

Region-specific SPON1 expression regulates cortical folding and brain function



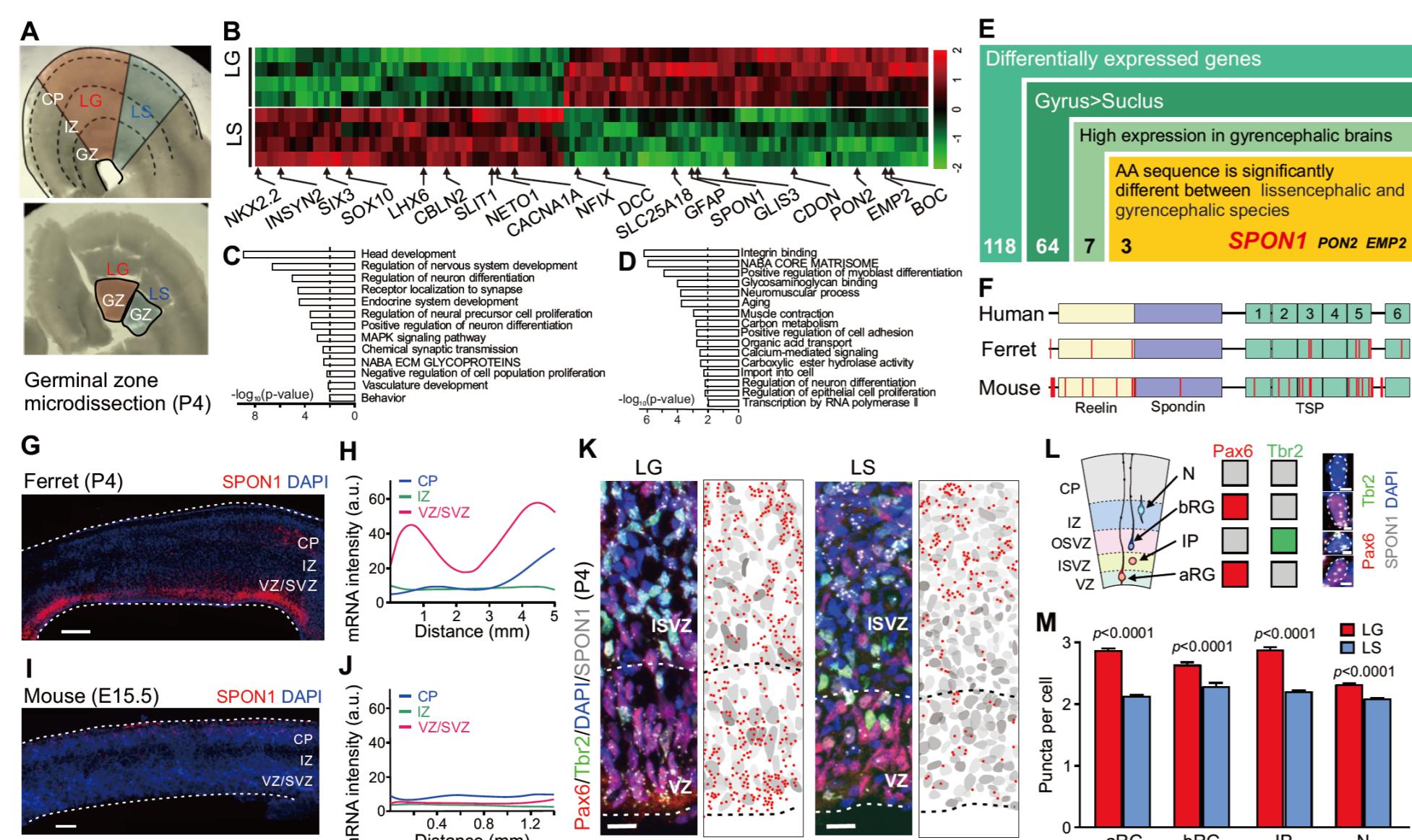
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Introduction

Previous studies have suggested that patterned gene expression in the germinal zone of gyrencephalic species regulates non-uniform cortical expansion, potentially impacting cortical folding development. Some research also indicates that certain genes may influence cell cycle progression or migration, further influencing cortical folding. This project primarily focuses on observing the phenotype of *SPON1* gene knockout ferrets. Although I was the second individual involved in this project and have since left the lab for an extended period, and did not contribute extensively to the work presented in this paper, I still want to introduce my previous work in this poster.

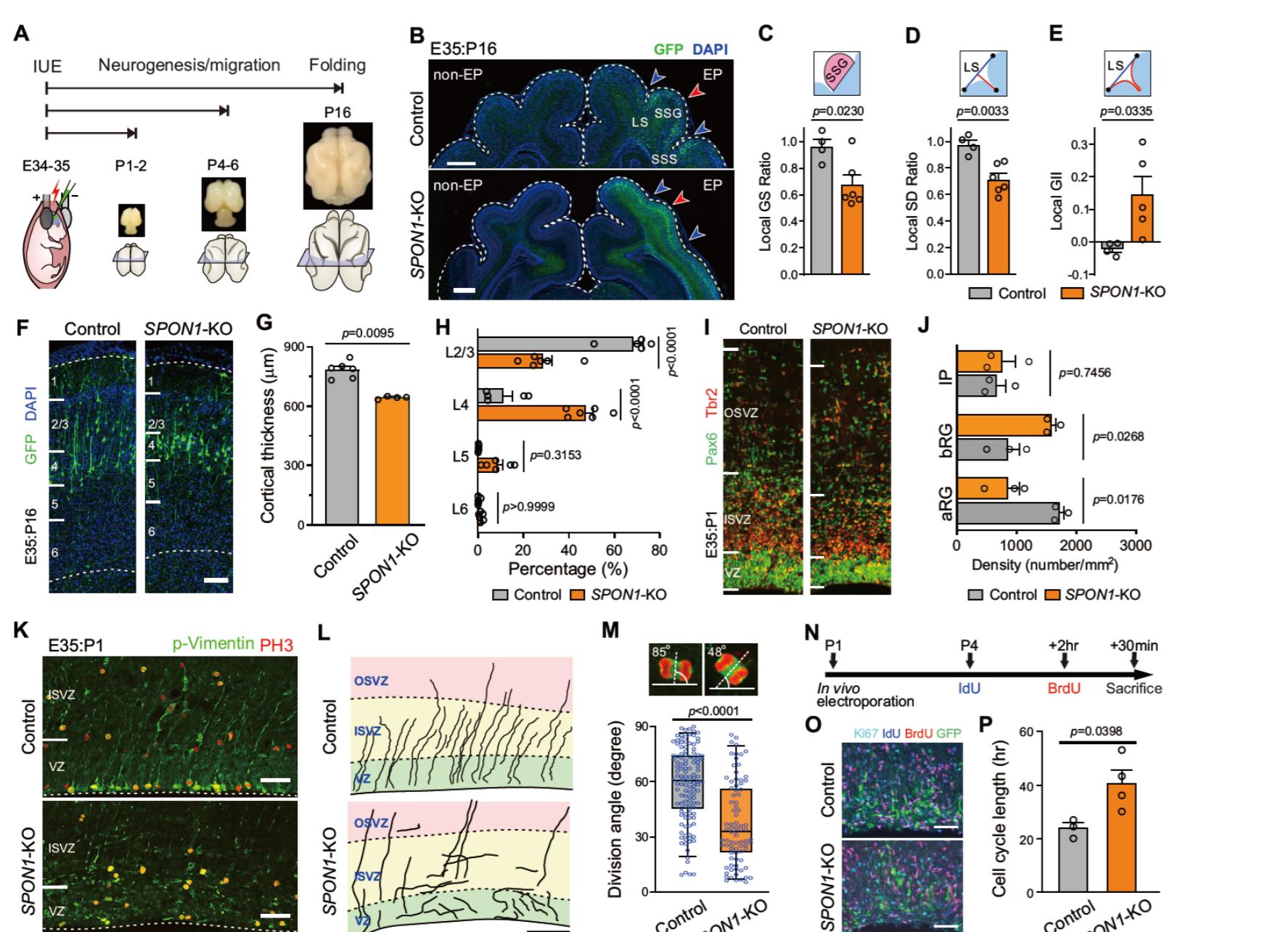
The region-specific gene SPON1

After screening DEGs between the lateral gyrus and flanking lateral sulcus, and comparing them with amino acid sequences between gyrencephalic and lissencephalic brains, we identified three genes (*SPON1*, *SPON2*, *EMP2*). Given *SPON1*'s role in activating the Wnt/β-catenin pathway implicated in cortical folding, our study focuses on *SPON1*. My previous work testing available Pax6 and Tbr2 antibodies, RNA-seq data analysis in ferret, and microdissection for collecting nearby gyrus and sulcus, which contribute to this study.



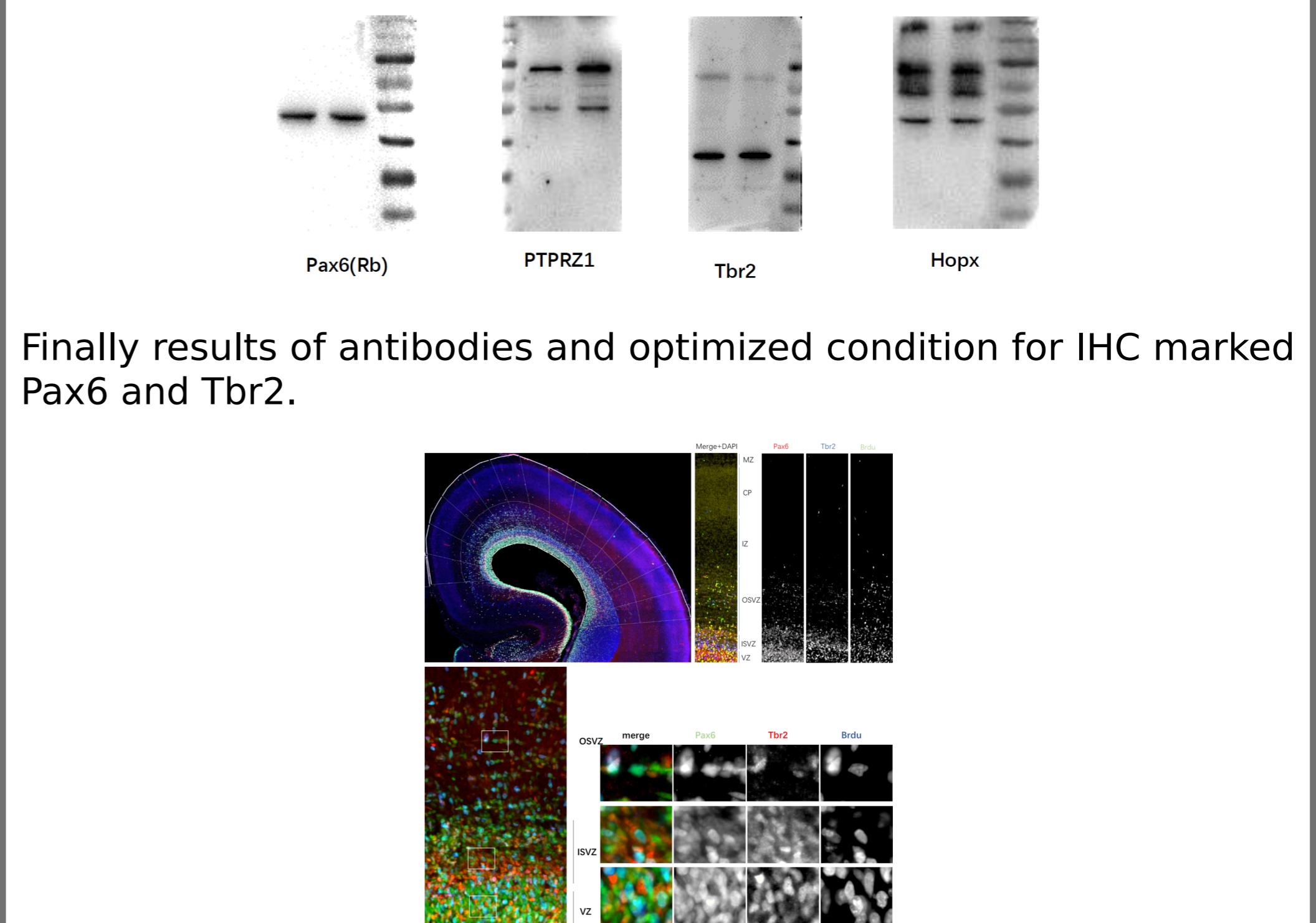
SPON1 affects structure and neurogenesis

To investigate *SPON1*'s role in cortical folding, we knock out it in developing ferret neocortex. Abnormalities in cortical folding and reduced thickness were observed compared to controls. GFP+ neuron distribution altered, with layer proportions changed. Examining cortical neurogenesis at P1-2, we found increased bRGs density and decreased aRGs density in *SPON1*-KO brains. Ectopic aRGs migrating into SVZ likely contributed to increased bRGs. Basal radial fibers showed aberrant directionality, and *SPON1* deletion affected aRGs' mitotic cleavage orientation and cell-cycle length, without inducing cell apoptosis. These findings suggest *SPON1* loss disrupts aRG localization and impairs neurogenesis.

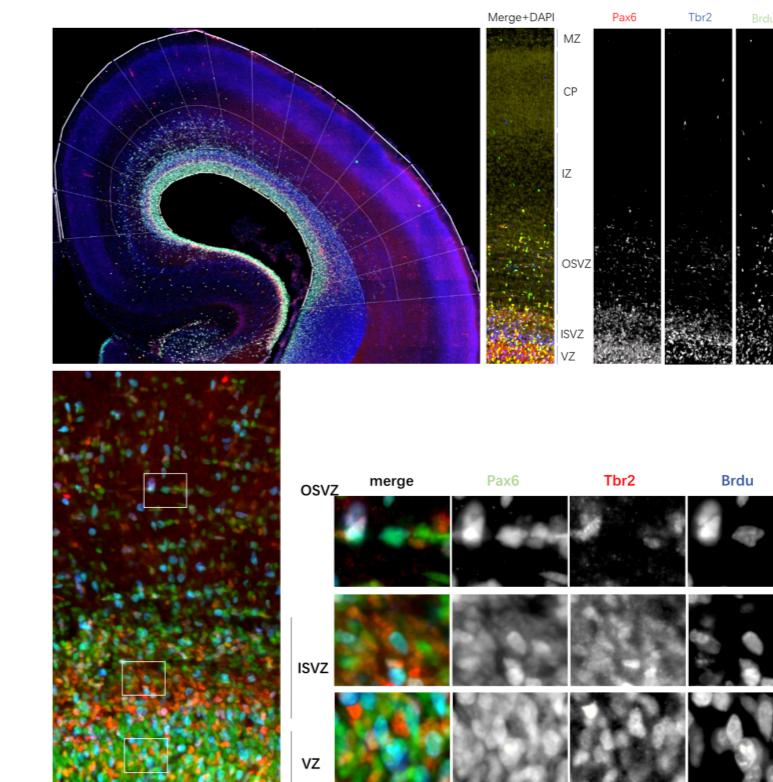


My previous antibodies testing in ferret

Ferret, a rare animal model, lacks specific antibodies for IHC. Despite attempting human or mouse antibodies, most were ineffective. Ultimately, one Pax6 and one Tbr2 antibody were chosen to label RGs and IPs.

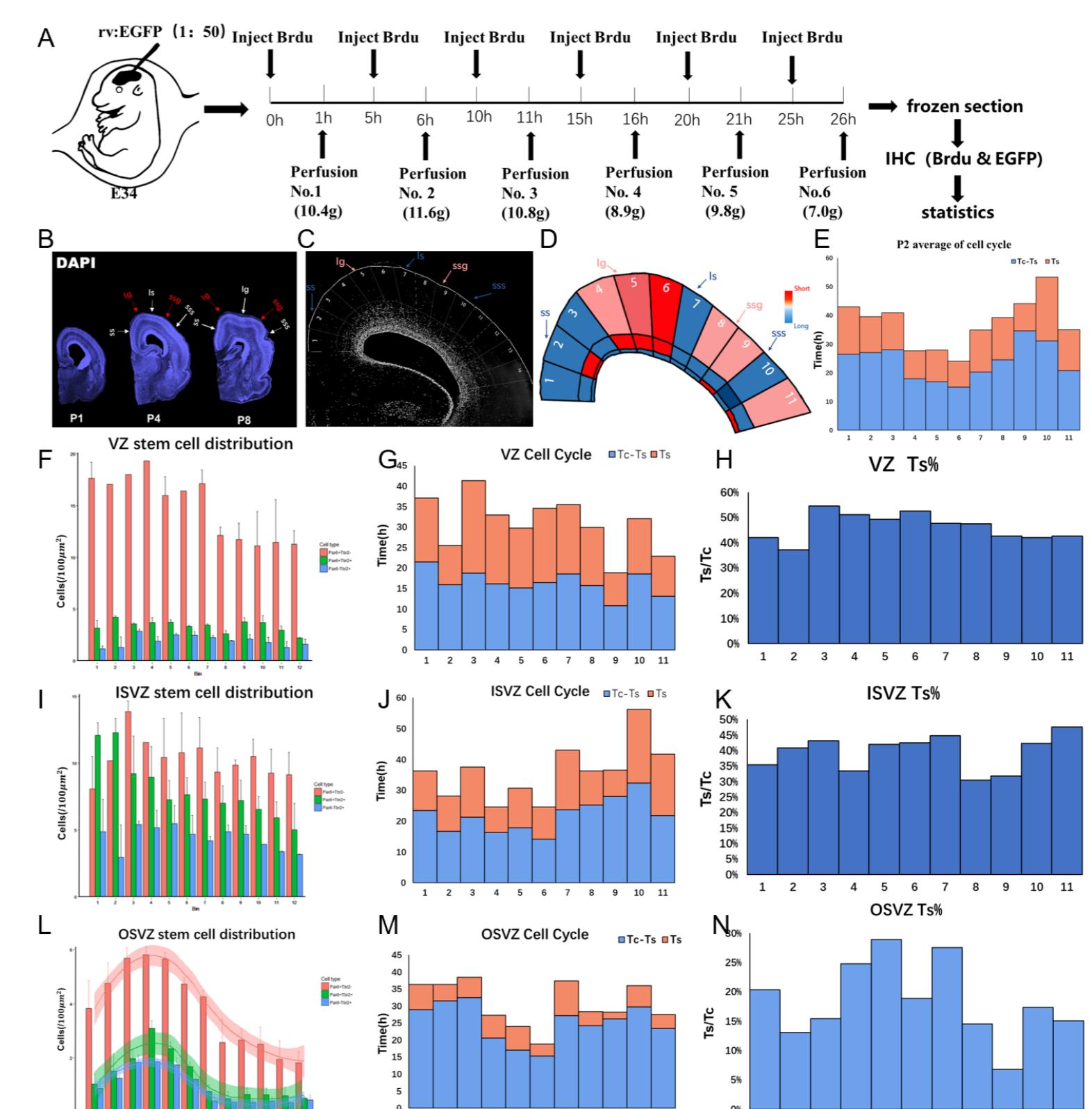


Finally results of antibodies and optimized condition for IHC marked Pax6 and Tbr2.



My previous cell cycle study

Conducting sequential BrdU injections to track cell proliferation over time, and quantifying the ratio of BrdU-positive cells within distinct populations (Pax6, Tbr2, or EGFP) to assess cell cycle duration among these groups. Intriguingly, we observed a notably shorter cell cycle length within bins 4-6 of the lateral gyrus (LG), while only the OSVZ region exhibited a comparable pattern with the overall average cycle duration.



Conclusion

This project conducted various experiments, only showing relevant part to my prior work. It enhanced my proficiency in basic experimental techniques, fostering scientific thinking and problem-solving skills.