**In vivo single human sweat gland activity monitoring by CARS and TPEF microscopies**

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**ABSTRACT:** Eccrine sweat secretion is of central importance for control of body temperature. Although the incidence of sweat gland dysfunctions might appear of minor importance, it can be a real concern for people suffering either from hypohidrosis or hyperhidrosis [1].

Nonlinear microscopic techniques, including coherent anti-Stokes Raman scattering (CARS) and two-photon excited auto-fluorescence (TPEF) microscopies, have shown strong potentials for biological applications [2]. In this work, they were used to study single sweat gland activity (SSGA), a relatively unexplored field in dermatology, *in vivo* in human palm. By filling sweat pore with oil and tuning CARS resonance at 2845 cm⁻¹, we observed the ejection of sweat droplets from a single sweat gland in real-time (see Fig. 1). TPEF signal was detected at the same time, which shows the inner morphology of sweat pore.

Averagely, for a single sweat pore, the frequency of sweat events is about 3 minutes in the conditions studied; each event lasts for about 30 seconds. In total, about 20% of sweat glands are found inactive on human palm. The early ‘transient sweat flow’ corresponding to the rapid (few seconds) expansion of the sweat area immediately before its start is 1.1pL/s. Our study additionally explored the anti-transparent action of aluminum chlorohydrate (ACH). The formation of a ‘plug’, which is resulted from the interaction between ACH and proteins, at the pore entrance is revealed *in vivo* for the first time [3].

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