# Membrane current evoked by mitochondrial Na<sup>+</sup>-Ca<sup>2+</sup> exchange in mouse heart Mohammed Moinul Islam, Ayako Takeuchi, Satoshi Matsuoka

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#### Background

Mitochondrial Na<sup>+</sup>-Ca<sup>2+</sup> exchanger (NCXm) is essential for maintaining mitochondrial Ca<sup>2+</sup> homeostasis. We aimed to measure and characterize the NCXm-mediated membrane current using mitoplasts derived from mouse heart in order to clarify the electrogenicity of NCXm, which has been a controversial topic for a long time.

### Methods

Mitochondria were isolated from mouse heart and were exposed to a hypotonic solution to form mitoplasts (Fig 1), which were then used for whole-mitoplast patch clamp experiments (Fig 2).

## Results

Under conditions that K<sup>+</sup> and Cl<sup>-</sup> currents, and Ca<sup>2+</sup> uniporter current were inhibited, extra-mitochondrial application of 12.5 - 50 mM Na<sup>+</sup> or 50 mM Li<sup>+</sup> induced inward currents with 1  $\mu$ M Ca<sup>2+</sup> in the pipette (Fig 3a). The inward current was diminished without Ca<sup>2+</sup> in the pipette, and was augmented with 10  $\mu$ M Ca<sup>2+</sup> (Fig 3b). The Na<sup>+</sup> and Li<sup>+</sup>-induced inward current were largely inhibited by 2  $\mu$ M CGP-37157, a mitochondrial Na<sup>+</sup>-Ca<sup>2+</sup> exchange blocker.



#### Conclusion

We succeeded in measuring the NCXm currents for the first time. It was concluded that the NCXm is electrogenic.

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