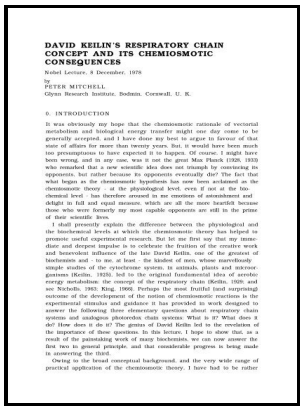
Mitochondrial energy transduction and oxidative phosphorylation - conservation and transfer of energy coupled to oxidoreduction in the terminal region of the respiratory chain

Societas Scientiarum Fennica - Electron carriers and energy conservation in mitochondrial respiration



DAVID KEILIN'S RESPIRATORY CHAIN CONCEPT AND ITS CHEMIOSMOTIC CONSEQUENCES

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by

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0. INTRODUCTION

It was obviously my hope that the chemiosmotic rationale of vectorial metabolism and biological energy transfer might one day come to be generally accepted, and I have done my best to argue in favour of that state of affairs for more than twenty years. But, it would have been much too presumptuous to have expected it to happen. Of course, I might have been wrong, and in any case, was it not the great Max Planck (1928, 1933) who remarked that a new scientific idea does not triumph by convincing its opponents, but rather because its opponents eventually die? The fact that what began as the chemiosmotic hypothesis has now been acclaimed as the chemiosmotic theory - at the physiological level, even if not at the biochemical level - has therefore aroused in me emotions of astonishment and delight in full and equal measure, which are all the more heartfelt because those who were formerly my most capable opponents are still in the prime of their scientific lives.

I shall presently explain the difference between the physiological and the biochemical levels at which the chemiosmotic theory has helped to promote useful experimental research. But let me first say that my immediate and deepest impulse is to celebrate the fruition of the creative work and benevolent influence of the late David Keilin, one of the greatest of biochemists and - to me, at least - the kindest of men, whose marvellously simple studies of the oxytochrome system, in animals, plants and microorganisms (Keilin, 1925b) led to the original fundamental idea of aerobic energy metabolism: the concept of the respiratory chain (Keilin, 1925 and see Nicholls, 1985; King, 1966). Perhaps the most fruitful (and surprising) outcome of the development of the notion of chemiosmotic reactions is the experimental stimulus and guidance it has provided to work designed to answer the following three elementary questions about respiratory chain systems and analogous photosynthetic chain systems: What is it? What does it do? How does it do it? The genius of David Keilin led to the revelation of the importance of these questions. In this lecture, I hope to show that, as a result of the painstaking work of many biochemists, we can now answer the first two to general principle, and that considerable progress is being made in answering the third.

Owing to the broad conceptual background, and the very wide range of practical application of the chemiosmotic theory, I have had to be rather

Description: -

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Phosphorylation.

Energy metabolism.

Mitochondria.Mitochondrial energy transduction and oxidative phosphorylation - conservation and transfer of energy coupled to oxidoreduction in the terminal region of the respiratory chain

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Commentationes biologicae -- 43Mitochondrial energy transduction and oxidative phosphorylation - conservation and transfer of energy coupled to oxidoreduction in the terminal region of the respiratory chain

Notes: Bibliography: p. 38-42.

This edition was published in 1971

Tags: #Stress #signalling #dynamics #of #the #mitochondrial #electron #transport #chain #and #oxidative #phosphorylation #system #in #higher #plants

Electron carriers and energy conservation in mitochondrial respiration

The mitochondrial content of rat brain and liver is not reduced in aging and the impairment of mitochondrial function is due to decreased rates of electron transfer by the selectively diminished activities of complexes I and IV. The proton-pumping stoichiometry of complex I i.

Bottom

LPEP, lipid peroxidation end products. The electron transport pathway Fig.

Organization of the Respiratory Chain and Oxidative Phosphorylation

Given their strong involvement in energy homeostasis, mitochondria are key organelles for plant responses to environmental stresses.

Plant Uncoupling Mitochondrial Protein and Alternative Oxidase: Energy Metabolism and Stress, Bioscience Reports

Balanced internal hydration discriminates substrate binding to respiratory complex I. To further investigate this issue, we subjected parental, SDHB KO, and SDHB KOSDHA low cells to RNAseq analysis Supplementary Fig.

Structures of mitochondrial oxidative phosphorylation supercomplexes and mechanisms for their stabilisation

As a small haem protein located in the mitochondrial intermembrane space and carrying electrons between complex III and complex IV, cytochrome c plays important roles in these interfaces.

Oxidative Phosphorylation

This occurs for instance under situations of ETC inhibition or ETC slow-down, whenever ADP availability is reduced by stress. NBGE analysis showed high levels of CII low in SDHB KO MDA231 cells and little CII low in SDHB KOSDHA low cells Fig. The flow of electrons occurs in a stepwise fashion, releasing the free energy incrementally.

Oxidative Phosphorylation

The ultimate goal is to construct a basic living unit entirely from non-living components.

Oxidative Phosphorylation

In this work we combine molecular evolution analyses with crystallographic and secondary structure prediction analyses to explore how mitochondrial genetic variation may be linked to the diverse metabolic patterns of 41 mammalian species Table from each of the four major clades of the placental mammals.

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