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Curr Res Integr Med,
ISSN: 2529-797X, Volume 07

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Liposomes-based Immunoassay for the Detection of Cardiac Troponin I-A Gold-Standard Biomarker for the Diagnosis of Myocardial Infarction

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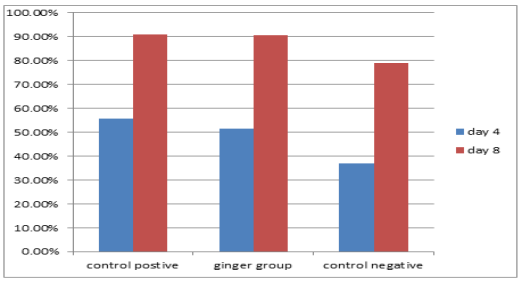
Statement of the problem: Wounds infection are very common which can range from mild to potentially fatal, current estimates indicate that nearly 6 million people suffer from chronic wounds worldwide specially in developing countries where most of the people suffer from an infected wound cannot afford to buy modern drugs, which are very high in costing and might have side effects therefor the plant roots are used in some parts of Sudan and other developing countries for wound healing however some of these plant not previously studied.

Aim of the study: to assess the antibacterial and wound healing activity of Zingiber officinale ethanolic (ginger) extract in wound infected albino rats and compare the effect of the plant against commercial reference drug against Staphylococcus aureus.

Methodology: an experimental study included fifteen swiss wistar albino rat, divided into three groups of five rats (Group 1 (wounded +infection, Group 2 wound +infection+ fusiderm ointment, Group 3 wound + infection +12% ethanol extract of Zingiber officinale with soft yellow paraffin), all results included microbial examination for bacterial count, histological examination done by Haematoxylin and Eosin stain and van Gieson for the presence of inflammatory cells and collagen and healing percentage measured by transparent ruler.

Finding: in vitro antimicrobial activity of the extract gave clear zones of inhibition on the standard Staphylococcus aureus, significant reduction of bacterial number observed in ginger treated group from.5×108cfu/ml to.5×102 cfu/ml on day 8 of dressing while the positive control group showed bacterial count reduction from.5×108cfu/ml to complete diminishing of bacterial infection. significant difference in the wound closure was observed in positive control group and ginger treatment group also showed faster wound healing with a percentage closed to positive control while the wound healing rate was slow and took more than 8 days in negative control, histological examination of granulated tissue showed more collagen fiber formation and reduction of inflammatory cell during the healing period, Conclusion: Zingiber officinale ethanolic extract exert antibacterial and wound healing capacity, this study established a good support to the use of plants in herbal medicine and as a base for the development of new drugs.



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Curr Res Integr Med,
ISSN: 2529-797X, Volume 07

New Resources from Timber Waste: Bioactive constituents obtained by “smart chain Extraction"

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Coniferous barks are known for high content in bioactive compounds with potential high bioactivities in several area. Timber industry is producing large amount of bark waste as result of wood cutting and preparation. In this paper an innovative extraction approach based on the sequential application of Supercritical CO_2 extraction, microwave or ultrasound assisted extraction with green solvents (water-based mixture with minimum amounts of ethanol) will be applied to Picea abies barks and wood, obtaining extracts enriched in bioactive secondary metabolites. Detailed analysis using LC-DAD-MSn GC-MS, NMR, FT-IR have been performed, and main constituents were identified and quantified on each extract. PiceasideG, piceaside H, taxifolin, taxifolin glucoside, trachelogenin, 7-Hydroxymatairesinol, 7-oxo matairesinol were the most abundant polar secondary metabolites. Volatile constituents extracted with microwave distillator were identified as eucalyptol, α and β pinene. More lipophylic constituents mostly extracted during the first step in CO_2 were dehydroabietic acid, cinnamic ester with fatty acids. Obtained fractions have been subjected to different bioassays related to antioxidant and metal chelating activity (DPPH, ABTS, CUPRAC, FRAP, MCA, PMB). Furthermore, inhibitory assays on enzymatic activities were performed namely acetylcholinesterase, butyrilcholinesterase, tyrosinase, amylase and glucosidase. Some extracts present very high antioxidant activity and significant tyrosinase effect thus being good candidate for topic application as cosmetic or pharmaceutical treatments for skin hyperpigmentation. Other fractions revealed significant inhibitory activity on cholinesterase. Thus, further studies are in progress to assay isolated compounds. The overall results showed the application of an innovative extractive approach based on green chemistry principles and combining different techniques. Obtained extracts demonstrated the opportunity to exploit timber industry waste as source of bioactive constituents.

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Effect of copper oxide Nanoparticles on Human Amyloid beta 1-42 peptide aggregation – a Preliminary Studies

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An undoubted challenge for modern biological physics, nanotechnology and medicine is to understand the mechanisms of the development of neurodegenerative diseases on the molecular level and to develop effective diagnostic methods and treatments. There is a chance that understanding the etiology of these diseases would provide opportunities to find a therapy that would effectively cure or even prevent the emergence of diseases. There are some premises [1,2] which suggest that some of the metal ions may influence the process of amyloid beta peptide (Aβ) oligomerization and fibrillization, which are thought to be responsible for the development of Alzheimer's disease. Disturbance of the zinc, iron and copper cations homeostasis was observed in the brain of Alzheimer's disease patients [3,4]. For this reasons it is important to investigate how the metal and metal oxide nanoparticles may influence the aggregation process of Aβ peptide. It is also interesting to compare how the size, shape and charge on the surface of nanoparticles affect the behavior of the Aβ peptide. First part of the studies included synthesis of copper oxide nanoparticles according to the published protocols [5]. Those nanoparticles were characterized using microscopic and spectroscopic techniques. UV-Vis spectroscopy confirmed the presence of plasmon resonance peak at around 250 nm, characteristic for copper oxide (II). The crystalline nature of CuO NPs was verified by the powder X-ray diffraction. Structural studies were conducted using atomic force microscopy and the average hydrodynamic size of the nanoparticles was measured by dynamic light scattering technique. The changes¬ in Aβ peptides structure in the presence of copper (II) oxide nanoparticles was monitored by the circular dichroism spectroscopy. Preliminary studies of the impact of copper oxide (II) nanoparticles of various size on human Aβ 1-42 peptides aggregation were carried out using thioflavin T fluorescence assay (see Figure 1).

This research has been founded by grant 2021/41/B/ST4/03807 from National Science Centre (Poland).

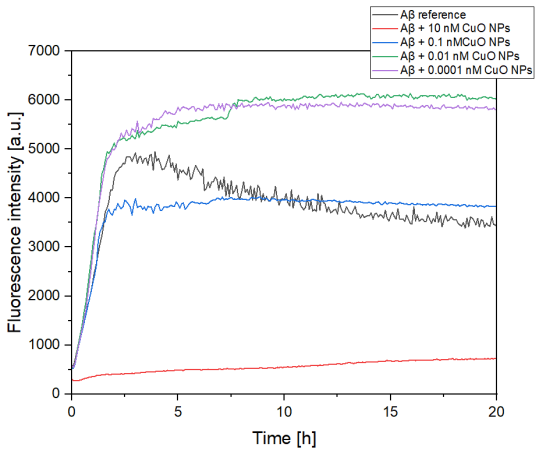

Figure 1. Thioflavin T fluorescence assay of amyloid beta 1-42 peptides in the presence of copper oxide nanoparticles

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Anti CD59 aptamer for Targeted Delivery of Gold Nanoparticles in cancer Therapeutics: An *in vitro* study

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Targeting nanoparticles to specific sites/cell types is seen as a way of preventing non-specific toxicity associated with their use. CD59, a cancer biomarker, is a membrane complement regulatory protein. Upregulation of complement inhibitory factors, such as CD59, is associated with tumour growth and progression as it allows cancer cells to evade complement surveillance (2). Targeting strategies have focused predominantly on monoclonal antibody's (Mab's) due to their high specificity and relative ease of conjugation (3). Batch to batch variations and high cost of Mab's incentivizes development of alternatives. Aptamers are short oligonucleotides capable of targeting agents via Systematic Evolution of Ligands by Exponential enrichment (SELEX). Interestingly gold nanoparticle (AuNP) use as a delivery vehicle for therapeutics have shown promise due to their unique properties(1). Within this work we raised an anti CD59 DNA aptamer and conjugated it to an AuNP surface through a bi-functional Poly(ethylene) glycol linker (AptAuNP). Replacing Mab's with aptamers has shown promise in recent years when combined with AuNP's for delivery of drugs to cells (4) as well as potentially as aptasensors (5). Data suggests that following exposure to AptAuNP HeLa cellss exhibited significantly increased toxicity compared to Mab conjugated nanoparticle (Mab-AuNP) at 10µg/ml and 20µg/ml, but no significant difference in toxicity was observed at 5µg/ml and 2.5µg/ml. 3D immunofluorescence microscopy analysis suggested that AptAuNP's accumulate within the intracellular space at higher concentrations whereas MaB-AuNP's remained outside the cells. AptAuNP's may be binding to CD59 contained within the Golgi disrupting it resulting in cell death (see figure 1). Our work suggests that an anti CD59 aptamer conjugated AuNP could be useful in targeting CD59 overexpressing cells. More work is required to establish the specific mechanism of cell death in this instance but demonstrates promise of an anti CD59 aptamer's use in alternative applications such as biomarker detection.

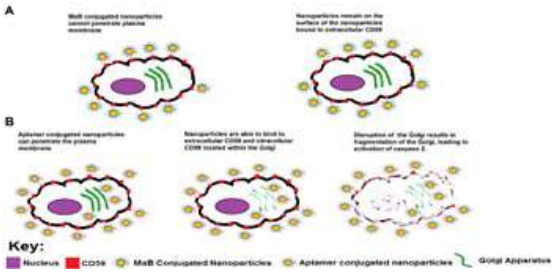

Figure 1: Aptamer conjugated nanoparticles have the potential to penetrate the lipid membrane and bind to intracellular CD59 contained within the Golgi. At a critical concentration, rate of penetration exceeds removal resulting in membrane destabilisation and cell death.