

- Wilson J.S., Pirola R.C., Apte M.V. 2014. Stars and stripes in pancreatic cancer: Role of stellate cells and stroma in cancer progression. *Front Physiol.* V. 5. P. 52.
- Wu M., Cao M., He Y., Liu Y., Yang C., Du Y., Wang W., Gao F. 2015. A novel role of low molecular weight hyaluronan in breast cancer metastasis. *FASEB J.* V. 29. P. 1290.
- Yamamoto G., Taura K., Iwaisako K., Asagiri M., Ito S., Koyama Y., Tanabe K., Iguchi K., Satoh M., Nishio T., Okuda Y., Ikeno Y., Yoshino K., Seo S., Hatano E., Uemoto S. 2017. Pancreatic stellate cells have distinct characteristics from hepatic stellate cells and are not the unique origin of collagen-producing cells in the pancreas. *Pancreas.* V. 46. P. 1141.
- Yoshida G.J. 2020. Regulation of heterogeneous cancer-associated fibroblasts: The molecular pathology of activated signaling pathways. *J. Exp. Clin. Cancer Res.* V. 39. P.112.
- Yoshida G.J., Azuma A., Miura Y., Orimo A. 2019. Activated fibroblast program orchestrates tumor initiation and progression; molecular mechanisms and the associated therapeutic strategies. *Int. J. Mol. Sci.* V. 20. P. 2256.

## The Role of Activated Stromal Cells in the Development of Pancreatic Ductal Adenocarcinoma and Therapeutic Approaches to Stroma Remodeling

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Progress in the treatment of pancreatic cancer remains very small and according to forecasts, PDAC (pancreatic ductal adenocarcinoma) will become the second leading cause of cancer death in Western countries over the next decade. Traditional cytotoxic chemotherapy is the modern standard of treatment for metastatic PDAC. The results of studies of the epithelial and stromal components showed that the dense fibrous stroma of the tumor plays an active role in the development of PDAC. There is accumulating evidence that the activated stroma contributes to the progression of the tumor. In a short review, we will describe the current understanding of the role of activated tumor stroma cells in the development of PDAC and the current state of research aimed at creating new therapeutic strategies for stromal ablation and stroma remodeling.

**Keywords:** pancreatic ductal adenocarcinoma, activated tumor stroma cells, desmoplasia