

25th Euro Dentistry Congress

September 20-21, 2017 Dublin, Ireland

Antioxidant and antimicrobial activity of lignin-based hydrogels for drug release applications in dental bone regeneration

Abla Alzagameem

Brandenburg University of Technology, Germany

Lignins are intensively studied regarding their potential as bio-based sustainable drug release material. Thus, various drugs have been encapsulated and tested regarding their release kinetics including antimicrobial substances. Regarding their availability, lignins are byproducts of the paper and pulping industry. They are available in huge amounts in form of so called black liquor, mainly produced via Kraft-pulping. However, applications of technical lignins are still limited to low-quality products due to the chemical and structural inhomogeneity. Thus, the first goal is to develop an appropriate approach for lignin extraction and purification. The purified lignins are then studied with special focus on antioxidant and bioactivity properties depending on biomass source and pulping process. In collaboration with the cold chain management group at the University Bonn, lignin-based polymers are developed for biomedical applications such as drug release for dental tissue regeneration. The lignin is extracted from black liquor via acidic precipitation, monitored by thin layer chromatography (TLC). Purification of kraft lignin was carried out by selective extraction. Lignins are characterized by FTIR, UV-Vis, ³¹P NMR, SEC, XRD and microscopy (SEM). Antioxidant activity is studied using a DPPH assay. The phenol content of lignins is determined by the Folin–Ciocalteu Micro method. The results of both methods confirm the antioxidant ability of lignins reported in literature. In addition, it could be shown that the antioxidant activity of the lignin fractions strongly depends on the source of the raw material (black liquor). Here, differences in biomass feedstock used for the kraft pulping process could be the reason for this observation which still is under investigation. Bioactivity (antibacterial and antifungal) of extracted lignins is accomplished by disk diffusion method and solution shake method. The antimicrobial activity is tested by modifying the method ISO 22196 (2007), a quantitative method to determine the level of antimicrobial activity of polymer surfaces. Polymer composites based on lignin and hydroxypropyl methylcellulose (HPMC) were prepared and tested regarding their swelling behavior and mechanical stability.

Notes: