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Carcinogenesis, cell differentiation, photodynamic therapy



Research topics

The research efforts of the group focus on genes and molecular mechanisms involved in

- 1) fate determination in multipotent haematopoietic and neural cells and terminal differentiation of haematopoietic, neural and myogenic cells;
- 2) malignant transformation of haematopoietic cells, melanocytes, nephrogenic blastema and lung cells;
- 3) apoptosis induced by photoactivation of specific porphyrins;
- 4) epithelial to mesenchymal and mesenchymal to epithelial transitions.

In studies on cell fate determination, differentiation and malignant transformation of haematopoietic and neural cells (collaboration with the Institute of Anatomy, Prague), *c-myb* and *v-myb* genes are used as tools to modulate development of avian cells and tissues. In studies on the nephrogenic blastema transformation and lung tumour formation, MAV retroviruses serve as tumour inducers in experimental chicks. Porphyrin derivatives synthesized by the cooperating group (Institute of Chemical Technology, Prague) are used for experiments with targeted drug delivery and induction of cell death in cancer cells and tissues. Finally, genes of the *egr* family serve as tools to affect epithelial and mesenchymal cell phenotypes.

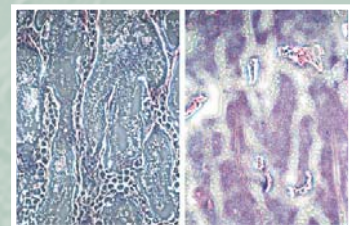
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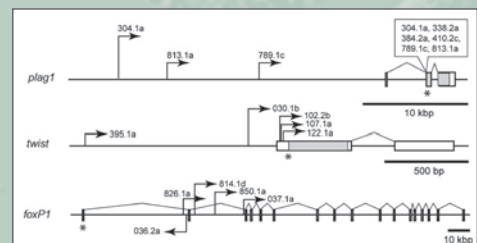
Selected recent papers

1. Pajer P, Pečenka V, Králová J, Karafiát V, Průková D, Zemanová Z, Kodet R, Dvořák M. Identification of potential human oncogenes by mapping the common viral integration sites in avian nephroblastoma. **Cancer Res.** 2006;66:78-86.
2. Karafiát V, Dvorakova M, Pajer P, Cermak V, Dvorak M. The melanocyte fate in neural crest is triggered by Myb proteins through activation of c-kit. **Cell Mol Life Sci.** 2007;64:2975-2984.
3. Bartunek P, Karafiát V, Bartunkova J, Pajer P, Dvorakova M, Kralova J, Zenke M, Dvorak M. Impact of chicken thrombopoietin and its receptor c-Mpl on hematopoietic cell development. **Exp Hematol.** 2008;36:495-505.
4. Kaspar P, Dvorak M. Involvement of phosphatidylserine externalization in the down-regulation of c-myc expression in differentiating C2C12 cells. **Differentiation.** 2008;76:245-252.
5. Kralova J, Dvorak M, Koc M, Kral V. p38 MAPK plays an essential role in apoptosis induced by photoactivation of a novel ethylene glycol porphyrin derivative. **Oncogene.** 2008;27:3010-3020.
6. Kralova J, Bríza T, Moserova I, Dolensky B, Vašek P, Poučkova P, Kejik Z, Kaplanek R, Martásek P, Dvořák M, Kral V. Glycol porphyrin derivatives as potent photodynamic inducers of apoptosis in tumor cells. **J Med Chem.** 2008;51:5964-5973.
7. Bríza T, Kejik Z, Císařová, I, Králová J, Martásek P, Král V. Optical sensing of sulfate by polymethinium salt receptors: colorimetric sensor for heparin. **Chem Commun (Camb).** 2008;16:1901-1903.

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Search for factors causing disintegration of bone marrow microenvironment in experimental acute monoclonal leukaemia. The growth plate regions of long bones (femur) in healthy (left) and leukaemic (right) experimental animals



Identification of *plag1*, *twist*, and *foxP1* genes as oncogenes in experimental nephroblastomas. The exon-intron structure of chicken genes and sites of proviral integrations. Arrows indicating gene-activating integration sites and orientation of transcription are marked by code numbers of tumours in which they were found.



Effect of photodynamic therapy on human breast carcinoma implanted to experimental NuNu mice.

Control untreated mouse



Mouse 30 days after treatment application (only the scar after tumour removal is visible)