

# Hair plucking for hair follicle epithelium analysis: Exploring genotypic classification and signaling pathways of androgenetic alopecia

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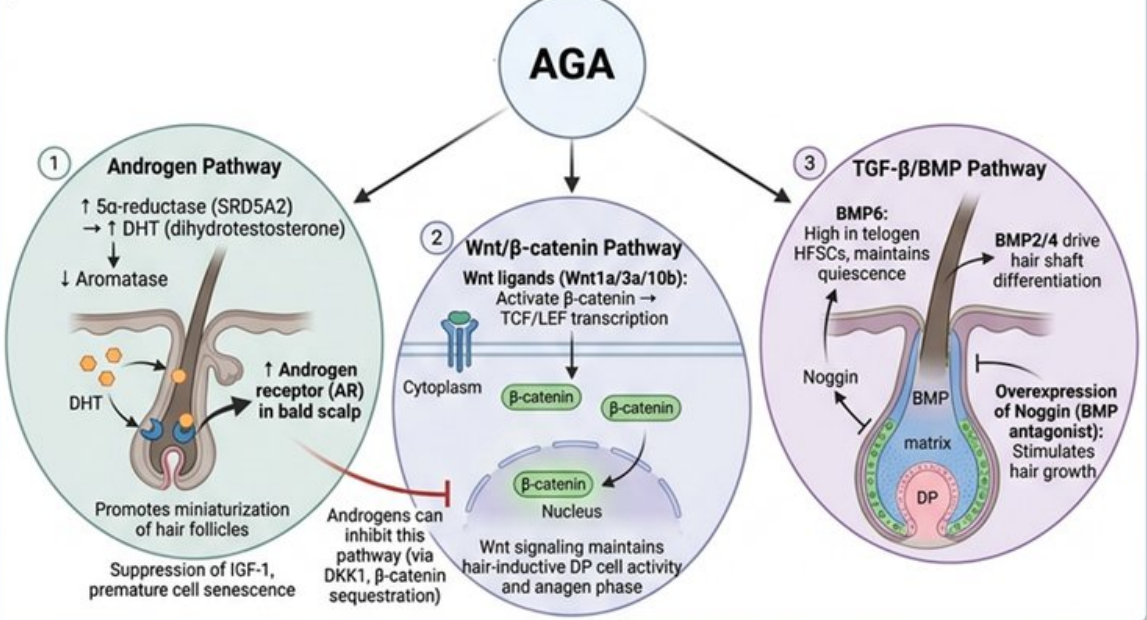
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## INTRODUCTION

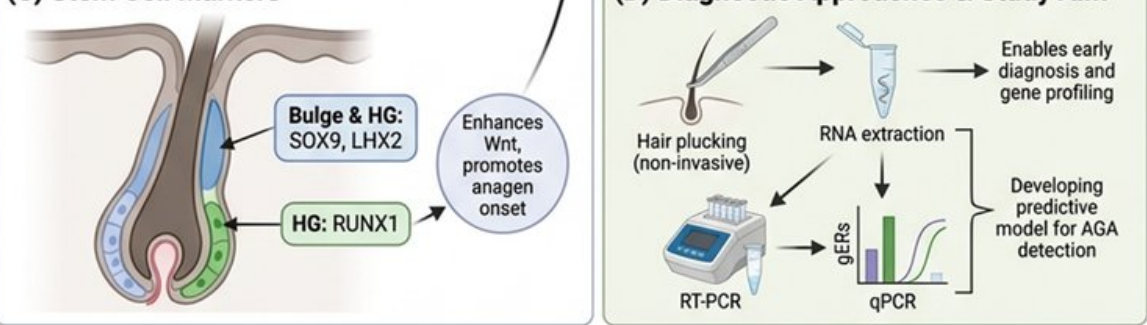
### (A) Prevalence & Overview



### (B) Pathogenesis Overview



### (C) Stem Cell Markers



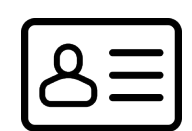
**(E)** Androgenetic alopecia (AGA) is a complex, highly prevalent disease driven by genetic, hormonal, and signaling pathway disruptions. Early diagnosis remains a challenge. Our study investigates key gene expression differences using non-invasive plucked follicle RT-PCR, focusing on androgen, Wnt/β-catenin, TGF-β/BMP, and stem cell pathways.

## PARTICIPANT



### Sample Size

35 male and female AGA patients,  
25 male and female healthy controls



### Age Range

18 - 49 years old

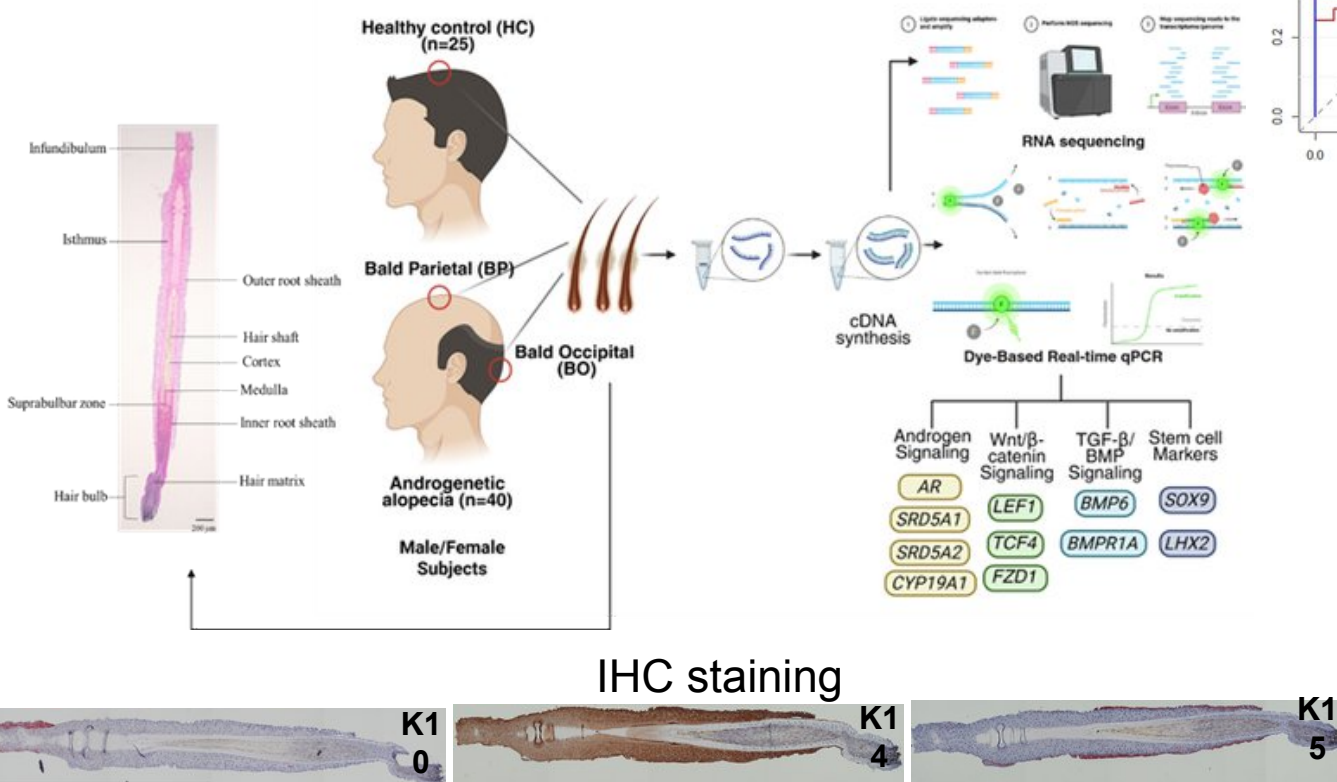


Male: Hamilton-Norwood grades IV-VI were classified as severe AGA, and grades I-III as mild AGA.  
Female: Ludwig grade 1 was classified as mild, and grades 2-3 were classified as severe.



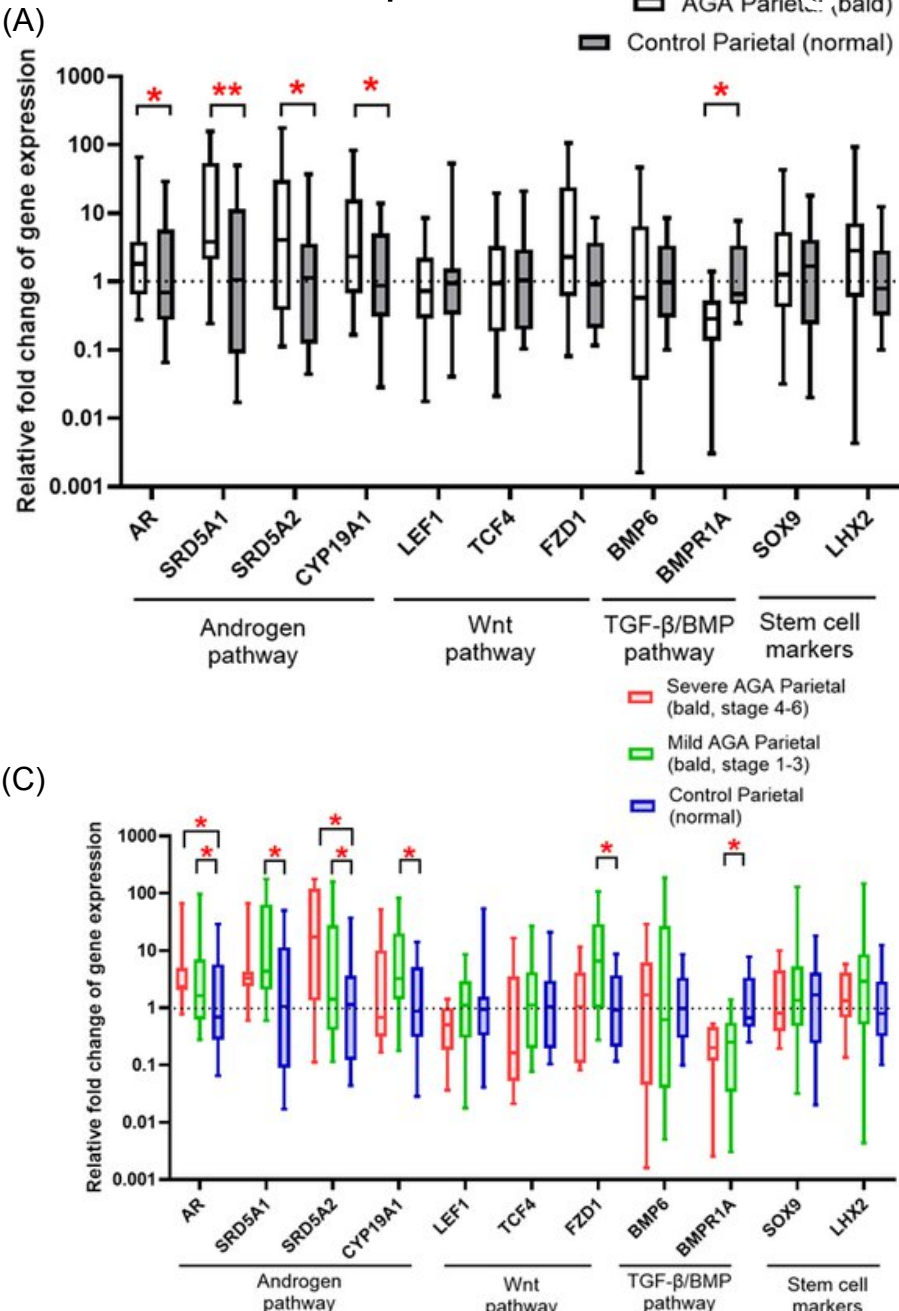
Subjects with other hair or scalp diseases or unwilling to have hair plucked

## METHODS

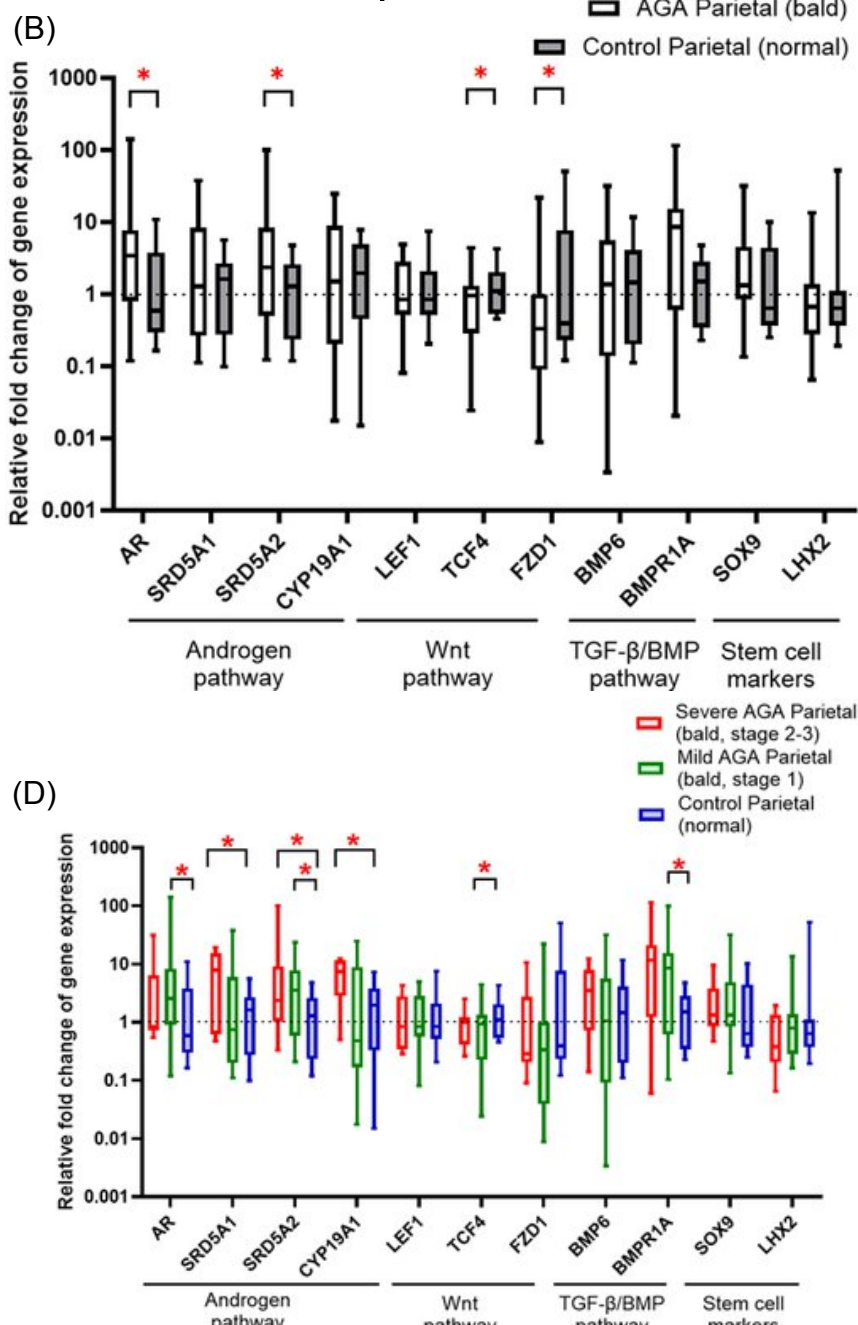


## RESULT

### Gene Expression-Male



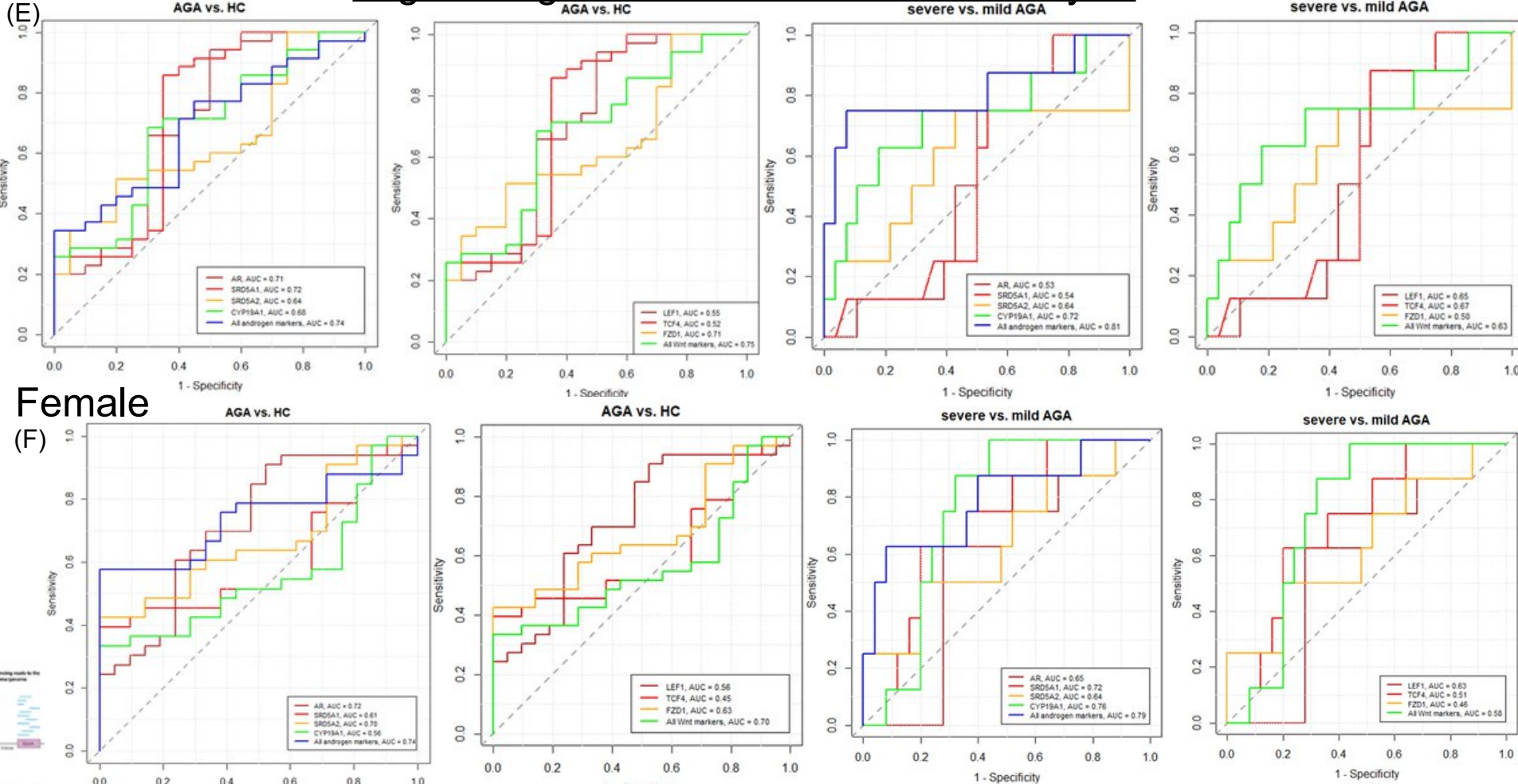
### Gene Expression-Female



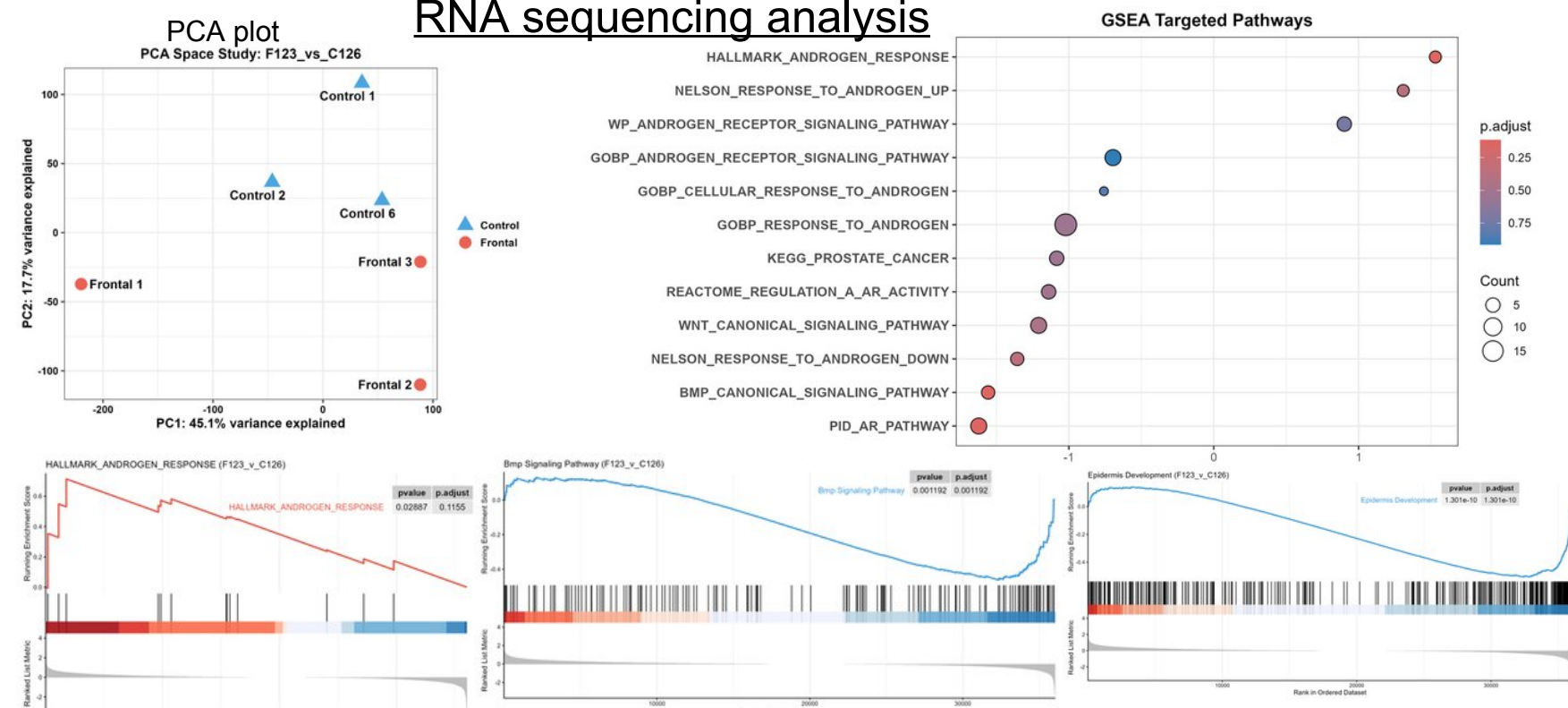
Comparison of the gene expression between parietal and occipital hair follicles of male AGA patients revealed no significant differences.

### Male

### Logistic regression and ROC curve analysis



### RNA sequencing analysis



## CONCLUSIO

1. Androgen signaling and TGF-β/BMP signaling were upregulated in AGA patients compared to controls, while Wnt/β-catenin signaling were downregulated.
2. Gene expressions in parietal and occipital follicles of AGA patients were not significantly different.
3. Androgen markers had the highest odds ratios and prediction accuracies of AGA.
4. RNA sequencing confirmed the involvement of androgen, Wnt, and BMP signaling in AGA pathogenesis.

| Male Subjects            | Severe AGA (N=7) | Mild AGA (N=28) | Total AGA (N=35) | Control (N=25) | Female Subjects          | Severe AGA (N=10) | Mild AGA (N=25) | Total AGA (N=35) | Control (N=25) |
|--------------------------|------------------|-----------------|------------------|----------------|--------------------------|-------------------|-----------------|------------------|----------------|
| Age (years)              | 42.9 ± 3.0       | 35.0 ± 8.0      | 36.4 ± 8.2       | 30.5 ± 9.7     | Age (years)              | 36.4 ± 7.6        | 30.8 ± 8.5      | 32.6 ± 8.6       | 35.8 ± 8.6     |
| Body weight (kg)         | 80.6 ± 11.6      | 74.2 ± 13.2     | 74.6 ± 12.3      | 69.0 ± 8.3     | Body weight (kg)         | 56.9 ± 8.1        | 56.6 ± 7.7      | 56.7 ± 7.8       | 56.6 ± 8.6     |
| Height (cm)              | 173.2 ± 5.9      | 172.2 ± 4.9     | 172.5 ± 5.2      | 172.8 ± 5.8    | Height (cm)              | 161.2 ± 3.4       | 159.3 ± 5.2     | 159.9 ± 4.8      | 160.1 ± 4.6    |
| BMI (kg/m <sup>2</sup> ) | 26.8 ± 3.5       | 24.9 ± 3.8      | 25.0 ± 3.6       | 23.2 ± 3.0     | BMI (kg/m <sup>2</sup> ) | 21.9 ± 2.8        | 22.3 ± 2.9      | 22.2 ± 2.9       | 22.1 ± 3.1     |