DermTech Smart Stickers can non-invasively detect RNAs that are associated with non-melanoma skin cancer

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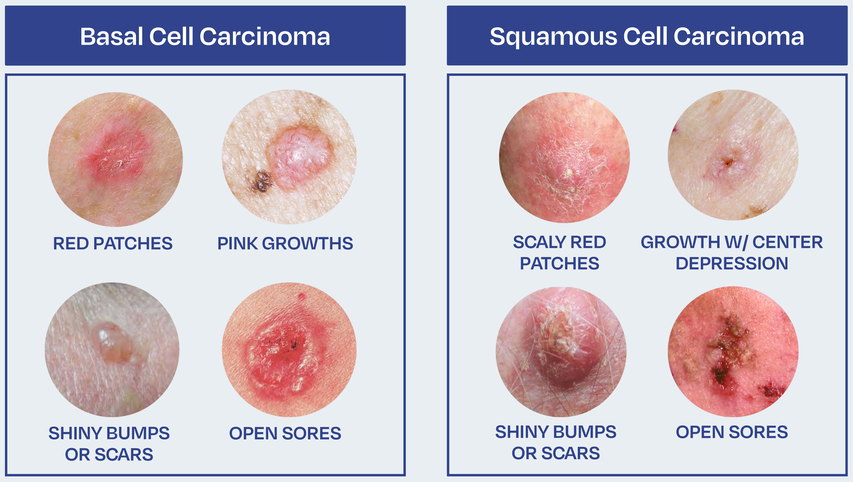
INTRODUCTION

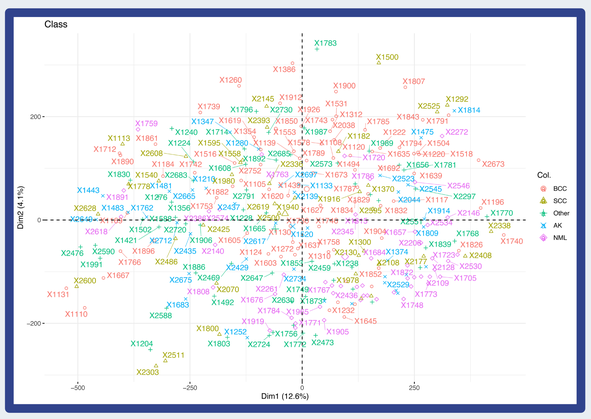
Background

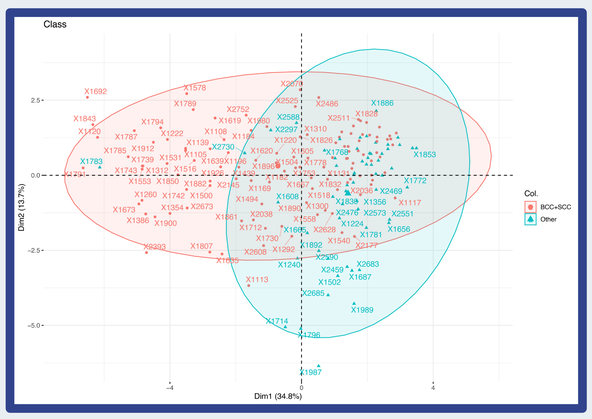
- Non-melanoma skin cancers (NMSC) are the most common types of skin cancer and include both basal cell carcinoma (BCC) and squamous cell carcinoma (SCC)[1].
- NMSCs primarily form on sun exposed skin areas and are expected to cause approximately 15,000 deaths in a year[2].
- Current diagnosis of NMSC relies on medical history and visual assessment of suspicious lesions.
- In some instances, it is difficult to distinguish and differentiate NMSC from actinic keratoses and other malignant and benign skin tumors from non-skin cancers, so skin biopsies are collected for further histopathologic review. This is problematic in cosmetically sensitive areas.
- We investigated whether non-invasive collection of skin tissue and subsequent genomic analysis could properly classify NMSC.



HETEROGENEITY OF NMSC

- Principal Component Analysis (PCA) was conducted with RNA-sequencing data to evaluate the natural distribution of genes expression among all sample types
- PCA did not reveal any distinct patterns or signatures for NMSC compared to Non-Cancer Skin Disease (NCSD)
- Applying a Random Forest algorithm to the RNA-sequencing data led to the identification of 161 candidate genes with the potential to differentiate between NMSC and NCSD





REFERENCES

1. Griffin LL, Ali FR, Lear JT. *Clin Med (Lond).* 2016;16(1):62-65 doi: 10.7861/clinmedicine. 16-1-62
2. Mansouri B, Housewright C. *J Am Acad Dermatol* 2017; 153(11):1200. doi:10.1001/jamadermatol.2017.3395.

METHODS

- Subjects ≧ 18 years of age with visually suspected NMSC were enrolled in this study from >20 Clinical sites. All subjects provided written informed consent prior to enrollment.
- Skin samples were collected non-invasively from enrolled subjects using the DermTech Smart Sticker™. Skin biopsies were also collected from all subjects for histopathological confirmation.
- The breakdown of histopathologically confirmed subjects for the Training Set and Test Set is provided in the table below:

Sample Set	Basal Cell Carcinoma	Squamous Cell Carcinoma	Other*/AK
Training Set	94	87	173
Test Set	108	89	169

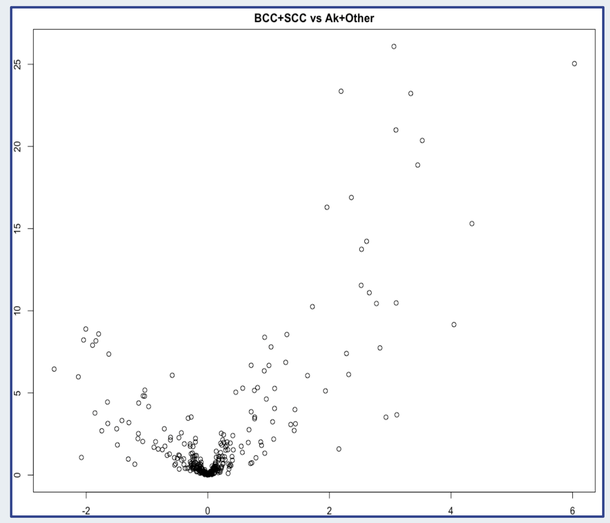
*Subjects were classified as "other" if histopathology confirmed their diagnosis as a non-cancerous skin disease including but not limited to seborrheic keratosis, actinic keratosis, verruca vulgaris, and plaque psoriasis

- RNA was extracted from the Smart Stickers using the DermTech's custom bead-based extraction method on the KingFisher Flex instrument (Thermo Fisher Scientific).
- Whole transcriptomic data was collected for the Training Sample Set using RNA sequencing.
- Targeted RNA AmpliSeq data was collected for the Test Sample Set.
- Random Forest machine-learning was used to analyze sequencing data

NOVEL GENE IDENTIFICATION FOR NMSC

- AmpliSeq Panel generated with initial 161 genes as well as 145 genes identified from literature and disease pathogenesis
- Targeted RNA AmpliSeq data was collected using the AmpliSeq Panel of 306 genes on the Test Sample Set.
- Random Forest machine-learning was used to analyze the targeted RNA AmpliSeq data

- 30 genes were significantly (fold change >2; multiple-testing adjusted P<0.05) increased in NMSC compared to NCSD
- 16 genes were lower in NMSC (fold change >2; multiple-testing adjusted P<0.05)



CONCLUSIONS

- ~40% of subjects enrolled in this study had discordant pathology results from the clinical assessment and diagnosis of BCC or SCC, suggesting the importance of additional objective assessments in ruling out non-melanoma skin cancers prior to a surgical biopsy.
- Non-invasively collected skin samples (Smart Sticker™) enabled the identification of RNAs that are differentially expressed between NMSC and NCSD.
- This non-invasive platform technology creates the opportunity for a multi-gene machine-learning algorithm to rule out NMSC without the need for surgical biopsy.
- Additional studies will provide further characterization of BCC and/or SCC lesions to aid in the diagnosis of NMSC.