RD&T – RESEARCH, DEVELOPMENT & TECHNOLOGY IN HEALTH

512

PHOTOPOLYMERIZABLE HYDROGELS CONTAINING DRUG-LOADED PARTICLES FOR BIOMEDICAL APPLICATIONS

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Introduction: Photopolymerizable hydrogels have been extensively investigated for several biomedical applications due to their ability to be prepared in situ in a short period of time, and to provide a great control over the spatial and temporal formation of the hydrogel.

Objective: To synthesize and characterize a novel photopolymerizable hydrogel system containing spatially organized drug-loaded particles for applications as drug delivery carriers.

Methods: Hydrogels were prepared through the layer-by-layer ultraviolet (UV) irradiation of a polyethylene glycol photosensitive solution containing alginate particles loaded with a model drug (nitrofurazone). The drug-loaded particles were incorporated into the middle layer of hydrogels and their location accessed by micro-computed tomography. The effects of the number of alginate particles in the hydrogel properties were investigated by mechanical, water absorption and in vitro degradation tests. The release profiles of drug-loaded particles, either alone or incorporated within the hydrogels, were determined in phosphate buffer solution for comparison.

Results: Data show that the number of alginate particles strongly determines the mechanical and in vitro degradation properties of hydrogels. The incorporation of high numbers of particles within the hydrogel limits the adhesion between adjacent layers during the polymerization, leading to a more fragile structure with lower mechanical properties and higher weight loss. The incorporation of drug-loaded particles within the hydrogels provides a better control over the drug release, eliminating the burst release effect.

Conclusions: The developed photopolymerizable hydrogels provide an effective system to tailor and extend the release of drugs, exhibiting promising properties for drug delivery applications.

Descriptors: Photopolymerizable hydrogels. Polyethylene glycol. Alginate particles. Nitrofurazone. Drug delivery.

513

ANALYSIS OF THE ALTERATIONS INDUCED BY WORKING MEMORY TASKS IN THE ELECTROENCEPHALOGRAM

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Introduction: The working memory (WM) is an essential cognitive function with limited capability that allows the temporary storage and manipulation of information used in complex cognitive tasks. The Fluid Intelligence (FI) is the ability to engage and respond to new situations, regardless of previous knowledge.

Objective: Assess the brain areas activated during the execution of WM and FI tasks, determining the variations in quantitative electroencephalogram (qEEG).

Methods: Each participant was submitted to an EEG. During the EEG two tests were administered: working memory (WISC Digit Span Subtest - Direct and Reverse Order and FI task (Raven Matrices). The EEG's activity was analyzed in different times of each task.

Results: There were statistically significant differences in the comparison between the beginning and the end of both WM's tasks, as well as in the FI, and in the relationship of these tests to the baseline record. In a more specific analysis, we found frontal and parietal areas to be activated during the WM tasks and fronto-parietal network in IF tests, as well as a decrease in EEG power in the right parietal alpha.

Conclusions: During WM tasks prefrontal and parietal regions are exacerbated, while the IF test causes the activation of a fronto-parietal network. The qEEG was useful in the evaluation of electroencephalographic changes in cognitive tests for this sample. However, the possible association with other types of tests may supplement data in terms of the results accuracy and reproducibility of tasks.

Descriptors: Working Memory. Fluid Intelligence. Digit Span. RAVEN Matrices. qEEG.

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