An Adhesive Patch-Based Skin Biopsy Device for Non-Invasive Gene Expression Analysis in Dermatology

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Introduction

Currently, many clinical diagnoses in dermatology depend on histopathologic confirmation. This image-recognition-based confirmation is not only subjective, it also always requires a surgical biopsy. A paradigm shift from a subjective image-based method to a more objective gene expression analysis appears highly desirable. It is on the horizon with the recent development of a non-invasive gene expression test for pigmented skin lesions1,2.

This study describes in detail an adhesive patch-based skin biopsy device that can be used to non-invasively collect skin tissue samples for gene expression analyses and other uses.

Materials and Methods

Epidermal skin samples were collected with an adhesive patch-based skin biopsy device (Figure 1) manufactured by DermTech (La Jolla, USA), and skin collection performance of the device was evaluated with complementary technologies including assessment of sample biomass, electron microscopy, total RNA isolation and gene expression analysis. In addition, the impact of this non-electron microscopy, total RNA isolation and gene expression analysis appears highly desirable. It is on the subjective image-based method to a more objective gene expression test for pigmented skin lesions1,2.

Results and Discussion

The adhesive patches successfully collected epidermal skin samples at different body locations for total RNA isolation (Figure 5). Although the total RNA yields varied from site to site, ranging from 2-14ng from 4 full patches (per test site) or 0.5-2ng from 4 macro-dissected 6mm-diameter areas of patches, the amounts of total RNA were sufficient for most molecular analysis in dermatology.

RNA molecules (from a variety of cell types not limited to keratinocytes) in the patch collected skin samples were stable under various storage conditions (Figure 6) as RNA molecules are more protected from nucleases in dried cells. This proved quite advantageous as the skin samples collected via the adhesive patch technology at various clinics and physician offices can simply be shipped to the analysis laboratories by regular mail or courier at ambient temperatures.

Conclusion

The adhesive patch-based skin sample collection device is an easy to use, safe and robust method that can be used to non-invasively collect epidermal tissue samples for molecular analyses (and potentially other applications as well). Samples collected via the adhesive patch biopsy method are stable and can be shipped cost effectively to analysis laboratories at ambient temperature by mail or standard courier service avoiding the need for special storage and handling.

References