

Application of platelet-rich plasma with stem cells in bone and periodontal tissue engineering

Authors:Gabriela Fernandes & Shuying Yang

Presently, there is a high paucity of bone grafts in the United States and worldwide. Regenerating bone is of prime concern due to the current demand of bone grafts and the increasing number of diseases causing bone loss. Autogenous bone is the present gold standard of bone regeneration. However, disadvantages like donor site morbidity and its decreased availability limit its use. Even allografts and synthetic grafting materials have their own limitations. As certain specific stem cells can be directed to differentiate into an osteoblastic lineage in the presence of growth factors (GFs), it makes stem cells the ideal agents for bone regeneration.

Nearest Blood & Plasma Donor Finding: A Machine Learning Approach

Authors:Nayan Das; MD. Asif Iqbal

presented,A bag of blood can save a precious life. Statistics show that a tremendous amount of blood is needed yearly because of major operations, road accidents, blood disorders, including Anemia, Hemophilia, and acute viral infections like Dengue, etc. Approximately 85 million people require single or multiple blood transfusions for treatment. Voluntary blood donors per 1,000 population of some countries are quite promising, such as Switzerland (113/1,000), Japan (70/1,000), while others have an unsatisfying result like India has 4/1,000, and Bangladesh has 5/1000. Recently a life-threatening virus, COVID-19, spreading throughout the globe, which is more vulnerable for older people and those with pre-existing medical conditions.

Negative experiences and donor return: an examination of the role of asking for something different

Authors:Barbara M. Masser,Liliana L. Bove,Katherine M. White,Kathleen L. Bagot

The responses of 894 eligible WB donors who had been approached to convert to plasmapheresis and 954 eligible first-time plasmapheresis donors who had been surveyed on their last donation experience and their intention to donate plasma were considered. This information was matched with individual vasovagal reaction records, deferral category, WB donation history, and subsequent donation behavioral data obtained from the blood collection agency.

Plasma medicine—current state of research and medical application

Authors: K-D Weltmann and Th von Woedtke

Plasma medicine means the direct application of cold atmospheric plasma (CAP) on or in the human body for therapeutic purposes. Further, the field interacts strongly with results gained for biological decontamination. Experimental research as well as first practical application is realized using two basic principles of CAP sources: dielectric barrier discharges (DBD) and atmospheric pressure plasma jets (APPJ). Originating from the fundamental insights that the biological effects of CAP are most probably caused by changes of the liquid environment of cells, and are dominated by reactive oxygen and nitrogen species (ROS, RNS), basic mechanisms of biological plasma activity are identified

Diagnostic application of total antioxidant capacity in seminal plasma to assess oxidative stress in male factor infertility

Authors: Suresh sikka & Ashok agarwal

Infertile patients showed significantly lower levels (mean \pm SEM) of total antioxidants (micromolar Trolox equivalents) in their seminal plasma ($1863.84 \pm 27.16 \mu\text{M}$) compared to those from fertile men ($2013 \pm 56.04 \mu\text{M}$, $P = 0.019$). A preferred cutoff TAC value of $1947 \mu\text{M}$ could facilitate better diagnosis of oxidative stress (OS) in men with male factor infertility. At this threshold, the specificity of TAC assay was 63.0 % and the sensitivity 59.5 % with a positive predictive value of 90.7 % and a negative predictive value of 20.4 %.

Treatment of Wound Healing Disorders of Radial Forearm Free Flap Donor Sites Using Cold Atmospheric Plasma

Authors: Stefan Hartwig MD, DMD* Christian Doll MD, DMD* Jan Oliver Voss MD* Moritz Hertel DMD† Saskia Preissner DMD, PhD‡ Jan Dirk Raguse MD, DMD, PhD

Four patients (mean age 64.2 years, range 44 to 80) who had undergone radial forearm free flap procedures and developed wound healing disturbance leading to exposed flexor tendons were included in the present prospective case series. In addition to routine wound care, all sites were irradiated with cold atmospheric plasma. The primary outcome variable was complete wound closure.

Diagnostic application of kidney allograft-derived absolute cell-free DNA levels during transplant dysfunction

Authors: John B. Whitlam, Ling Ling, Alison Skene, John Kanellis, Francseco L. Ierino, Howard R. Slater, Damien L. Bruno, David A. Power

The present study evaluated the diagnostic validity of absolute measurements of graft-derived cell-free DNA, as well as calculated graft fraction, for the diagnosis of graft dysfunction. Plasma graft-derived cell-free DNA, total cell-free DNA, and graft fraction were correlated with biopsy diagnosis as well as individual Banff scores. Sixty-one samples were included in the analysis. For the diagnosis of antibody mediated rejection, the receiver-operator characteristic area under the curves of graft-derived cell-free DNA and graft fraction were 0.91 (95% CI 0.82-0.98) and 0.89 (95% CI 0.79-0.98), respectively. Both measures did not diagnose borderline or type 1A cellular mediated rejection.

Gold nanoparticle-polymer nanocomposites synthesized by room temperature atmospheric pressure plasma and their potential for fuel cell electrocatalytic application

Authors: Ri-Chao Zhang, Dan Sun, Ruirui Zhang, Wen-Feng Lin, Manuel Macias-Montero, Jenish Patel, Sadegh Askari, Calum McDonald, Davide Mariotti & Paul Maguire

Conductive polymers have been increasingly used as fuel cell catalyst support due to their electrical conductivity, large surface areas and stability. The incorporation of metal nanoparticles into a polymer matrix can effectively increase the specific surface area of these materials and hence improve the catalytic efficiency. In this work, a nanoparticle loaded conductive polymer nanocomposite was obtained by a one-step synthesis approach based on room temperature direct current plasma-liquid interaction. Gold nanoparticles were directly synthesized from HAuCl_4 precursor in poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS). The resulting AuNPs/PEDOT:PSS nanocomposites were subsequently characterized under a practical alkaline direct ethanol fuel cell operation condition for its potential application as an electrocatalyst. Results show that AuNPs sizes within the PEDOT:PSS matrix are dependent on the plasma treatment time and precursor concentration, which in turn affect the nanocomposites electrical conductivity and their catalytic performance.

Convalescent Plasma Therapy for COVID-19: State of the Art

Authors: Daniele Focosi, Arthur O. Anderson, Julian W. Tang, Marco Tuccori

Convalescent plasma (CP) therapy has been used since the early 1900s to treat emerging infectious diseases; its efficacy was later associated with the evidence that polyclonal neutralizing antibodies can reduce the duration of viremia. Recent large outbreaks of viral diseases for which effective antivirals or vaccines are still lacking has renewed the interest in CP as a life-saving treatment. The ongoing COVID-19 pandemic has led to the scaling up of CP therapy to unprecedented levels. Compared with historical usage, pathogen reduction technologies have now added an extra layer of safety to the use of CP, and new manufacturing approaches are being explored.

Evolution, current status and advances in application of platelet concentrate in periodontics and implantology

Authors:Amit Arvind Agrawal

Platelet concentrates (PC) [platelet-rich plasma (PRP) and platelet-rich fibrin (PRF)] are frequently used for surgical procedures in medical and dental fields, particularly in oral and maxillofacial surgery, plastic surgery and sports medicine. The objective of all these technologies is to extract all the elements from a blood sample that could be used to improve healing and promote tissue regeneration. Although leukocyte rich and leukocyte poor PRP's have their own place in literature, the importance of non-platelet components in a platelet concentrate remains a mystery. PC have come a long way since its first appearance in 1954 to the T-PRF, A-PRF and i-PRF introduced recently. These PC find varied applications successfully in periodontics and implant dentistry as well. However, the technique of preparation, standing time, transfer process, temperature of centrifuge, vibration, *etc.*, are the various factors for the mixed results reported in the literature.

Impact of Disease on Plasma and Lung Exposure of Chloroquine, Hydroxychloroquine and Azithromycin: Application of PBPK Modeling

Authors:Karen Rowland Yeo, Mian Zhang, Xian Pan, Alice Ban Ke, Hannah M. Jones, David Wesche, and Lisa M. Almond

We use a mechanistic lung model to demonstrate that accumulation of chloroquine (CQ), hydroxychloroquine (HCQ), and azithromycin (AZ) in the lungs is sensitive to changes in lung pH, a parameter that can be affected in patients with coronavirus disease 2019 (COVID-19). A reduction in pH from 6.7 to 6 in the lungs, as observed in respiratory disease, led to 20-fold, 4.0-fold, and 2.7-fold increases in lung exposure of

CQ, HCQ, and AZ, respectively. Simulations indicated that the relatively high concentrations of CQ and HCQ in lung tissue were sustained long after administration of the drugs had stopped. Patients with COVID-19 often present with kidney failure. Our simulations indicate that renal impairment (plus lung pH reduction) caused 30-fold, 8.0-fold, and 3.4-fold increases in lung exposures for CQ, HCQ, and AZ, respectively, with relatively small accompanying increases (20 to 30%) in systemic exposure. Although a number of different dosage regimens were assessed, the purpose of our study was not to provide recommendations for a dosing strategy, but to demonstrate the utility of a physiologically-based pharmacokinetic modeling approach to estimate lung concentrations. This, used in conjunction with robust *in vitro* and clinical data, can help in the assessment of COVID-19 therapeutics going forward.

Anti-SARS-CoV-2 antibodies in healthy donor plasma pools and IVIG products

Authors: Carolina Romero, José María Díez, Rodrigo Gajardo

The persistent worsening of the COVID-19 pandemic demands greater efforts for epidemiological surveillance. Few studies have assessed the seroprevalence of anti-SARS-CoV-2 antibodies in the general population. These studies have generally had small sample sizes or been restricted to specific, well-defined individuals. Given that more than 1000 donors contribute to a plasma pool, the antibody profile of the pool could be considered a representation of the epidemiological status of the population at the time of donation.

Convalescent plasma treatment of severe COVID-19: a propensity score-matched control study

Authors: Sean T. H. Liu, Hung-Mo Lin, Ian Baine, Ania Wajnberg, Jeffrey P. Gumprecht, Farah Rahman, Denise Rodriguez, Pranai Tandon, Adel Bassily-Marcus, Jeffrey Bander, Charles Sanky, Amy Dupper, Allen Zheng, Freddy T. Nguyen, Fatima Amanat, Daniel Stadlbauer, Deena R. Altman, Benjamin K. Chen, Florian Krammer, Damodara Rao Mendu, Adolfo Firpo-Betancourt, Matthew A. Levin, Emilia Bagiella, Arturo Casadevall, Nicole M. Bouvier

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a new human disease with few effective treatments. Convalescent plasma, donated by persons who have recovered from COVID-19, is the acellular component of blood that contains antibodies, including those that specifically recognize SARS-CoV-2. These antibodies, when transfused into patients infected with SARS-CoV-2, are thought to exert an antiviral effect, suppressing virus replication before patients have mounted their own humoral immune responses. Virus-specific antibodies from recovered persons are often the first available therapy for an emerging infectious disease, a stopgap treatment while new antivirals and vaccines are being developed. This retrospective, propensity score-matched case-control study assessed the effectiveness of convalescent plasma therapy in 39 patients

with severe or life-threatening COVID-19 at The Mount Sinai Hospital in New York City. Oxygen requirements on day 14 after transfusion worsened in 17.9% of plasma recipients versus 28.2% of propensity score–matched controls who were hospitalized with COVID-19 (adjusted odds ratio (OR), 0.86; 95% confidence interval (CI), 0.75–0.98; chi-square test P value = 0.025). Survival also improved in plasma recipients (adjusted hazard ratio (HR), 0.34; 95% CI, 0.13–0.89; chi-square test P = 0.027). Convalescent plasma is potentially effective against COVID-19, but adequately powered, randomized controlled trials are needed.

Histologic Evidence of New Collagen Formulation Using Platelet Rich Plasma in Skin Rejuvenation: A Prospective Controlled Clinical Study

Authors: Ozlem Karabudak Abuaf, Hamza Yildiz, Hüseyin Baloglu, Memet Ersan Bilgili, Hasan Aktug Simsek, Bilal Dogan

Sections were stained with hematoxylin and eosin and Masson's thichrome stains. Areas in blue color spectrum in Masson's thichrome stained section were accepted as collagen rich (collagenous) area. The proportion of the blue stained area within the skin biopsy was measured by the Samba 4000 image analysis system (Samba Technologies, Meylan, France) for each skin biopsy pieces. In addition, at least 50% of blue stained collagenous areas were quantified in terms of blue staining intensity and these measurements were used to compare the induction effects of testing methods on collagen production. For collagen intensity measurements, target areas were randomly selected with the blue spectrum with an attention to yield minimum 5 mm² areas per case. This randomly selected blue spectrum stained collagenous areas of each case were submitted to optical density measurements.

Immuno-biological Rationale for the Use of Platelet-rich Donor Plasma for the Regional Treatment of Wounds

Authors: Corotkich N.N., Aralova M.V., Ostroushko A.P., Shipilova V.V.

There has recently been great interest in platelet growth factors. Universal mechanism of action, simplicity, low cost and maloinvazivnogo receiving expand their use in practical medicine. However, comorbidities and the technical difficulty of isolating platelets from autoplasm are the limiting factors for widespread adoption of the techniques in the daily work of doctors of most hospitals. The article listed the main drugs of platelets enriched plasma (pure platelet-rich plasma enriched with white blood cells and platelets blood plasma, pure platelet-enriched fibrin enriched with platelets, leukocytes and fibrin), the features, the conditions of their production and hardware by apheresis, and from the pool leykotrieny layers. The marked advantages of automatic separation of blood components, which minimizes the human factor in (avoiding manual labor), allows to distinguish the

platelets of high quality with little loss of hemoglobin and plasma, ensures quick and accurate obtaining of necessary blood components and the shelf life of platelets, the importance of timely delivery. The authors considered immune and biological aspects of the use of donor platelet concentrate.

Enzyme-labeled Antigen Method: Development and Application of the Novel Approach for Identifying Plasma Cells Locally Producing Disease-specific Antibodies in Inflammatory Lesions

Authors: Yasuyoshi Mizutani, Kazuya Shiogama, Takanori Onouchi, Kouhei Sakurai, Ken-ichi Inada, Yutaka Tsutsumi

In chronic inflammatory lesions of autoimmune and infectious diseases, plasma cells are frequently observed. Antigens recognized by antibodies produced by the plasma cells mostly remain unclear. A new technique identifying these corresponding antigens may give us a breakthrough for understanding the disease from a pathophysiological viewpoint, simply because the immunocytes are seen within the lesion. We have developed an enzyme-labeled antigen method for microscopic identification of the antigen recognized by specific antibodies locally produced in plasma cells in inflammatory lesions.

Improvement of cutaneous microcirculation by cold atmospheric plasma (CAP): Results of a controlled, prospective cohort study

Authors: Tobias Kisch^a, Andreas Helmke^b, Sophie Schleusser^a, Jungin Song^a, Eirini Liodaki^a, Felix Hagenstang^a, Peter Mailaender^a, Robert Kraemer^a

Cold atmospheric plasma (CAP) has proven its benefits in the reduction of various bacteria and fungi in both *in vitro* and *in vivo* studies. Moreover, CAP generated by dielectric barrier discharge (DBD) promoted wound healing *in vivo*. Charged particles, chemically reactive species (such as O₃, OH, H₂O₂, O, N_xO_y), ultraviolet radiation (UV-A and UV-B), strong oscillating electric fields as well as weak electric currents are produced by DBD operated in air. However, wound healing is a complex process, depending on nutrient and oxygen supply via cutaneous blood circulation. Therefore, this study examined the effects of CAP on cutaneous microcirculation in a prospective cohort setting.

Remote ischemic postconditioning as well as blood plasma from double-conditioned donor ameliorate reperfusion syndrome in skeletal muscle

Authors: Rastislav Burda, Miroslava Némethová, Jozef Burda, Radoslav Morochovič

The aim of this study was to verify the possibility of preparation and effectiveness of the use of blood plasma containing an effector of ischemic tolerance activated by applying two sublethal

stresses to a donor. As sublethal stresses, two periods of 20-minute hindlimb ischemia were used with a two-day interval between them. Active plasma was isolated six hours after the second hindlimb ischemia. The effectiveness of active plasma as well as remote postconditioning was tested after three hours of tourniquet-induced ischemia on the gastrocnemius muscle. The wet/dry ratio of gastrocnemius muscle (degree of tissue oedema), nitroblue tetrazolium reduction (tissue necrosis), and CatWalk test (hind limb functionality) were evaluated 24 h after the end of ischemia.

Regulation of plasma for fractionation in the United States

Authors: Mark Weinstein

Plasma for fractionation (PF) to make plasma derived medicinal products is in high demand, particularly in middle- and low-income countries. The World Health Organization (WHO), the Council of Europe (CoE), and most regulatory authorities globally, seek to develop national blood systems based on voluntary unpaid donations and to work towards the goal of self-sufficiency. Currently, however, commercial blood establishments in the United States and elsewhere supply at least 80% of the source plasma used in the world, which they obtain from paid donors. Here we review the regulations and standards of the United States Food and Drug Administration (FDA) and the voluntary standards of the Plasma Protein Therapeutic Association (PPTA) which ensure the safety and quality of PF, and the safety and health of the donor relative to the donation process.

A specific spectral signature of serum and plasma-derived extracellular vesicles for cancer screening

Authors: Christoph Krafft PhD^{a1} Konrad Wilhelm MD^{bc1} Anna Eremin MS^c Sigrun Nestel MS^d Nikolas von Bubnoff MD^{ef} Wolfgang Schultze-Seemann MD^b Juergen Popp PhD^a Irina Nazarenko PhD

In cancer, extracellular vesicles (EV) contribute to tumor progression by regulating local and systemic effects. Being released into body fluids, EV may be used in nanomedicine as a valuable source for diagnostic biomarkers. In this work, infrared and Raman spectroscopy were used for comprehensive comparative analysis of cancer versus non-cancer EV and patient screening. Two different EV fractions enriched in exosomes and microvesicles were isolated by differential centrifugation from serum and plasma of cancer and non-cancer patients and from serum and plasma of a healthy donor. The EV fractions were then subjected to drop-coating deposition and drying on calcium fluoride substrates.