

Abstract Submitted  
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**Oxidant Signaling in Cells Revealed by Single Rare-Earth Based Nanoparticle Imaging** CEDRIC BOUZIGUES, MOUNA ABDESSELEM, RIVO RAMODIHARILAFY, THIERRY GACOIN, Ecole Polytechnique, PIERRE-LOUIS THARAUX, PARCC - Inserm - HEGP, ANTIGONI ALEXANDROU, Ecole Polytechnique — The spatio-temporal organization of signaling pathways controls the cell response. Reactive oxygen species (ROS) are second messengers involved in the control of numerous normal and pathological processes and their local concentration is thus tightly regulated. However, the dynamics of ROS production and organization is mostly unknown, due to the lack of efficient probes. We developed single ROS sensitive  $\text{Eu}^{3+}$ -doped nanoparticle imaging to quantitatively probe the intracellular ROS response. We revealed specific temporal patterns of ROS production under different types of stimulation (PDGF and ET-1) and quantitatively identified mechanisms of transactivation, which notably control the dynamics of the cell response. By using a microfluidic system, we apply spatially controlled stimulations and displayed the maintenance of asymmetric ROS concentration in the cell under a PDGF gradient. We then developed a ratiometric method using a nanoparticle mix, to quantitatively detect ROS with a 500 ms temporal resolution. We thus elucidate molecular mechanisms responsible for the control of the oxidant production kinetics. Altogether, our results reveal regulation mechanisms controlling ROS spatio-temporal organization, which can be crucial for the buildup of the cell response.

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