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In silico analyses of the tumor microenvironment in basal cell carcinoma highlight the importance of T_H2 cytokine profile, tumor-associated macrophages, and acquisition of mesenchymal stem cell-like phenotype in advanced and treatment-resistant tumors



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Background: Basal cell carcinoma (BCC) represents the most common form of all cancers. BCC is characteristically surrounded by a fibromyxoid stroma. Previous studies have suggested a shift towards a T_H2 response, an increase in T regulatory lymphocytes and the presence of cancer-associated fibroblasts in the BCC tumor microenvironment.

Methods: In this study, we aimed to characterize the BCC tumor microenvironment in detail by analyzing BCC RNA-sequencing data and correlating it with clinically-relevant features, using *in silico* RNA deconvolution.

Results: Using immune cell type deconvolution by CIBERSORT, we have identified a brisk lymphocytic infiltration, and more abundant macrophages in BCC tumors compared with normal skin. Using cell type enrichment by xCell, we confirmed the observed immune infiltration in BCC tumors. In addition, as they are more abundant in low-risk BCC than in high-risk BCC, gamma-delta T lymphocytes may play a protective role against BCC by restricting its growth. We confirmed the shift towards T_H2 immunity in high-risk BCC requiring Mohs surgery; enrichment for a T_H2 cytokine response was also observed in advanced tumors and vismodegib-resistant tumors. Tumoral inflammation induced by macrophage activity was associated with advanced BCC, while lymphocytic infiltration was greatest in non-advanced tumors, likely related to an anti-tumoral response. In advanced and vismodegib-resistant BCC, mesenchymal stem cell-like properties were observed. In vismodegib-resistant BCC, fibroblasts and adipocytes were found in high numbers, which ultimately may contribute to decreased drug delivery to the tumor.

Conclusions: In conclusion, this study has revealed notable BCC tumor microenvironment findings associated with important clinical features.

Commercial disclosure: None identified.

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Dermatology residency applicants: How many pursue a dedicated research year or dual-degree, and do their stats differ?



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Background: The dermatology application process is competitive. 81.6% of US applicants in dermatology match, the second lowest rate among all specialties. The mean USMLE Step 1 score among matched applicants is 249, highest of all specialties. To gain a competitive edge, applicants face decisions regarding pursuit of dedicated research time and additional professional degrees.

Objective: To determine how many dermatology applicants pursue additional years of training prior to applying, and how this decision relates to USMLE scores and other metrics.

Methods: All applicants to the University of Michigan dermatology residency program for the 2018-2019 application cycle (n = 608) were included.

Results: There were 608 (377 female, 231 male, mean age 27.9 years) applicants. 30% (184/608) did not finish medical school in 4 years. 28 (4.6%) obtained a master degree, 21 (3.5%) obtained a PhD, and 135 (22.2%) pursued dedicated research. Neither mean Step 1 scores (P = .31) nor mean Step 2 Clinical Knowledge scores (P = .44) were statistically different between applicants who pursued additional training and those who did not. Applicants who completed medical school in four years had fewer research experiences (mean 13.9) than students with a master degree (mean 18.5), PhD (mean 24.5), or dedicated research time (mean 23.9) (P < .001).

Conclusions: 30% of dermatology residency applicants pursued a second professional degree or dedicated research time. USMLE Step 1 and Step 2 scores were not different between applicants who pursued additional training and those who did not. The increased costs of extending medical school might have implications on diversity of the applicant pool.

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Temporal trends in primary and secondary skin cancer prevention in the United States



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Background: There are an increasing number of public health campaigns addressing skin cancer prevention to combat rising incidence. We analyzed temporal trends in skin cancer prevention behaviors to examine the impact of such campaigns.

Objective: A retrospective, cross-sectional study was conducted using the National Health Information Survey (NHIS) to analyze trends in sun protective behaviors over a fifteen year period to determine temporal trends.

Methods: The NHIS was used to analyze trends in sun protective behaviors with data collected in 2005, 2010, and 2015. Our outcomes of interest were the use of sun protective measures, lifetime history of full body skin examination, history of indoor tanning, and history of two or more sunburns in the past year.

Results: The prevalence of all primary and secondary skin cancer preventive behaviors rose with indoor tanning use decreasing. Primary skin cancer preventive measures increased including sunscreen (31.0% to 33.6%, P < .001), protective clothing (36.6% to 38.0%, P = .018), and sun avoidance (32.5% to 37.5%, P < .001). Secondary skin cancer prevention also increased (18.9% to 22.2%, P < .001). Prevalence of indoor tanning use decreased significantly (13.8% to 3.9%, P < .001), but prevalence of sunburn in the past year rose significantly (17.7% to 19.2%, P = .001).

Conclusions: Americans are increasingly adopting sun protective behaviors, but the prevalence of multiple annual sunburns is rising. Further research is needed to determine the impact of behavioral changes on skin cancer incidence and why sunburn prevalence is rising.

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A theory-based community-outreach curriculum improves skin-care and foot-care self-efficacy in Chinese-American elderly



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In Chinese-American elderly, skin cancers are often diagnosed at advanced stages, and high prevalence of foot problems greatly affects quality of life. This study sought to improve understanding of skincare perceptions and behaviors of Chinese-American elderly, and to increase their knowledge and self-efficacy through a skincare curriculum. The curriculum was developed according to the Health Belief Model. Two 90-minute sessions covering skin cancer and foot-care were delivered across three locations in Boston. Pre- and post-session surveys, based on the validated Skin Self-Examination Attitude Scale and Foot Care Confidence Scale, were administered. Individuals were included if they were older than 60 years of age, attended the full session, and returned both pre and post surveys. 120 participants met inclusion criteria. Median age was 76, and 75% of participants were female. 32.3% were concerned about a skin growth, yet only 18.8% knew what features were concerning for skin cancer. 52.9% were concerned about a foot problem, but only 41.2% knew how to check for foot injuries. After the curriculum, features of skin cancer knowledge increased significantly (18.8% to 46.8%; P < .001), as did knowledge of how to check feet for injuries (41.1% to 75.6%; P < .001). Self-efficacy for self-skin exams and foot-care significantly increased (both P < .001). Our findings suggest that Chinese-American elderly have significant knowledge gaps in skin cancer surveillance and foot-care. Our targeted educational sessions increased participants' knowledge and self-efficacy, consistent with prior studies. Dermatologists should consider implementing interventions in diverse populations to promote skin health.

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