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Organoid Culture and Its Importance

Aditi Banerjee*

Department of Pediatrics, University of Maryland School of Medicine, USA

***Corresponding author:** Aditi Banerjee, Department of Pediatrics, 655 Bressler Research Building, University of Maryland School of Medicine, Baltimore, MD 21201, Maryland, USA, contact no: 410-706-8778, E-mail: abanerjee@peds.umaryland.edu

Commentary

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Human stem cell derived epithelial organoids or three-dimensional (3D) organoid culture is a major technological breakthrough for both basic biology and clinical applications. This culture condition has allowed the development of an ex-vivo primary tissue expansion from normal and diseased tissue of mouse and human as well. This technique can be used for high throughput drug screening to identify gene-drug associations that may facilitate personalized therapy [1]. In addition, this model can be used to explore the regulation of several in-vivo biological processes including intestinal stem cell-renewal, stem cell/niche functions, and tissue responses to drugs, mutation, or damage. Moreover, long-term expanded organoid cultures may be applicable for the therapy of gastrointestinal stem cell in preclinical animal or human models and in studies on colorectal tumor stem cells, and other cells [2]. Indeed, these models deliberately reduce the exceptional costs and address the paucity of new drug approvals for epithelial translational medicine.

In our studies, we developed mouse intestinal organoids to measure the efficacy of anti-carcinogenic of andrographolide, a bicyclic diterpenoid lactone, purified from Andrographis paniculata, an herb from South Asia used for numerous maladies. We found that andrographolide was less toxic in normal organoids which were isolated from mouse intestine compared to colon cancer cells [3]. Colon cancer is the third leading cause of cancer death in the United States [4]. We recently developed organoids according to a standard protocol (Figure 1) from the tissue of normal human epithelium [5]. Tissues were taken with informed consent and the study was approved by an IRB at University of Maryland School of Medicine. We have found that the variability in the isolation of organoids in human are greater than mouse which is consistent with earlier studies [6]. We anticipate that this long term expandable ex-vivo model will allow us to investigate the efficacy of AGP in colon tumor organoids and its mechanism for personalized treatment of colon cancer.

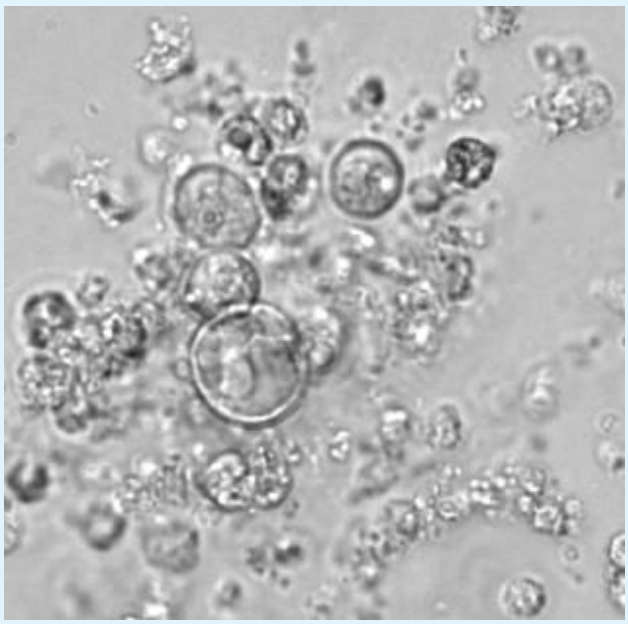

Figure 1: Human colon organoid. Tissues were obtained from The University of Maryland School of Medicine with informed consent and the study was approved by the ethical committee. The isolation of healthy crypts was performed essentially as described by Sato et al [5].

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