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Review

# Non-beating HL-1 cells for confocal microscopy: Application to mitochondrial functions during cardiac preconditioning

Sophie Pelloux[a], Julie Robillard[b], René Ferrera[a], André Bilbaut[c], Carlos Ojeda[d], Valdur Saks[e], Michel Ovize[a], Yves Tourneur[a,f,*]

[a]*INSERM E0226 Université Lyon1, 8 Avenue Rockefeller, 69373 Lyon, France*
[b]*Université de Montréal, Canada*
[c]*CNRS UMR 5123 49 Boulevard du 11 novembre 1918, 69622 Villeurbanne, France*
[d]*INSERM ERIT-M 107 18 Avenue du doyen Lépine, 69500 Bron, France*
[e]*Fundamental and Applied Bioenergetics, INSERM E0221, Joseph Fourier University, Grenoble, France*
[f]*Centre Commun de Quantimétrie Université Lyon1, 8 Avenue Rockefeller, 69373 Lyon, France*

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## Abstract

HL-1, the first cell line with a cardiac phenotype for biological experiments, displays spontaneous electrophysiological and mechanical regular activity, and cyclic calcium movements. We isolated a derived line, devoid of transient movements, for confocal microscopy experiments. These cells do express cardiac proteins: connexin 43, the cardiac isoform of dihydropyridine receptors, desmin, and developmental myosin but have no sarcomeric arrangement. They still possess the electrophysiological characteristics and ionic currents of cardiac cells, among them the cardiac potassium current $I$Kr. We also found diazoxide and glibenclamide sensitive potassium channels with properties similar to $I\mathrm{K}_{\mathrm{ATP}}$ in adult cardiac myocytes. The pacemaker current $I_{\mathrm{f}}$ was not observed, in agreement with the cells showing excitability but lacking in pacemaker activity.

The absence of movement is an advantage for studies which include changes of media in order to follow morphological changes under continuous perfusion. We observed however a basal spontaneous movement of mitochondria and we developed a method to quantify its amplitude using confocal microscopy. No mitochondrial depolarization could be detected when the membrane potential was measured by using very

*Corresponding author. Tel.: +33 4 78 77 75 19; fax: +33 4 78 77 71 75.
*E-mail address:* yves.tourneur@univ-lyon1.fr (Y. Tourneur).

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low light photomultiplier and confocal fluorescence imaging under the $K_{ATP}$ channel opener diazoxide. Thus cardiac pharmacological preconditioning by $K_{ATP}$ channel openers might involve other routes than mitochondrial K channels targeting.


*Keywords:* HL-1 cell line; $K_{ATP}$ channels; Mitochondrion; Cardiac preconditioning

**Contents**