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Section Editor-in-Chief

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Message from the Section Editor-in-Chief

The Section on Applied Biosciences and Bioengineering encourages multidisciplinary research in the field of novel biosciences and biological engineering applications. It spans the full range of bioengineering types, clinical engineering, cardiac bioengineering, neural engineering, system modeling, biosignal processing, health informatics, bioinformatics, bioprocess engineering, biotechnology, biosensors, biomechanics, biorobotics, cardiopulmonary systems engineering, fermentation technology, food technology, and microbiology. The main focus is on novel developments and applications in societally relevant themes. Applied Sciences in general and this Section on Applied Biosciences and Bioengineering in particular offers high-quality peer review followed by a rapid publication decision.

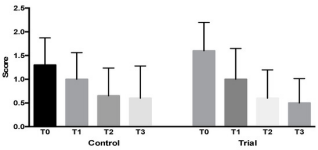
Featured Papers

DOI:10.3390/app12062800

Domiciliary Use of Chlorhexidine vs. Postbiotic Gels in Patients with Peri-Implant Mucositis: A Split-Mouth Randomized Clinical Trial

Authors: Andrea Butera, Maurizio Pascadopoli, Matteo Pellegrini, Simone Gallo, Paolo Zampetti, Giada Cuggia and Andrea Scribante

Abstract: Peri-implant mucositis is a pathological condition characterized by an inflammatory process in the peri-implant soft tissues. Progression to peri-implantitis takes place in case of peri-implant bone resorption. Recently, an aid for non-surgical treatment by mechanical debridement (SRP) has been identified in probiotics. As there are no recent studies regarding their use for peri-implant mucositis, the aim of this study was to test a new postbiotic gel for this clinical condition. A split-mouth randomized clinical trial was performed. Twenty patients undergoing SRP were randomly assigned to two treatments based on the following oral gels: chlorhexidine-based Curasept Periodontal Gel (Group 1) and postbiotic-based Biorepair Parodontgel Intensive (Group 2). At baseline (T0) and after three (T1) and six (T2) months, the following peri-implant mucositis indexes were recorded: Probing Pocket Depth (PPD), Plaque Index (PI), Gingival Bleeding Index (GBI), Bleeding Score (BS), Marginal Mucosal Condition (MMC). A significant decrease is reported for both postbiotic and chlorhexidine for all peri-implant mucositis indices studied. Quite the opposite, no significant variation was present in intergroup comparisons. Greater improvements for BS, GBI and MMC inflammatory indices of the postbiotic gel compared to chlorhexidine suggest the importance of further studies to investigate the relevance of the product alone.

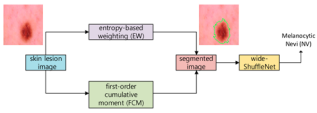


DOI:10.3390/app12052677

Multiclass Skin Lesion Classification Using a Novel Lightweight Deep Learning Framework for Smart Healthcare

Authors: Long Hoang, Suk-Hwan Lee, Eung-Joo Lee and Ki-Ryong Kwon

Abstract: Skin lesion classification has recently attracted significant attention. Regularly, physicians take much time to analyze the skin lesions because of the high similarity between these skin lesions. An automated classification system using deep learning can assist physicians in detecting the skin lesion type and enhance the patient's health. The skin lesion classification has become a hot research area with the evolution of deep learning architecture. In this study, we propose a novel method using a new segmentation approach and wide-ShuffleNet for skin lesion classification. First, we calculate the entropy-based weighting and first-order cumulative moment (EW-FCM) of the skin image. These values are used to separate the lesion from the background. Then, we input the segmentation result into a new deep learning structure wide-ShuffleNet and determine the skin lesion type. We evaluated the proposed method on two large datasets: HAM10000 and ISIC2019. Based on our numerical results, EW-FCM and wide-ShuffleNet achieve more accuracy than state-of-the-art approaches. Additionally, the proposed method is superior lightweight and suitable with a small system like a mobile healthcare system.

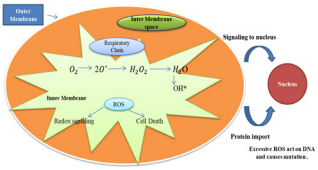


DOI:10.3390/app12199737

Antibacterial Applications of Low-Pressure Plasma on Degradation of Multidrug Resistant V. cholera

Authors: Nimra Manzoor, Irfan Qasim, Muhammad Ijaz Khan, Muhammad Waqar Ahmed, Kamel Guedri, Omar T. Bafakeeh, El Sayed Mohamed Tag-Eldin and Ahmed M. Galal

Abstract: The existence of Vibrio cholera (V. cholera) is a major health problem in many parts of the world; therefore, the treatments of V. cholera have always remained necessary for public safety, health, and environmental protection. In the last few decades, plasma discharges have proven to be a novel technique of sterilization against infectious bacteria such as V. cholera. In this research, a low-pressure plasma (LPP) technique has been introduced for the degradation of multidrug resistant V. cholera. The V. cholera strains with 107 CFUs (colony-forming units) were treated by low-pressure plasma, with and without H2O2 injection into the sterilization chamber, to investigate and report the adverse effects of plasma on V. cholera. The results demonstrated that plasma treatment has significant effects on the degradation of V. cholera in the presence of H2O2 vapors inside the plasma sterilization chamber. The time-course study of the bactericidal effects revealed that there is no regeneration or increase in the number of V. cholera colonies after plasma treatment.

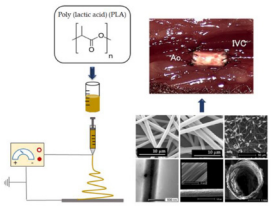


DOI:10.3390/app12063192

Poly(lactic acid)-Based Electrospun Fibrous Structures for Biomedical Applications

Authors: Homa Maleki, Bahareh Azimi, Saeed Ismaeilimoghadam and Serena Danti

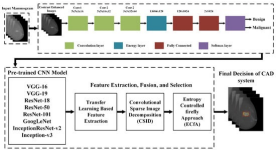
Abstract: Poly(lactic acid)(PLA) is an aliphatic polyester that can be derived from natural and renewable resources. Owing to favorable features, such as biocompatibility, biodegradability, good thermal and mechanical performance, and processability, PLA has been considered as one of the most promising biopolymers for biomedical applications. Particularly, electrospun PLA nanofibers with distinguishing characteristics, such as similarity to the extracellular matrix, large specific surface area and high porosity with small pore size and tunable mechanical properties for diverse applications, have recently given rise to advanced spillovers in the medical area. A variety of PLA-based nanofibrous structures have been explored for biomedical purposes, such as wound dressing, drug delivery systems, and tissue engineering scaffolds. This review highlights the recent advances in electrospinning of PLA-based structures for biomedical applications. It also gives a comprehensive discussion about the promising approaches suggested for optimizing the electrospun PLA nanofibrous structures towards the design of specific medical devices with appropriate physical, mechanical and biological functions.



DOI:10.3390/app12073273

A Breast Cancer Detection and Classification towards Computer-Aided Diagnosis Using Digital Mammography in Early Stages

Authors: Sarmad Maqsood, Robertas Damaševi ˇcius and Rytis Maskeliūnas



Abstract: Breast cancer is a major research area in the medical image analysis field; it is a dangerous disease and a major cause of death among women. Early and accurate diagnosis of breast cancer based on digital mammograms can enhance disease detection accuracy. Medical imagery must be detected, segmented, and classified for computer-aided diagnosis (CAD) systems to help the radiologists for accurate diagnosis of breast lesions. Therefore, an accurate breast cancer detection and classification approach is proposed for screening of mammograms. In this paper, we present a deep learning system that can identify breast cancer in mammogram screening images using an "end-to-end" training strategy that efficiently uses mammography images for computer-aided breast cancer recognition in the early stages. First, the proposed approach implements the modified contrast enhancement method in order to refine the detail of edges from the source mammogram images. Next, the transferable texture convolutional neural network (TTCNN) is presented to enhance the performance of classification and the energy layer is integrated in this work to extract the texture features from the convolutional layer. The proposed approach consists of only three layers of convolution and one energy layer, rather than the pooling layer. In the third stage, we analyzed the performance of TTCNN based on deep features of convolutional neural network models (InceptionResNet-V2, Inception-V3, VGG-16, VGG-19, GoogLeNet, ResNet-18, ResNet-50, and ResNet-101). The deep features are extracted by determining the best layers which enhance the classification accuracy. In the fourth stage, by using the convolutional sparse image decomposition approach, all the extracted feature vectors are fused and, finally, the best features are selected by using the entropy controlled firefly method. The proposed approach employed on DDSM, INbreast, and MIAS datasets and attained the average accuracy of 97.49%. Our proposed transferable texture CNN-based method for classifying screening mammograms has outperformed prior methods. These findings demonstrate that automatic deep learning algorithms can be easily trained to achieve high accuracy in diverse mammography images, and can offer great potential to improve clinical tools to minimize false positive and false negative screening mammography results.

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Sports Performance and Health
Guest Editor: Prof. Dr. Matej Supej

Biomedical Optics: From Methods to Applications
Guest Editor: Dr. Vladislav Toronov

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