

New Insights Into Cleft Palate Unlocked With 10x Genomics' Single Cell and Spatial Technologies



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Researchers used Chromium Single Cell products and Xenium In Situ to profile how gene expression is spatially regulated during secondary palate formation

PLEASANTON, Calif., June 27, 2024 /PRNewswire/ -- **10x Genomics, Inc.** (Nasdaq: **TXG**), a leader in single cell and spatial biology, announced today that its Xenium In Situ platform was used in a study published in the *Journal of Dental Research*, offering novel insights into cellular mechanisms regulating the formation of the secondary palate. The study was led by researchers at the National Institutes of Health (NIH) in collaboration with computational experts at the University of Connecticut's Schools of Medicine and Dental Medicine.

Annually, clefts of the lip and/or palate occur in ~1 in every 700 live births. Despite its prevalence, there is still a very limited understanding of how the bones forming these foundational facial structures develop and pattern as an embryo develops. In this study, "Spatial Multi-omics Reveals the Role of the Wnt



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Modulator, Dkk2, in Palatogenesis," the researchers set out to clearly define how the Pax9 protein functions as a transcription factor in the context of Wnt signaling, a crucial pathway known to regulate many elements of embryonic development.

The study's first author, Jeremie Oliver Piña, PhD, MS, MBA, a Postdoctoral Fellow in Dr. Rena D'Souza's lab (*Eunice Kennedy Shriver* National Institute of Child Health and Human Development, NIH), said, "The higher spatial resolution of compartment-specific gene enrichment using Xenium allowed us to extend our understanding of these molecules at greater depth and breadth than prior studies could using traditional in situ hybridization approaches. With this more detailed understanding of signaling pathway target genes in the developing palate, we will be able to more effectively pave the way toward innovative diagnostic and therapeutic strategies for cleft palate anomalies.

"Xenium In Situ's workflow and analysis pipeline allowed us to optimize the assay conditions for our target tissue, run the whole protocol and analyze all replicates in-house in less than one month. The intuitive design of the bench workflow and post-run analysis software may be the most valuable aspects of this high-throughput in situ technology to accelerate science."

As part of their initial assessment, the researchers performed an integrated assessment of the transcriptomic and epigenomic profiles of wild-type and *Pax9*-deficient mice using the **Chromium Single Cell Multiome ATAC + Gene Expression** (Multiome) assay. Paired with 3D-micro-computerized tomography (micro-CT) bone imaging analysis showing disrupted patterning of the palate in *Pax9*-deficient mice, the authors hypothesized that loss of *Pax9* expression disrupts Wnt signaling dynamics in a way that influences the process of proper bone formation.

To further investigate the relationship between Pax9 and Wnt signaling, the researchers created a fully custom gene expression panel to profile 350 genes at single cell spatial resolution with the **Xenium In Situ platform**. The researchers customized their gene panel to focus on cell-type specific markers, genes involved in signaling interactions and other genes of interest uncovered in the Multiome data.

The Xenium analysis revealed significant spatial gene expression differences between wild-type and *Pax9*-deficient mice, indicating a role for Pax9 in regulating the differentiation and maturation of a specific subset of progenitor cells. Of particular note, Xenium revealed that disrupting Wnt signals blocks the extension of the palate to the midline in this cleft palate model, a process that could be targeted for discovery of potential in utero and early postnatal treatments to correct cleft palate anomalies.



Ben Hindson, Co-Founder and Chief Scientific Officer, said, "This paper by Piña et. al is a strong demonstration of the power of single cell multiomics coupled with targeted in-situ sequencing. The detailed spatial analysis of cleft palate dynamics also shows how researchers can take advantage of the fully custom gene panel options on Xenium to answer their specific research questions."

To learn more about this study, [read the full article](#).

About 10x Genomics

10x Genomics is a life science technology company building products to accelerate the mastery of biology and advance human health. Our integrated solutions include instruments, consumables and software for single cell and spatial biology, which help academic and translational researchers and biopharmaceutical companies understand biological systems at a resolution and scale that matches the complexity of biology. Our products are behind breakthroughs in oncology, immunology, neuroscience and more, fueling powerful discoveries that are transforming the world's understanding of health and disease. To learn more, visit 10xgenomics.com or connect with us on [LinkedIn](#) or [X \(Twitter\)](#).

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