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RESEARCH AREA

Research area: epigenetics, genome editing
Cis-regulatory elements, known as enhancers, are specific segments of the non-coding DNA that exert remote control over distant gene transcription. These elements interact with transcription factors (TFs), which are trans-acting proteins, to enhance the expression of target genes located on the same DNA molecule. Several large-scale genome-wide sequencing initiatives have provided evidence that enhancers are frequently transcribed into long non-coding RNA (lncRNA) or enhancer RNA (eRNA). The levels of these transcripts often exhibit a correlation with the expression levels of the target gene's mRNA. Our research aims to identify cancer-specific enhancers and investigate their mechanisms of action, including TF binding, activation, interaction, and tissue-specific operation. Additionally, we seek to understand the consequences of altered target gene expression associated with cancer development.

TECHNIQUES AVAILABLE IN THE LAB

CRISPRi, CRISPRa (gene inactivation and activation)
RNA-seq, ATAC-seq, ChIP-seq, 3D interactions, CRISPR-screen

SELECTED PUBLICATIONS

Bajtai, E., Kiss, C., Bakos, É., Langó, T., Lovrics, A., Schád, É., Tisza, V., Hegedűs, K., Fürjes, P., Szabó, Z., Tusnády, G. E., Szakács, G., Tantos, Á., **Spisák, S.**, Tóvári, J., & Füredi, A. (2025). Therapy-induced senescence is a transient drug resistance mechanism in breast cancer. **Mol Cancer 24**(1): 128.

Diossy, M., Tisza, V., Li, H., Sahgal, P., Zhou, J., Sztupinszki, Z., Young, D., Nousome, D., Kuo, C., Jiang, J., Chen, Y., Ebner, R., Sesterhenn, I. A., Moncur, J. T., Chesnut, G. T., Petrovics, G., Klus, G. T., Valcz, G., Nuzzo, P. V., Ribli, D., … **Spisák, S.**, Szallasi, Z. (2024). Frequent CHD1 deletions in prostate cancers of African American men is associated with rapid disease progression. **NPJ Precis Oncol 8**(1): 208.

Spisak, S., Chen, D., Likasitwatanakul, P., Doan, P., Li, Z., Bala, P., Vizkeleti, L., Tisza, V., De Silva, P., Giannakis, M., Wolpin, B., Qi, J., & Sethi, N. S. (2024). Identifying regulators of aberrant stem cell and differentiation activity in colorectal cancer using a dual endogenous reporter system. **Nat Commun 15**(1): 2230.

Spisak, S., Tisza, V., Nuzzo, P. V., Seo, J. H., Pataki, B., Ribli, D., Sztupinszki, Z., Bell, C., Rohanizadegan, M., Stillman, D. R., Alaiwi, S. A., Bartels, A. H., Papp, M., Shetty, A., Abbasi, F., Lin, X., Lawrenson, K., Gayther, S. A., Pomerantz, M., Baca, S., … Freedman, M. L. (2023). A biallelic multiple nucleotide length polymorphism explains functional causality at 5p15.33 prostate cancer risk locus. **Nat Commun 14**(1): 5118.

Lu, X., Fong, K. W., Gritsina, G., Wang, F., Baca, S. C., Brea, L. T., Berchuck, J. E., **Spisak, S.**, Ross, J., Morrissey, C., Corey, E., Chandel, N. S., Catalona, W. J., Yang, X., Freedman, M. L., Zhao, J. C., & Yu, J. (2022). HOXB13 suppresses de novo lipogenesis through HDAC3-mediated epigenetic reprogramming in prostate cancer. **Nat Genet 54**(5): 670–683.

Guo, H., Wu, Y., Nouri, M., **Spisak, S.**, Russo, J. W., Sowalsky, A. G., Pomerantz, M. M., Wei, Z., Korthauer, K., Seo, J. H., Wang, L., Arai, S., Freedman, M. L., He, H. H., Chen, S., & Balk, S. P. (2021). Androgen receptor and MYC equilibration centralizes on developmental super-enhancer. **Nat Commun 12**(1): 7308.

Nuzzo, P. V., Berchuck, J. E., Korthauer, K., **Spisak, S.**, Nassar, A. H., Abou Alaiwi, S., Chakravarthy, A., Shen, S. Y., Bakouny, Z., Boccardo, F., Steinharter, J., Bouchard, G., Curran, C. R., Pan, W., Baca, S. C., Seo, J. H., Lee, G. M., Michaelson, M. D., Chang, S. L., Waikar, S. S., … Freedman, M. L. (2020). Detection of renal cell carcinoma using plasma and urine cell-free DNA methylomes. **Nat Med 26**(7): 1041–1043.

Takeda, D. Y., **Spisák, S.**, Seo, J. H., Bell, C., O'Connor, E., Korthauer, K., Ribli, D., Csabai, I., Solymosi, N., Szállási, Z., Stillman, D. R., Cejas, P., Qiu, X., Long, H. W., Tisza, V., Nuzzo, P. V., Rohanizadegan, M., Pomerantz, M. M., Hahn, W. C., & Freedman, M. L. (2018). A Somatically Acquired Enhancer of the Androgen Receptor Is a Noncoding Driver in Advanced Prostate Cancer. **Cell 174**(2): 422–432.e13.