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Objectives: Despite progress elucidating the molecular mechanisms involved in skin aging, identifying approaches to improve skin appearance remains a challenge. Combining molecular biology, gene expression, and clinical data with computational mechanistic modeling provides a novel approach to support material identification and evaluation.

Methods: To increase the scientific understanding of biological pathways underlying skin aging and evaluate potential anti-aging technologies, Rosa and P&G developed a Skin PhysioPD Research Platform (Platform), a quantitative physiological model representing the physiology of aged skin and the potential visible effects of anti-aging products. The Platform represents key components and processes involved in intrinsic and photaging of normal human skin and begins to illuminate the mechanisms of anti-aging appearance benefits. Published and proprietary data was used in the Platform development and qualification. Five Virtual Consumers (VCs) representing different phenotypes of aged skin were created to investigate responses to standard of care (SOP) and novel anti-aging technologies. The simulated outcomes of SOP therapies, e.g., topical retinoic acid, estrogen (E2), Fraxel® agree with the published data.

Results: New application were simulated on all VCs, and the predicted effects on the magnitude and the speed of skin appearance improvements were analyzed, leading to insights supporting prioritization of technologies. Simulations revealed that, given specific treatment onset and duration, topical E2 may lead to improvements in the appearance of photaged skin. Positive effects of E2 treatment include stimulation of hyaluronic acid (HA) related pathways and that could result in increased skin viscoelasticity. These results have been previously presented in part at Society for Investigative Dermatology Annual Meeting, Portland, OR, April 26-29 2017 and published in the conference proceedings as Abstract 563.

Conclusions: Mechanistic modeling is useful in elucidating key pathways involved in skin aging. On-going research using the Platform is expected to continue to enhance P&G’s ability to make informed development decisions.