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# Cellular Oncology and Personalized Medicine: Tailoring Cancer Treatments

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## Abstract

Pancreatic cancer is indeed one of the most challenging types of cancer, primarily because it is often diagnosed at an advanced stage when treatment options are limited, and it has a poor prognosis. The passage you've provided outlines a research project aimed at investigating the role of microRNA 138 (miR-138-5p) in the regulation of pancreatic cancer cell growth and its potential as a therapeutic target. Let's break down the key points: The passage acknowledges the dismal prognosis associated with pancreatic cancer, highlighting that limited progress has been made in its diagnosis and treatment over recent decades. This emphasizes the urgency and importance of research in this area. The primary objective of this study is to understand the role of miR-138-5p in the context of pancreatic cancer. MicroRNAs are small RNA molecules that can influence gene expression, and investigating their role in cancer is a common area of research.

**Keywords:** Cancer • Cellular oncology • Pancreatic cancer

## Introduction

Cellular oncology, also known as cancer cell biology or oncologic cellular biology, is a subfield of oncology (the study of cancer) that focuses on understanding the cellular and molecular aspects of cancer development, progression, and treatment. It examines the abnormal behaviours and characteristics of cancer cells at the cellular and molecular levels. Cellular oncology plays a crucial role in advancing our understanding of cancer and developing targeted therapies. Here are some key aspects of cellular oncology: Cellular oncology investigates how cancer cells differ from normal cells in terms of their growth, division, and behaviour. This includes studying the mechanisms that drive uncontrolled cell proliferation, evasion of the immune system, invasion of nearby tissues, and metastasis. Researchers in this field explore the intricate molecular signalling pathways that are disrupted or dysregulated in cancer cells. Understanding these pathways can reveal potential targets for drug development. Cellular oncology delves into the genetic and epigenetic changes that occur in cancer cells. Mutations, gene amplifications, and alterations in DNA methylation patterns are among the genetic and epigenetic events studied [1-3].

## Literature Review

The interactions between cancer cells and their surrounding microenvironment, including stromal cells, blood vessels, and immune cells, are a focus of study. The tumor microenvironment can influence cancer progression and response to therapy. To address the limitations of current photo thermal sensitizers, biocompatible polymer Nan containers loaded with magnesium phthalocyanine (Pht-Mg) were synthesized and characterized as effective photo thermal sensitizers. In 2D cell culture, these nanocontainers were effective in inducing specific destruction of cancer cells when exposed to near IR light. However, their efficacy decreased by more than ten times in the transition from 2D to 3D cell culture. To improve the quality of observational studies, researchers can use rigorous study designs, such as prospective cohort studies or randomized controlled trials, to minimize the impact of confounding, selection bias, and measurement bias. They can also use advanced statistical techniques, such as propensity score matching or instrumental variable analysis, to adjust for confounding and reduce bias [4].

### Quantifying miR-138-5p expression in pancreatic cancer

To effectively diffuse inside solid tumors and penetrate the cancer cells through physical barriers, therapeutic agents need to bypass the intercellular contacts. One promising approach to opening up cell contacts is through the use of junction opener (JO) proteins derived from human adenovirus serotype. The activation of MAP-kinases triggers transient trans-differentiation of epithelial cells, which reduces the expression of adhesion and blocking cell contact proteins, thereby enabling the diffusion of drugs inside the cancer cells. If the study finds that miR-138-5p has a significant role in driving pancreatic cancer cell growth and if ways to target it effectively can be developed, this could have important implications for the development of novel therapeutic approaches for pancreatic cancer. The study initially used reverse transcription-polymerase chain reaction (RT-PCR) to analyse the expression levels of miR-138-5p in various pancreatic cancer cell lines and primary human pancreatic cancer samples. This step helps assess whether miR-138-5p expression is altered in pancreatic cancer. After exogenous over-expression of miR-138-5p in Capan-2 cells, the study assessed its effect on cell proliferation using an in vitro propidium iodide fluorescence assay. This assay can provide insights into whether miR-138-5p influences the rate of cell growth. To investigate the in vivo effects of miR-138-5p on tumor growth, Capan-2 cells with exogenous miR-138-5p over-expression were transplanted into nude mice. This approach allows researchers to observe how miR-138-5p affects the growth of pancreatic cancer tumors in a living organism [5,6].

## Discussion

The use of JO proteins to enhance drug delivery to tumors has been extensively demonstrated for antibodies and chemotherapy drugs, but their effect on nanostructure delivery is poorly understood. Studies have shown that JO significantly increases the mass tumor accumulation of 35 nm but not 120 nm gold nanoparticles, and significantly enhances the efficacy of liposomes loaded with doxorubicin. The study focuses on determining whether miR-138-5p plays a role in regulating the growth of pancreatic cancer cells. This involves studying whether the microRNA promotes or inhibits the proliferation of cancer cells. The research project also aims to evaluate whether miR-138-5p could serve as a potential therapeutic target. If miR-138-5p is found to be involved in promoting cancer cell growth, targeting it with therapies or interventions could be explored as a strategy to slow down or inhibit tumor progression.

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## Conclusion

The use of biocompatible polymer nanoparticles loaded with magnesium phthalocyanine (PLGA/Pht-Mg) as photo thermal sensitizers has shown promise in non-invasive photo thermal treatment (PTT) for cancer. However, the limited penetration of sensitizers into solid tumours of epithelial origin with tight cellular connections has been a challenge for PTT. The combination of PLGA/Pht-Mg nanoparticles with an intersection opener protein JO-4 has been found to significantly enhance the efficiency of nanoparticle penetration into tumours and improve the efficacy of PTT in both 3D and 2D cell cultures. Further research in this area could lead to the development of more effective non-invasive cancer treatments.

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## Conflict of Interest

None.

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