BIO_09 - Production of monoclonal antibodies via gold nanoparticles for induction of murine immune response

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Introduction: Recent studies have drawn attention to the use of gold nanoparticles (AuNPs) in immunobiological production. Ongoing efforts in the effective production of peptide-derived monoclonal antibodies (mAbs) have shown the trend in developing target-specific systems, in which the antigen is conjugated to AuNPs for targeted delivery to antigen-presenting cells (APCs). Several studies describe them as promising vehicles in the immunotherapy of diseases such as cancer, due to their ability to stimulate innate immunity. Thus, they play an interesting dual role, acting as adjuvant and carrier of the antigen, being able to reduce the toxicity of the system and increase its immunogenic activity, promoting significant antigen-specific responses, without the need for traditional adjuvants.

Objective: Thus , the study aims to use AuNps as carriers of peptides and as adjuvants as an initial platform for production of anti-cancer monoclonal antibodies.

Methodology: Based on this, a suitable medium was prepared for exposure and binding of peptides, previously produced to AuNps for murine immune response induction. For this, functionalizations of 900µl of AuNps in contact with 100µl of colorectal cancer marker peptides were performed, under constant magnetic stirring, 24 hours before each inoculation. After functionalization, BALB/c mice were immunized with the nanosystem in ten doses at 15-day intervals each. Serum samples were obtained after each immunization and subjected to ELISA (Enzyme-Linked Immunosorbent Assay) to evaluate the immune response, a control group was immunized only with the peptide in 0.01% PBS. The spleen was macerated under nylon compression to obtain B lymphocytes, which were fused to myeloma cells to obtain hybridomas. These were cultured in selective HAT (hypoxanthine-aminopterin-thiamine) medium and the supernatant was submitted to ELISA to determine the wells containing polyclonal and monoclonal antibody producing cells and mAbs were purified in two steps and the positive clone expanded for large-scale production.

Results: The final product was concentrated and obtained yield equal to 1.3mg/mL of pAbs and 1.14mg/mL of mAbs.

Conclusion: The study demonstrated the efficiency of the system in the production of the proposed immunobiological, since several challenges were encountered in the production without the use of the nano-system, preventing the production of mAbs through immunization with the peptides alone. This project serves as a basis for further production using AuNps/Peptides based nanosystems as the primary platform.

Keywords: Metal nanoparticles; Monoclonal Antibodies; Immune response