



COLLÈGE  
DE FRANCE  
—1530—

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# SPATIO-TEMPORAL REGULATION OF A RESPIRATORY COMPLEX IN *ESCHERICHIA COLI*

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Salle 2

Oxidative phosphorylation (OXPHOS) is an essential process for most living organisms sustained by multisubunit complexes anchored in the lipid bilayer. The basic principle of OXPHOS applies to the respiratory electron transfer chains of eukaryotes and prokaryotes. Plasticity is a hallmark of the OXPHOS process. In eukaryotes, mitochondria are dynamic compartments fine-tuning their activity in response to changes in nutrient availability and oxygen concentrations through a plastic organization of the OXPHOS complexes in the membrane. Such a plastic organization consists in a balanced distribution between isolated complexes and supercomplexes. Similarly, prokaryotes are characterized by the coexistence of several complexes both at the electron input and output leading to multiple electron transfer routes. Such a metabolic flexibility accounts for colonization of multiple environments and adaptation to environmental changes. An immediate question concerns the cellular organization of OXPHOS in living organisms i.e. how are distributed the complexes across the membrane? Is there a dynamic distribution? Furthermore, does such organization have functional implications ?

Through the use of fluorescent protein tagging, we have characterized at a single-cell level the distribution of the nitrate reductase from *E. coli*, an anaerobic OXPHOS complex largely represented in prokaryotes. Apart from observing a submicrometric localization of the complex at the bacterial cell poles, its distribution within the cytoplasmic membrane is strongly influenced by environmental signals, that is, in response to the metabolic demand. We provide here the identification of an unprecedented polar cue and describe the functional implications of such spatio-temporal regulation. In summary, I will discuss how spatio-temporal regulation on timescales of few tens of minutes may significantly influence the optimum performance of the bacterial cell.