OSM secreted by trichophages serves as a chalone to repress hair growth

Hair follicle stem cells (HFSCs) integrate activating and inhibitory signals that orchestrate the hair follicle growth cycle. Macrophages have also recently been implicated in the mammalian hair cycle, and integral signaling pathways have begun to be revealed. Wang et al. (2020) recently demonstrated that OSM is an endogenous inhibitor of tissue growth, a so-called chalone that maintains the quiescence of HFSCs. OSM signals through the OSM receptor β (OSMRβ) and the downstream Jak-STAT5 signaling pathway to maintain telogen. A distinct subset of TREM2⁺ dermal macrophages that expresses markers of long-term resident microglia, termed trichophages, was identified as the source of OSM in early telogen hair follicles. The depletion of this cell type resulted in the induction of hair growth in mice. These studies indicate that the OSM-OSMRβ-Jak-STAT5 signaling axis maintains HFSC quiescence and may offer potential targets for therapeutics aimed at reversing human hair loss. (Cell Stem Cell 24:654–669, 2020; https://doi.org/10.1016/j.stem.2019.01.011) Selected by I. Brownell

STAR particles promise a novel topical drug delivery system

Physical properties of the epidermis can constrain the topical delivery of drugs to provide efficacious skin therapies. Tadros et al. (2020) recently described a novel topical drug delivery approach using star-shaped millimeter-scale particles derived from metal or ceramic materials. These STAR particles have micron-scale projections that generate hundreds of micropores per square centimeter in the stratum corneum and enable increased local skin permeability independent of the physicochemical properties of the delivered compound. Tadros et al. (2020) found that STAR particle-containing formulations were well-tolerated by animals and humans and that these formulations also resulted in increased delivery of hydrophilic molecules such as 5-fluorouracil and methotrexate and macromolecules such as FITC-dextran and tetanus toxoid across the stratum corneum. This novel method may ultimately enhance the clinical efficacy of topical drug and vaccine delivery, pending further trials in humans. (Cell Stem Cell 24:654–669, 2020; https://doi.org/10.1016/j.stem.2019.01.011) Selected by I. Brownell

Identification of human mAb that neutralizes severe acute respiratory syndrome coronavirus 2

Because the coronavirus transmembrane spike protein mediates cell entry, therapeutic and vaccine strategies have focused on neutralizing antibodies (Abs) that target this protein. Passive administration of mAbs offers an opportunity to provide immediate protection from virus infection and complement the development of vaccines, as shown by the previous success with a mAb treatment for Ebola virus infection. Pinto et al. (2020) identified several mAbs that neutralize severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a SARS-CoV-2 survivor. Purified S309 mAb exhibited potent neutralization of SARS-CoV-2 on the basis of strict conservation of the cross-reactive N343-glycan epitope, suggesting that this Ab may neutralize virtually all SARS-CoV-2 isolates as well as other zoonotic sarbecoviruses. In addition to this in vitro neutralization capability, S309 may also promote other antiviral protective mechanisms, including NK cell–mediated Ab-dependent cell cytotoxicity and Ab-dependent cellular phagocytosis. Finally, these studies showed that combining additional cross-reactive Abs with S309 enhanced the neutralization potency, supporting the use of mAb cocktails to prevent or control SARS-CoV-2. Currently, clinical trials with engineered variants of the S309 mAb are materializing in a concerted effort to combat the coronavirus disease 2019 pandemic. (Nature 583:290–295, 2020; https://doi.org/10.1038/s41586-020-2349-y) Selected by M. Bagot

Deep learning improves skin disease diagnosis

To improve the diagnostic accuracy of skin disease by primary medical care providers, who often shoulder this burden, artificial intelligence tools are being developed to improve differential diagnoses. Liu et al. (2020) developed a deep learning system to recognize 26 of the most common skin conditions that are referred for teledermatology consultations by primary care providers. The system was trained on 16,114 deidentified cases, including photographs and demographics and medical history data. The top diagnostic accuracy of this system was not inferior to that of dermatologists and was higher than that of other primary care providers. This system also provides a differential diagnosis, which is particularly beneficial for dermatology diagnoses to expedite treatment initiation and reduce morbidity. (Nat Med 26:900–908, 2020; https://doi.org/10.1038/s41591-020-0842-3) Selected by I. Brownell

Cytotoxic T cells drive endothelial cell apoptosis in systemic sclerosis

Fibrosis and vasculopathy characterize the autoimmune inflammatory disorder systemic sclerosis (SSc). SSc pathophysiology is incompletely understood, and current treatments are inadequate. Maehara et al. (2020) recently demonstrated that cytotoxic CD4⁺ T cells comprise the major immune cell infiltrate in the skin in patients with early diffuse SSc. These T cells gain CD57 expression and lose CD28 expression, thus representing the most differentiated effector subset of the cytotoxic CD4⁺ T cells. Moreover, endothelial cells, which upregulate HLA class II molecules in SSc tissues, are prominent targets of apoptosis in involved tissues. These findings indicate that CD4⁺ cytotoxic T cells, which are known to induce apoptosis in an HLA class II–dependent manner, directly contribute to vasculopathy and tissue fibrosis through targeted endothelial cell killing and production of inflammatory molecules that lead to tissue remodeling and fibrosis. Targeting cytotoxic T cells in early disease may offer a therapeutic option for halting SSc progression. (J Clin Invest 130:2451–2464, 2020; https://doi.org/10.1172/JCI131700) Selected by T. Schwarz