

List of Supervisors and Projects in China for
Summer Research Program 2019

1. Dr. Qianming Chen

Project Title: The study of elaborate regulation of PA28 γ protein in OSCC

Project description:

Our preliminary results suggested PA28 γ overexpression is associated with adverse prognosis in patients with oral squamous cell carcinoma (OSCC). The aberrant expression of PA28 γ contributed to the metastasis and progression of OSCC. We hypothesize that disturb PA28 γ could interfered Tumor-associated macrophages (TAM) and tumor microenvironment remodeling and block metastasis in OSCC. But the elaborate regulation mechanism of PA28 γ protein in the tumor microenvironment of OSCC is still unknown. This study will figure out the elaborate regulation mechanism of PA28 γ protein in the tumor microenvironment of OSCC.

Objectives: Ascertain the elaborate regulation mechanism of PA28 γ protein in the tumor microenvironment of OSCC.

Hypothesis: Disturb PA28 γ could interfered TAM and tumor microenvironment remodeling to effect metastasis in OSCC.

Rationale: We have found PA28 γ promotes oral squamous cell carcinoma development and progression and is suggested to play a role in tumor angiogenesis, it acts as a dual regulator of IL-6 and CCL2 and contributes to tumor angiogenesis in OSCC, but the molecular mechanisms have not been investigated.

Experimental outline:

1. Adopting pull down technology to obtain a mixture of proteins interacting with PA28 γ , then identifying the interacting proteins by mass spectrometry;
2. Identifying the modification mode and modification site of PA28 γ protein by mass spectrometry; using small molecule inhibitor or siRNA interference or site-directed mutation experiment to detect which post-translational modifications play a role in tumor-associated immune regulation via co-culture system.

According to functional analysis, analyzing the candidate target proteases that regulate PA28 γ post-translational modification, Co-IP technology will be employed to validation and identification of target proteases for interaction with PA28 γ , revealing the active form of PA28 γ in the regulation of tumor-associated immunity.

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2. Dr. Ling Ye

Project Title: Cell response of dental pulp cells (DPCs) on hydroxyapatite decorated PCL microspheres.

Project description:

Background : Pulp capping is an important technique to preserve vital pulp, which is to prevent dental pulp from deteriorating when the dental pulp inflammation is local and/or irreversible. The mostly applied materials for pulp capping in clinic practice now are calcium hydroxide (CaOH₂) or MTA, due to their favorable outcome by protecting pulp from noxious agents and stimulating dental pulp cells (DPCs) to form reparative dentin. However, CaOH₂ has significant disadvantages like low compressive strength; MTA can lead to tooth discoloration and take a long time to set completely. Therefore, studies should be conducted to find capping materials with better property in mechanical strength, esthetics, friendly-operation and bionics.

Rationale: The decoration of hydroxyapatite would mimic the inorganic component of natural tooth.

Impact: Hydroxyapatite decoration on porous biomaterials could increase the cure rates and reduce the burden of diseases.

Hypothesis: hydroxyapatite decorated PCL microspheres enhance the adhesion, proliferation, and mineralization of dental pulp cells.

Objective: Evaluate the application potential of hydroxyapatite-decorated PCL microsphere in dental pulp capping treatment.

Methods: PCL microspheres will be fabricated via water/oil/water emulsion polymerization. Different concentrations of porogen will be used to control the pore sizes. The morphology, porosity, and pore sizes will be measured by scanning electron microscope (SEM), dynamic light scattering (DLS). To deposit hydroxyapatite, PCL microspheres will be coated by polydopamine (PDA) in advance, followed by the simulated body fluid (SBF) for several days. The chemical composition of hydroxyapatite will be identified by X-ray photoelectron spectroscopy (XPS) and X-ray diffraction (XRD). Dental pulp cells will be used to evaluate the cell response. DPCs will be isolated from human third molars and cultured in vitro. After seeding for 24 hours, the cells will be observed by fluorescence staining of cytoskeleton. The cell proliferation will be measured by cell counting kit-8 (CCK-8) at day 1, 3, 5. To evaluate the mineralization ability, the alkaline phosphatase (ALP), calcium nodes, and collagen secretion will be assayed by staining and quantitation.

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