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Use of continuous glucose monitoring

Recent advances in diabetes management have included the continuous monitoring of blood glucose, thereby providing better management and control of the condition. In a recent publication (1) research was conducted relating to both within person and between sensor variability for continuous glucose monitoring. The researchers used two free-style devices on each participant, the Abbott Freestyle Libra pro and the Dexcom 64 Platinum. The subjects were all type 2 diabetics with no insulin requirements. The Abbott Free Style Libra pro was placed on the back of the upper arm and the Dexcom G64 Platinum on the right lateral abdominal wall. The Abbott device measured glucose every 15 minutes for up to 14 days and the Dexcom device every 5 minutes for 7 days. Participants also used finger prick glucose measurements for the Dexcom device as required by the manufacturer. Data for approximately two weeks and a three monthly follow up were analysed. Both devices gave similar results non-significant mean and variance glucose values. Despite the concordance of the two devices, variability in glucose values were identified from some individual participants. However, the mean glucose values over the trial period was 8.2mmol/L and the authors considered that the physical location of the devices may have influenced individual data sets. In addition the authors concluded that just using Pearson's correlation coefficient had limitations for assessing the data and recommended using root mean squared error as well as Bland-Altman plots when method comparisons are being undertaken.

Antibiotic use in food producing animals

The development of intensive farming practices to increase food production has been rising over the last decade. In doing so, antimicrobial use has increased to both maintain animal health and productivity. In 2017 (latest figures available) the use of antimicrobials in animals represented 73% of all antimicrobials used world-wide. This is considered to represent a serious threat to humans by creating drug resistant infections. Complicating the use of antimicrobials with farm animals there is no international agreement on limiting or banning the use of antimicrobials in animal food production. A recent international publication (2) funded by the European Union searched the international literature on data from three sources: government reports on the veterinary use of antimicrobials, scientific articles relevant to farm use and international reports relating to in-farm use within countries. Data on international sales, consumption and imports were considered a proxy for overall usage. Four groups of animals were included: cattle, sheep, pig and chickens. Included in the data were projections for between 2020 and 2030 for 299 countries. Data for 2020 indicated that an estimated 99,502 tonnes of active ingredients could be tracked with the top five countries being: China, Brazil, India, USA and Australia and were predicated to continue to be the top five by 2030. The breakdown of antimicrobial sales fell into 13 classes: Tetracyclines, Amphenicols, Penicillins, Cephalosporins, Sulphonamides, Macrolides, Lincosamides, Aminoglycosides, Quinolones, Pleuromutilins and Polymyxins. Plus some unspecified antimicrobials. Overall Asia continued to increase the use of antimicrobials with Thailand for the penicillins and China for the aminophenicols.

What bears can tell us about blood clots

It is well known that people who are temporarily immobilised such as during long international flights or recovering from surgical procedures are at risk for deep vein blood clots forming resulting from deep vein thrombosis. (DVT). Collectively DVT and pulmonary embolism are known as venous thromboembolism (VTE) and cause between 60,000 and 100,000 deaths per year. Strangely, people who are paralysed long-term with spinal cord injuries (SCI) seem to be 'protected' against VTE despite the immobilisation. Whilst the mechanisms for VTE are understood relating to the initial interaction with platelets and the endothelium causing an activation of the plasmatic coagulation system and subsequently an innate immune response causing VTE. A recent international collaborative research programme has now provided an answer to the issue of VTE (3). Using four mammalian species, the investigation focus was to identify an antithrombotic factor. Key to this research was hibernating brown bears who have long period of winter hibernation but fail to develop VTE; controls were non-hibernating brown bears, but immobilised for blood collection. In addition blood was collected from long term SCI matched with mobile controls, healthy participants put into voluntary bed rest for 28 days, sedentary lactating pigs matched with non-lactating pigs and genetically modified mice to lack a key protein the investigators were interested in. Using the full range of coagulation factors and mass-spectroscopy proteomics they identified a number of specific proteins involved with platelet activation. One protein in particular stood out, heat shock protein 47 (HSP47) and HSP47 receptor on the surface of platelets, which was 55 times lower in hibernating bears. This was replicated in the SCI, long-term bed rest group near the end of 28 days, the sedentary lactating pigs and in the modified mice. The authors conclude that platelets with less HSP47 are less likely to attract white cells and other proteins associate with clot formation and that it this effect was conserved across species thereby reducing the risk of VTE.

Identifying sudden cardiac death by molecular autopsy

Approximately 30% of sudden unexplained cardiac deaths in a young population remain without a conclusive cause after a comprehensive autopsy and in the young population, (<35years) the main cause of death is inherited arrhythmogenic syndrome (IAS). This is classified as sudden death of cardiac origin (SCD). And still lacks a current explanation of the cause of death. In an international co-authored publication (4) the authors both propose the use of molecular technologies in sudden unexplained death and their respective use in SCD. They indicate that SCD accounts for 15 to 20% of all deaths world-wide and that in the age group of <35years the main cause is consistent with IAS. The problems the authors consider is that with IAS there is incomplete penetrance, genetic variability and genetic overlap with these diseases. Additionally, other considerations are age, ethnicity, gender medications and other medical conditions may factor in as comorbidities. The authors proceed to consider cardiac channelopathies and consider seven cardiac anomalies and their population incidence: long QT syndrome (1 in 2500) Brugada syndrome (1 in 2500), short QT syndrome (rare), catecholaminergenic polymorphic ventricular tachycardia (1 in 10000), hypertrophic cardiomyopathy (1 in 500) diluted cardiomyopathy (primarily familial) and arrhythmogenic cardiomyopathy (1 in 5000). They propose to utilise next generation sequencing (NGS) as a relatively low cost approach and include blood samples from the immediate family. In 2008 there was a Trans-Tasman agreement endorsed by the Royal College of Pathologists of Australia (RCPA) to standardise autopsies in SUD on young people. In addition the authors indicate that a Swiss multidisciplinary collaboration has initiated informing families and the implications for surviving members and recommending molecular autopsies on SUD cases.

Milk of human kindness

Whilst most if not all people are aware of the "breast is best" clarion which is acknowledged as providing the young infant with certain immunological advantages as well as a maternal-child bonding process. A publication purporting additional advantages to breast

feeding (hypothetical) is the transfer of genetic information. In the 1970s, a publication identified particles in human milk that demonstrated similarities with retroviruses. Subsequently, the micro vesicles were considered to be formed from mammary epithelium and derived from 'milk fat' globules. In the present research paper (5) the authors propose that the micro vesicles from breast milk contain RNA transcripts and that they have reverse transcriptase activity. In this paper they consider that the receipt of human breast milk represents an allograft conveying tolerance of maternal MHC antigens after breast feeding. It was considered that the transfer of maternal RNA was a mechanism for the neonate to receive maternal genetic information and create immunological tolerance. In a more futuristic consideration the authors propose that parental transfer of genetic information via breast feeding (6) could open the opportunity for an alternative route for gene therapy for certain inherited metabolic diseases.

What happens to troponin T after an acute myocardial infarction

The measurement of blood troponin T is one of the key analytes for diagnosing acute myocardial infarction. With a half-life of approximately 90 minutes, troponin T assays provide an excellent indication relating to the damage of cardiac muscle. While the use of this test is widely acknowledged, there is no consensus relating to the troponin T forms that exist in the blood following a myocardial infarction. If the test is to be refined to allow new generation troponin T assays to be considered, knowing what happens to troponin T in the blood becomes important. Previous research has identified a number of troponin T forms in the blood, however those researchers used serum in their investigations. In the present research (6) scientists from Russia have demonstrated that using serum for troponin T fragment analysis causes troponin T to degrade due to thrombin-mediated degradation. However when plasma was used, no related degradation artefacts occurred. Using plasma from myocardial patients, troponin T fragments were identified by western blotting and immunofluorescence using monoclonal antibodies. They identified 23 proteolytic fragments of troponin T with a range of molecular weights. Two types of fragments dominated, one which was detectable within the first few hours and the second which appeared to be almost unchanged. They concluded that troponin T degradation takes place in the necrotic myocardium and that the fragments appear in the blood at differing times. Further, they propose that antibodies currently in use to detect troponin T may identify different regions of troponin T and not certain troponin T fragments being released into the blood.

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