thrombotic Thombocytopenic Purpura (TTP), complement-mediated disorder and viral infections. The patient's bone marrow aplasia and hemolysis were later found to be caused by Parvovirus-B19, confirmed by serology and PCR. This is considered a rare complication in otherwise healthy adolescents.

Conclusion:

This case exemplifies how continuous focus in recognition of possible critical conditions, using morphology, can improve patient care. Case discussions, employing CellaVision Proficiency Software, and establishing thorough SOPs based on ICSH recommendations results in experienced staff, equipped with necessary tools to handle unexpected situations in routine medical laboratories.

P-23

Stability of the p50-value measured on Hemox Analyzer

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Introduction and background

Some hemoglobin variants have an abnormal oxygen affinity, which can lead to polycythemia or cyanosis. The relationship between the oxygen saturation of the hemoglobin ($_SO_2$) and the partial pressure of oxygen in the blood ($_PO_2$) is presented through a dissociation curve, and the p50-value denotes the $_PO_2$-value at 50% saturation. Decreased oxygen affinity is indicated by an increased p50-value and a right-shift of the dissociation curve, and vice versa.

Hemox Analyzer, delivered by TCS scientific corp, measures the dissociation curve and the p50-value. The instrument manufacturer does not state the stability of the p50 in blood samples, so we wanted to establish this for storage in room temperature and at 2-8°C.

Methods

Voluntaries donated blood, and we collected fresh, excess blood from the routine laboratory. We tested 18 samples stored in room temperature, including 10 EDTA-blood samples and eight heparin-blood samples, as well as 14 samples stored at 2-8°C, including six EDTA-blood samples and eight heparin-blood samples. The total number of samples included in the project were 32.

All samples were anonymized and analyzed on the Hemox Analyzer according to the manufacturer's instructions. To establish the initial p50-value, all samples were analyzed within one hour after sampling.

Samples stored in room temperature were analyzed after 2, 4, 6, 8 and 24 hours. Samples stored at 2-8°C were analyzed after 4, 24, 48, 72 and 96 hours.

Results and findings:

The p50-value in EDTA- and heparin-blood had an average change of less than 3% for the first 6 hours in room temperature and for the first 96 hours in 2-8°C. Except for two outliers, no p50-values changed by more than 10% in these time intervals.

Conclusion:

The p50-value measured on the Hemox Analyzer is stable for 6 hours in blood samples stored at room temperature, and for 96 hours when stored at 2-8°C.

P-24

Interference from rheumatoid factor in multiplex cytokine analyses

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Introduction and background

The multiplex ELISA technology is frequently used for research, including the analysis of cytokines for studying immunological processes in rheumatoid arthritis (RA). It has been shown that multiplex analyses are susceptible to interference from rheumatoid factor (RF) and other heterophilic antibodies, that bind to assay antibodies.

The main goal of the study was to assess the occurrence of interference in multiplex cytokine analyses in patients with RA and compare two different multiplex ELISA kits. Another aspect was to evaluate whether high levels of RF were associated with interference.

Methods

72 serum samples from RA patients included in the ULRABIT study were analyzed using 27-plex kit from Bio-Rad, 24-plex kit from R&D Systems and in addition, Interleukin-6 (IL-6) on a routine immunoassay platform, Roche Elecsys. To block interference from RF, an in-house modified blocker was used. Interference was defined as 50 % discrepancy in cytokine value between the untreated and blocked sample.

Results and findings:

The results showed interference in respectively 14% and 25% of cytokine measurements for each of the multiplex suppliers, but the difference was not consistently statistically significant. No interference was detected in the Elecsys IL-6 analysis.

There was a statistically significant difference in the number of interferences between samples with high levels of RF IgM compared to samples with negative or low level of RF IgM ($p= 0,01$ (Bio-Rad) and $p= 0,001$ (R&D), but there were also many exceptions. There was no correlation between the number of interferences and the level of RF IgA.

Conclusion:

Interference was observed in a substantial proportion of samples and cytokine measurements for both multiplex assay kits studied. Based on the measured concentration of RF IgM, it cannot be determined whether samples should be pretreated or not. Pretreatment with blocking antibodies is recommended for all samples to be analyzed with multiplex bead-based immunoassays.

P-25

Implementation of task shifting in extended gross examination from pathologists to biomedical laboratory scientists - Department of histopathology at Ålesund Hospital

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Introduction and background

Traditionally, all gross examinations of histopathological samples were performed by pathologists. Today, most gross examinations of smaller samples are executed by biomedical laboratory scientists. An increased amount of samples and a shortage of pathologists have led to a heavy workload, and the need for further task shifting. A pilot project was initiated in which three biomedical laboratory scientists would learn expanded gross examination of new organs. The intention was to free up time for the pathologists while sustaining good quality.

Methods

Execution:

- Theoretical review of organ anatomy, terminology and orientation.
- Observation of the task performed by a pathologist
- Review of procedures
- Performing the task under supervision
- Carrying out the task independently, consulting each other or a pathologist if needed
- Evaluation

Organs:

- Appendix
- Cervical amputation
- Fallopian tubes
- Gallbladder
- Lymph nodes in colorectal adenocarcinoma
- Morton's neuroma
- Parathyroid glands
- Placenta
- Prepuce

Results and findings:

An estimate for potential time saved was made based on cases from 2023.

Total number of cases: 1196

Estimated time: 248 hours

Conclusion:

The project started with macrodissection of the appendix and gallbladder. An evaluation was held with the conclusion that the pathologists experienced a reduced work load and were satisfied with the quality of the work. It was decided to expand the project to include more organs.

According to the estimate provided under results, the potential time saved for the pathologists is 248 hours annually, roughly one hour per workday. Future statistics will be influenced by the steady increase of total cases.

The project have been successful, and the new workflow is implemented.

P-27

The implementation of mobile devices as work tools at Sunnaas Hospital

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Introduction and background

There is an increasing use of mobile devices as tools to streamline and improve the quality of healthcare services. In 2019, WHO published its first guidelines on digital technologies to strengthen healthcare. The guidelines focused on digital strategies via healthcare workers mobile devices, including tools and channels that enabled them to communicate with patients and other healthcare workers. Sunnaas Hospital in Norway has used mobile devices on various occasions since 2015, and since 2021, there has been an increasing focus on replacing PCs with mobile devices.

In our research, we aimed to explore the experience of using mobile phones as work tools at Sunnaas Hospital and identify the factors that contribute to successful implementation in a hospital department. The following issue was developed:

What do healthcare professionals need in order to use mobile phones as work tools to streamline their workday?

Methods

The study was based on material obtained through semi-structured, in-depth interviews with eight respondents from Sunnaas Hospital. The interviews were conducted on Teams, and we used the Stepwise-Deductive Induction (SDI) method for the data analysis.

Results and findings:

Three concepts emerged: (1) the startup process, (2) digital competence, training and colleague support and (3) communication.

Conclusion:

Our results show that the healthcare professionals we spoke to were positive about adopting mobile phones. To use mobile phones effectively as a work tool in hospitals, users reported needing clear guidance from their managers on the intended purpose of the device. Additionally, they emphasized the importance of perceiving the tool as relevant to their daily tasks and having opportunities to provide feedback on needed changes or improvements. Most importantly, they require dedicated time to explore the device and practice to become proficient in its use.

P-28

Preventive measures in blood sampling of children

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Introduction and background

We have noticed an increase in children expressing fear of blood tests due to inadequate preparation and previous experiences with coercion. Difficult blood sample collection is a challenge for those involved, and it can often negatively impact the test results.

In this study, our goal has been to both improve the children's preparation for blood tests and enhance the overall experience.

Methods

The work was carried out using various methods, including providing information about EMLA cream, decorating the blood sampling rooms, creating information forms for parents, and producing a video that demonstrates the blood sampling process. We also introduced soap bubbles, colorful bandages, hospital clowns, a play room and a picture book that explains blood sampling. Additionally, the laboratory staff participated in courses focused on effective communication with children.

Results and findings:

We have received positive feedback from both parents and children regarding the measures. As of November 13, 2024, our website, which features a video and information about preparation, has received 1,677 views. We have observed that the majority of children who come in for blood tests either have EMLA cream applied or are familiar with it, and we can see its effects through repeated blood tests, where the same child undergoes sampling both with and without the cream.

Conclusion:

Together with the right information, preparation, and distraction techniques, the use of EMLA cream makes the process of taking blood samples significantly easier in most cases for both young patients and the person collecting the blood sample.

P-29

Establishment of a DNA Hub for Forensic Analysis: Collaboration between the police, UiT and OUS

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Introduction and background

On recommendation from the Health and Care Services Committee, the Forensic Genetics Center at University of Tromsø (UiT) was tasked with performing DNA and trace analyses for use in criminal justice, supplementing the services of the Institute of Forensic Medicine. A new laboratory was established in Tromsø to conduct DNA analysis of trace and personal samples upon request from National criminal investigation service.

In conjunction with the development of a new application for UiT and the requirement to establish a DNA hub (within the police), the two laboratories, Oslo University hospital (OUS) and UiT, will be able to compile DNA profiles analyzed at different locations. This necessitates changes in the OUS application, Embla. Sykehuspartner (SP) deliver IT services to hospitals in South-Eastern region (HSØ) in Norway. As owner of the infrastructure for the Embla application, SP has coordinated the subproject of upgrading Embla. Embla is used by the Department of Forensic Medicine at OUS.

Methods

SP used the HSØ project guide for implementation of Embla infrastructure subproject.

The project method emphasized agile implementation, which is subject for frequent reassessment and adaptation, making it easier to identify and address issues early on. SP upgraded the Embla application and associated infrastructure. We also enabled communication between Embla and the DNA hub.

Results and findings:

The HSØ project guide proved to be an effective tool for the execution of this project.

The project resulted in two laboratories sharing a DNA hub and exchanging DNA profiles. The collaboration has resulted in a new and efficient case flow.

Conclusion:

DNA hub enables both laboratories to assist the police with DNA analyses. They can match already existing DNA profiles to ongoing cases.

P-30

Validation and Implementation of GeneProof Kit for Expedited Neisseria gonorrhoeae PCR Result Confirmation.

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Introduction and background

Our laboratory previously required approximately one week to confirm positive *Neisseria gonorrhoeae* PCR results due to a dual-step process: internal analysis followed by another lab confirmation. To optimize this workflow, we evaluated an alternative methodology based on validated GeneProof testing protocols from a partner hospital. This approach utilizes eluates from Cobas 4800x extractions, with GeneProof targeting an alternative genetic marker, thereby enhancing result reliability. Following comprehensive validation, we successfully integrated this method into our accreditation scope. This implementation significantly reduced turnaround time, enabling next-day reporting of positive Cobas 4800 test results, excluding weekend delays. Our primary objective was to minimize result delivery time for positive *Neisseria gonorrhoeae* samples through GeneProof kit implementation. Since the manufacturer hasn't validated extraction using Cobas 4800x and Cobas medium, we conducted independent validation studies. This analysis serves as a verification method for Cobas 4800 CT/NG (Roche) results.

Methods

We analyzed 60 samples (30 positive, 30 negative) from various anatomical sites (cervix, vagina, and urine) using Cobas 4800x extraction. The extracted eluates underwent secondary analysis using the GeneProof *Neisseria gonorrhoeae* PCR kit on a CFX 96 platform. We performed a comparative analysis of GeneProof and Cobas 4800 results, including a detailed evaluation of cycle threshold (Ct) values.

Results and findings:

All samples met predefined analytical sensitivity and specificity criteria, with satisfactory inter- and intra-assay performance metrics. Stability testing demonstrated robust results for eluates stored overnight at 4 °C and after three-day storage at -20°C, simulating weekend conditions.

Conclusion:

Implementation of the GeneProof-based confirmation protocol achieved a significant reduction in turnaround time from >7 days to 1-2 days. Based on comprehensive validation data, the confirmation analysis utilizing the GeneProof *Neisseria gonorrhoeae* PCR kit with Cobas 4800x eluates meets all requirements for inclusion in our department's accreditation scope.

P-33

Outbreak of *Salmonella* Agona in Norway, November 2022 – February 2023

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Introduction and background

In mid-November 2022, a medical microbiological laboratory (MML) reported three cases of domestically transmitted *Salmonella* Agona (*S*. Agona) infection. The following week, the MML reported three new cases, while the National Reference Laboratory (NRL) for Enteropathogenic Bacteria at the Norwegian Institute of Public Health (NIPH) reported two cases. In response, NIPH initiated an outbreak investigation in collaboration with the Norwegian Food Safety Authority(NFSA), the Norwegian Veterinary Institute(NVI) and municipal medical officers to determine the source and stop the outbreak.

Methods

All human *Salmonella* isolates detected at MMLs were routinely sent to NRL at NIPH. Isolates were verified with MALDI-TOF-MS, serotyped for *S*. Agona and underwent whole genome sequencing(WGS). Serovar(SeqSero), sequence type(ST) (multilocus sequence typing; MLST), and cluster type(CT) (core genome MLST, Enterobase scheme, SeqSphere) were determined by WGS.

A case was defined if resident in Norway with symptom onset after November 1,2022 and confirmed if carrying *S*. Agona, ST13, CT15744 by WGS. Cases were interviewed and purchase receipts were collected. Product tracing and investigation of food samples were conducted.

Results and findings:

In total, 87 cases were confirmed, geographically spread in Norway, age 1-91 years, and included both sexes. Sweden, the Netherlands and the United Kingdom reported cases with identical bacterial strain.

From interviews, cucumber, tomato, lettuce, ground meat, chocolate and nuts were suspected vehicle of infection. No positive samples from tested food were obtained.

Cucumbers, particularly from one packaging facility, were consistent with the distribution and exposure details of most cases. No batches of suspected cucumbers were available for testing.

Conclusion:

Batches of imported cucumbers distributed few weeks before the outbreak were likely the vehicle of infection. Control and preventive measures included increased sampling at the packaging facility and from Norwegian importers. Public was remined to wash and dry imported fruits/vegetables that are not heat-treated before consumption.

P-34

HUVEC: an available experimental model for microinflammation modelling in vitro

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Introduction and background

It is well known that different environmental stressors such as xenobiotics which are highly presented in our environment, may alter the specific physiological functions, and irreversibly affect the immune functions in humans. The result of such exposure is the development of many diseases that demonstrably reduce the quality of life of an individual and affect their socioeconomic status.

Methods

The aim of the present in vitro study was to evaluate the effect of bisphenol A and bisphenol S on the morphological and functional aspects of human umbilical vein endothelial cells (HUVEC). These cells were exposed to selected doses of bisphenols (from 1 µg/mL to 50 µg/mL) during 24 h. Subsequently, mitochondrial activity was determined by MTT assay, cell membrane integrity was measured by CFDA-AM assay, and IL-6 as a pro-inflammatory cytokine was quantified by the ELISA method.

Results and findings:

The gained results revealed a significant ($p<0.05$; $p<0.001$) decrease in mitochondrial activity of HUVEC cells at 10, 25 and 50 µg/mL of both bisphenols. A similar tendency was recorded in cell membrane integrity, where 25 and 50 µg/mL of bisphenol S significantly ($p<0.001$) disrupted fluidity and membrane entirety. The same situation was confirmed in bisphenol A with significant ($p<0.05$; $p<0.01$) changes at 10, 25 and 50 µg/mL. Interesting results were observed in IL-6 release when lower experimental doses (up to 10 µg/mL) of both bisphenols stimulated this pro-inflammatory cytokine with significant ($p<0.01$, $p<0.001$) changes at 2.5, 5 and 10 µg/mL.

Conclusion:

Our study confirmed the potential of bisphenols to induce negative effects on HUVEC cells in vitro. This work was financially supported by the Scientific Grant Agency of the of the Slovak Republic – VEGA 1/0555/25, by the Cultural and Educational Grant Agency of the Slovak Republic - KEGA 054SPU-4/2024, and by the Slovak Research and Development Agency Grant APVV-20-0218

P-35

How to produce half a liter of emergency blood in 27 minutes - and keep your people happy in the long term!

Conny Graumann

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Introduction and background

During the first 1,5 years of operation the emergency room in Alta municipality have had 8 “activations” of our walking blood bank (WBB) with an average time from setting off the alarm to delivery of the first blood bag of 27 minutes.

There are some absolute prerequisites to being able to do this so surprisingly fast: Financing, management, a coordinator, an agreement, procedures and equipment.

The long-term operation can present challenges. Especially, is it important to keep your blood donors and phlebotomists happy, they are special.

Methods

This development project seeks to uncover possible solutions to the long-term challenges of being able to recruit and keep blood donors and phlebotomists.

To do this, we have

- carried out surveys for blood donors and phlebotomists
- been continuously improving the WBB in Alta
- carried out regular practical training
- arranged information meetings for blood donors

Results and findings:

The main motivations for donors to join the WBB are the desire to be able to help save lives and at the same time contributing positively to the local community. Motivations to continue are the feeling of being safe and well looked after during the blood donation and that the blood given is used.

Main motivations for phlebotomists to join the WBB are also the desire to be able to help save lives and participating in something new and exciting. Motivations to continue are receiving training and updates and being confident in doing the different parts of the job.

Conclusion:

To be able to run a WBB in a sustainable way you must address these issues: Continuous recruitment of both emergency blood donors and phlebotomists, saving lives, making sure your donors feel safe and training your phlebotomists.

P-36

Can BD BACTEC™ Myco F/Lytic vials in plastic be used for detection of *Mycobacterium* species in bloodstream infections?

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Introduction and background

Infections due to mycobacteria are increasing. Left untreated, these can lead to bloodstream infection (BSI), particularly in immunocompromised patients. Mycobacteria consist of the *Mycobacterium tuberculosis* complex (MTBC) and non-tuberculous mycobacteria (NTM). MTBC and NTM are transmitted through aerosols. Focus on health, safety and environment (HSE) is especially important while working with these bacteria. Blood culture is considered the gold standard for the diagnosis of BSI with mycobacteria.

BD BACTEC™ Myco F/Lytic plastic vials were developed for rapid detection of growth of mycobacterium species, yeast and mold in blood. This study aimed to verify the use of BD BACTEC™ Myco/F Lytic vials in plastic compared to vials in glass for improved HSE.

Methods

The design of verification included seven different mycobacterial strains (including MTBC and NTMs), one yeast strain (*Candida glabrata)* and one nocardia strain (*Nocardia asteroides*).

One McFarland bacterial/yeast suspension was diluted 1:100 and 100 µl of the diluted suspension was added to the blood culture vials. The vials were incubated in a BD BACTEC™ FX incubator. Three parallels of the strains were examined with both plastic and glass vials. Time to detection (TTD) was measured for each strain.

Results and findings:

The glass vials detected the *M.tuberculosis* strain one day earlier than the plastic vials, while the *M. bovis BCG* strain was detected two days earlier in the plastic vials. For *M. avium* and *C. glabrata,* there was no difference between the vials. *N. asteroides* was detected two hours earlier in the glass vials.

Conclusion:

This study demonstrated that BD BACTEC™ Myco F/Lytic vials in plastic can be used for detection of mycobacterial species. The plastic vials are equally effective in detecting mycobacterial species, compared to the glass vials. Implementation of plastic vials will reduce the risk of blood culture vials breaking and prevent laboratory related infections.

P-37

Detection of *Borrelia burgdorferi* (s.l.) in *Ixodes ricinus* ticks collected in Iceland

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Introduction and background

Hematophagous arthropods, such as ticks, are known vectors of blood-borne pathogens worldwide. The most prevalent tick species in Europe, *Ixodes ricinus,* is a known vector for tick-borne encephalitis virus (TBEV) and *Borrelia burgdorferi* (s.l.) complex. Three *B. burgdorferi* (s.l.) genospecies, *B. garinii*, *B. afzelii* and *B. burgdorferi* (s.s) are the primary causative agents of Lyme borreliosis in humans. There is growing concern about *I. ricinus* ticks transmitting these pathogens to humans and animals in Iceland.

This study aimed to determine whether *I.ricinus* ticks collected in Iceland carry pathogens that can be transmitted to humans and animals.

Methods

Samples were obtained from two Ixodes ricinus tick collections, Collection A (n=133), and Collection B (n=1076) from both larval and nymph stages. Larval samples were pooled in some tubes, while nymphs were collected individually, resulting in a total of 866 samples. The samples were homogenised and DNA was extracted using a QiaAmp DNA kit (Qiagen). Samples from Collections A and B were screened for B. burgdorferi (s.l.) by qPCR. Sample collection A was additionally screened for Tick-borne encephalitis virus (TBEV), Coxiella burnetii, Francisella tularensis, and Rickettsia spp. by qPCR. Samples positive for B. burgdorferi (s.l.) were further analyzed for species identification by genotyping PCR**.**

Results and findings:

Screening of 866 samples by qPCR, confirmed 9.9% of samples positive for B.burgdorferi (s.l.). Samples additionally screened for TBEV, Coxiella burnetii, Francisella tularensis, and Rickettsia spp. were negative for the respective pathogens.

Conclusion:

This research confirms the presence of *Borrelia burgdorferi* (s.l.) in *Ixodes ricinus* ticks in Iceland. Further studies on *B. burgdorferi* (s.l.) and other tick-borne pathogens and heightened public awareness are essential to reduce the risk of tick-borne diseases in Iceland.

AUTHORS INDEX

Author Name	Program Codes	Author Name	Program Codes
Aadne, Silje Henriette	P-16	Dahl, Inge-Lise	P-11
Aas, Finn Erik	P-16	Dautbegovic, Nejra Hasic	P-08
Aass, Hans-Christian	P-24	de Souza Coelho, Valeria	S-08-04
Alfredsson, Matthias	P-37	Dellgren, Anja	S-07-04
Amirnejad, Homayoun	S-14-02	Deyab, Gia	P-29
Anderson, Kimberley	S-13-02	Dimopoulos, Konstantinos	S-01-03
Andreassen, Eirin	S-12-03	Dreier, Ida	S-07-04
Andreassen, Lotte	S-14-01	Duran Rios, Claudia Juliana	P-13
Andreassen, Lotte Leonore	S-14-02	Eid, Ragnhild Vassbø	P-19
Andrew, Joanna	S-11-03	Eide, Ingvild	P-09, S-07-01
Anover, Cindy	S-04-03	Einarsdóttir, Arney	S-09-02
Apeland, Solveig	P-22	Einarsdóttir, Gyða Hrönn	S-04-04, S-06-02, S-20-02, S-20-03
Ashraf, Muhammad Aaqib	S-03-03	Einarsdóttir, Kristín	S-20-03 / P-26
Aspen, Lene	P-27	Elvarsdóttir, Edda María	S-13-03
Ausland, Solbjørg	S-12-02	Emanuelsen, Linda	P-33
Aziz, Hassan	S-03-01	Engebretsen, Solveig Beate	P-12
Barkhald, Siv-Heidi	S-12-03	Erlendsdóttir, Helga	S-19-01
Barkved, Pundharika	P-16	Erlingsdóttir, Ásthildur	S-15-02
Berg, Vivian	S-14-01, S-14-02	Falk, Monica	P-33
Berghäll, Heidi	P-05	Fjeld, Bente	P-23
Bergþórsson, Jón Þór	S-01-02	Franconeri, Lea	P-33
Bivand, Joanna Malgorzata	S-12-01	Freysdottir, Jona	S-21-01, S-21-02
Bjornsson, Hans Tomas	S-13-02	Frick, Elisabet	S-04-02
Björnsdóttir, Þórunn Sóley	P-37, S-15-03	Frøstrup, Ann-Britt	P-11
Björnsson, Hans Tómas	S-10-01	Gehin, Johanna Elin	P-24
Bjørnholt, Jørgen Vildershøj	P-36	Goll, Guro Løvik	P-24
Bolstad, Nils	P-24	Gottfreðsson, Magnús	S-19-02
Bragadóttir, Erla	S-08-03	Graumann, Conny	P-35
Briem, Eiríkur	S-13-03	Greisen, Holger Dahl	P-11
Brustad, Åge Winje	P-13	Gresslien, Kaja	P-23
Bruvik, Torbjørn	P-33	Grevskott, Elisabeth	P-27
Bugge, Elin	S-07-01 / P-04	Grimholt, Runa M.	P-23
Bugge, Elin Svendsen	P-09	Gudbrandsdottir, Eva Sif	P-11
Bøtcher, Tina Scharbau	P-11	Gunnarsdóttir, Helga Sigrún	S-10-02
Carter, Daniel	P-37	Gunnarsson, Kristján Þór	S-16-01
Cassata, Bridget	S-13-01	Guntvedt, Torunn	P-03
Casás Casal, Sam	S-15-03	Guðmundsdottir, Valborg	S-04-02
Chishti, Fatima	P-07	Guðmundsson, Bjarki	S-13-01
Christiansen, Maren Andrea	S-14-01	Guðnason, Vilmundur	S-04-02
Clausen, Nina Merethe	P-20	Haagensen, Ina	P-33
como, fabio	S-07-03	Habostad, Renate-Kristin	P-25
Dahbi, Lina	S-13-01	Haglund, Hedda Glidje	P-36

Author Name	Program Codes	Author Name	Program Codes
Hakonarson, Hakon	KN-02	Kommedal, Øyvind	S-12-01
Halldórsdóttir, Anna Margrét	S-02-01	Koskenvuori, Janika	S-09-01
Halldórsdóttir, Sara Þöll	S-10-01	Kristinsson, Dr. Sigurður Yngvi	KN-01
Haltbakk, Ildri	P-33	Kristinsson, Sigurdur Yngvi	S-01-01
Hammer, Hilde Berner	P-24	Kristjánsdóttir, Borghildur Fjóla	S-06-04
Hansen, Haakon	S-15-02	Kristmundsson, Árni	S-15-02, S-15-03
Hansen, Mia Iren	P-08	Kristþórsdóttir, Kristrún Helga	S-15-01
Hansen, Victoria Kristin Wulff	P-06	Kroepelien, Siril Viste	S-20-01 / P-31
Hansford, Kayleigh	P-37	Kval, Natalia	P-10
Hanssen, Hege Marie	P-01	Landrö, Ragna	S-17-02
Hauksdóttir, Helga	S-13-03	Lange, Heidi	P-33
Hegstad, Kristin	S-12-03	Lanther, Tina	P-11
Hellström, Åsa	P-15	Larsen, Rune	P-11
Herø, Elin Christine Eliassen	P-29	Larsen, Ruth-Anne	P-27
Hillestad, Paula	P-19	Lerbech, Charlotte	S-18-02
Hindrum, Marit	P-33	Lilletvedt, Daniel	P-22
Hjálmarsdóttir, Martha Ásdís	S-11-01	Lind, Andreas	P-20, P-21
Humstad, Kristin	P-30	Loft, Isabella	P-11
Hundhausen, Thomas E.	S-17-01	Love, Thorvardur Jon	S-01-01
Hustad, Matilde	P-21	Lumme, Riitta	S-09-01
Jacobsen, Maria Verlo	P-17	Lúðvíksson, Björn Rúnar	S-21-02
Jambor, Tomas	P-34	Manolescu, Irina	S-03-02
Jensen PhD, Jørghild Karlotte	S-11-02 / P-32	Manolescu, Irina Beatrice	S-18-03 / P-38
Jensen, Camilla Skovbjerg	S-08-01	Mansilla Castaño, Francisco	S-08-01
Jensen, Thomas Hartvig	S-03-03	Maríusdóttir, Eyrún Inga	S-17-03
Joakimsen, Berit	P-02	Matthíasdóttir, Sigurborg	S-17-02
Joakimsen, Ingrid Sofie	P-02	Medlock, Jolyon M.	P-37
Johnsen, Bente Helene	P-15	Mehus, Lise Larsen	P-24
Jonsdottir, Sigridur	S-05-02	Meyer-Myklestad, Malin Holm	P-20, P-21
Jóhannsson, Freyr	S-13-01	Meyn, Stephen	S-13-03
Jónsdóttir, Kristín	S-06-01	Mo, Solveig	P-05, S-18-03 / P-38
Jónsdóttir, Rósa Björk	S-20-03 / P-26	Mundal, Anne Mari	P-28
Jónsson, Jón Jóhannes	S-13-01, S-13-03	Møller, Ina	S-14-04
Jónsson, Stefán Ragnar	S-02-02	Nedreberg, Tine	P-18
Kaalund, Alikka	S-02-04	Nesdal, Johanne Marie	P-12
Karlsbakk, Egil	S-15-02	Neslein, Inger-Lise	S-14-03, S-18-01
Katsiouleri, Polina	P-33	Noem, Dordi Anne	P-02
Kaur, Jagdip	P-36	Nordman, Sina	S-09-01
Klaasen, Rolf	S-20-01 / P-31	Olafsdottir, Thorunn Asta	S-10-03
Klaasen, Rolf A.	P-13	Olafsson, Sigurdur	KN-03
Klundby, Ingvild	P-20, P-21	Olafsson, Sigurgeir	S-10-02
Koivisto, Kati	S-09-01	Olsen, Anita Ellevold	P-03

Author Name	Program Codes
Pedersen, Anne-Berit	S-12-02
Pelanti, Jonna	P-05
Persson, Anita	S-08-02
Pálsdóttir, Guðný Rut	P-37, S-02-03
Pétursdóttir, Katrín Birna	S-01-02
Pétursson, Hrólfur Smári	P-37
Ragnarsson, Kristján Ari	S-13-03
Reiersøl, Elin Hallheim	S-17-01
Rekany, Gulistan	P-13
Reykdal, Sigrún Edda	S-01-02
Roald, Marie Nora	P-14
Rowe, Outi	S-09-01
Rögnvaldsson, Sæmundur	S-01-01
Røsholm Nilsson, Anna	P-06
Rúnarsson, Guðmundur	S-01-02
Sandbech, Ida Linea Welin	P-29
Sandberg, Martine	P-20, P-21
Schack, Britta Louise	P-11
Schmidt, Caroline	S-08-02
Sigurgeirsdóttir, Kristín	S-20-03 / P-26
Sigurgrímsdóttir, Hildur	S-21-02
Sigurjónsdóttir, Helga Sigrún	S-07-02
Sigurðardóttir, Heiða	P-37, S-02-02, S-02-03, S-15-03
Sigurðardóttir, Tanja Dögg	S-01-02
Sigurðsson, Vignir	S-16-01
Sindt, Cilia Maria Katharina	S-08-01
Skibelund, Bine	S-02-04
Snorradottir, Asbjorg Osk	KN-02
Solem, Hege	P-08
Solli, Ann Iren	S-14-01, S-14-02
Sriranganathan, Vethanayaki	P-08, P-20
Stefánsson, Kári	S-10-02
Steinsbekk, Kristin Solum	S-14-04
Stenberg, Ingunn Bjerkvik	S-11-02 / P-32
Sundsfjord, Arnfinn	S-12-03
Svansson, Vilhjálmur	S-02-02
Sveinbjörnsdóttir, Erla	S-13-03
Sverresdotter Sylte, Marit	S-18-03 / P-38
Sylte, Marit Sverresdotter	P-05
Sækmose, Susanne	P-11
Sørensen, Claess Henning	P-11
T. Brandal, Lin	P-33
Tangen, Anne-Marie	S-20-01 / P-31
Thorarensen, Kristbjörg Sara	S-02-03
Thorolfsdottir, Eirny Tholl	S-13-02
Thorsteinsdottir, Sigrun	S-01-01
Tran, An-Thuy Truc	P-20, P-21
Truong, Christine Thuy-Trang	P-20, P-21
Tómasdóttir, Sigurlína	S-17-02
Tønjum, Tone	P-36
Ulfig, Agnes	S-10-01
Valle, Per Christian	P-01
Veneti, Lamprini	P-33
Viertola, Riitta	P-05
Vik, Anne Sofie Øyvindsdatter	P-19
Virtanen, Kristel	P-05
Viðarsson, Brynjar	S-01-02
Zetterberg, Henrik	S-04-01
Árnadóttir, Ragnheiður	S-10-02
Årvik, Monica	P-25
Óskarsdóttir, Lóa Björk	S-09-02
Óskarsson, Jón Þórir	S-01-01
Þorgeirsdóttir, Stefanía	S-05-01
Þorláksdóttir, Auður Ýr	S-06-03
Þorsteinsdóttir, Þórunn Rafnar	S-05-03