Albupad project: Protein based biomaterials for the delivery of anti-tumoral active ingredients

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ABSTRACT:

The Albupad project is about the development of protein based biomaterials showing plastic behaviors and tunable features (shape, size, porosity…). These materials are obtained through the salt assisted compaction of albumin. They can be loaded with active ingredients to create implantable devices for a drug delivery purpose. The Albupad materials can outperform and replace synthetic implantable polymers by providing a higher biocompatibility and an easier green production process.

The biocompatibility of unloaded human albumin-based implants has already been demonstrated *in vivo*, in a humanized mouse model. The study presented here focuses on the adaptation of the Albupad technology for the delivery of anti-tumor molecules. Doxorubicin, a DNA intercalant, is a highly suitable active ingredient for this type of application [1]. Indeed, this molecule represents a reference treatment for several types of cancer such as breast or esophagus cancer. However, this active principle generates a strong systemic toxicity and suffers from a lack of specificity [2]. Thus, the development of localized delivery systems would reduce the risks related to doxorubin and increase the efficiency of these treatments. Doxorubicin loaded materials were formulated and characterized. The release kinetics of doxorubicin was studied as a function of its loading rate and the material formulation process. Two different delivery profiles were identified, one with moderate flux and long-term release (>30 days) and the other with a higher flux and shorter release time (≈ 30 days). The study of direct and indirect cytotoxicity of doxorubicin-loaded materials was performed on two human cancerous cells strains (HCT-116 and MCF-7). The efficiency of the materials was found similar to the one of free doxorubicin, demonstrating that the release of active doxorubicin is allowed by our system.

Finally, an *in vivo* study aiming to demonstrate the therapeutic efficiency of peri-tumoral implants is underway on a mouse model with orthotopic tumors.

Keywords: drug delivery, albumin, implantable device.

References

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