Title (en)

METHOD FOR MEASURING THE VITALITY OF CELLS

Title (de)

VERFAHREN ZUR VITALITÄTSMESSUNG VON ZELLEN

Title (fr)

PROCEDE POUR MESURER LA VITALITE DE CELLULES

Publication

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Application

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Priority

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- EP 00124662 A 20001110

Abstract (en)

[origin: EP1205540A1] To measure the vitality of biological cells without damaging them, especially to determine apoptosis where damaged cells are destroyed in a programmed process without damage to the whole organ, at least one cell is exposed to high frequency and alternating and especially rotating electrical fields and/or impedance test fields. The measurements give at least one measured parameter, characteristic for the state of cell vitality. To measure the vitality of a biological cell, at least one cell is measured by at least one rotation spectrum through its rotary speed according to the frequency of the rotating electrical field. The rotary speed of at least one cell is determined by at least one frequency in a range of 1-4 MHz and preferably 2-3 MHz and especially 2.3-2.6 MHz, and a frequency range of 5-100 MHz and preferably 6-50 MHz and especially 8-15 MHz. The measurement parameter is derived from the quotient of the rotation speeds in the higher and the lower frequency ranges. The quotient for an apoptotic cell is ≥ 1 and preferably 1.1-1.8, where the quotient for necrotic cell is ≤ 1 and preferably 0.6-0.8, and the quotient for a vital cell is 1. Apoptosis is determined in a cell by comparison of the rotation spectrum and/or the minimum of two rotation speeds with the rotation spectrum and/or a minimum of two identical frequencies at a reference cell. Apoptosis is established if the rotation spectrum of the test cell in comparison with the reference cell has its maximum in a low frequency range, where the reference cell is a vital cell or a cell targeted into a necrotic condition. Apoptosis is also established if the test cell rotation has its maximum against the reference cell in a frequency range of 5-100 MHz and preferably 6-50 MHz and especially 8-15 MHz. Apoptosis is also established if the rotation spectrum of the test cell has its maximum in a comparable frequency range as the reference cell, where the reference cell is at a condition of apoptosis and preferably the same cell type. Apoptosis is also established where the rotation spectrum of the test cell, exactly as the reference cell, has its maximum in a frequency range of 5-100 MHz and preferably 6-50 MHz and especially 8-15 MHz. At least one dielectrophoresis spectrum of at least one cell is measured by the drift speed or the electrophoretic movement of the cell according to the frequency of the electrical field. The dielectrophoresis spectrum of at least one cell is denoted by an external conductivity of especially 0.3 S/m in a frequency range of 0-5 MHz and especially 1-4 MHz. The frequency penetration of the transit from a negative to a positive dielectrophoresis lies in a dielectrophoresis spectrum of 3.3-3.8 MHz and preferably 3.5 MHz. Apoptosis is established by the comparison of the dielectrophoresis spectrum of the test cell with that of a reference cell. At least one impedance spectrum is measured at the test cell by establishing the impedance amount and/or phase according to the frequency of the impedance test field. The impedance spectrum of the test cell is shown in a frequency range of 1 Hz to 100 kHz, and preferably 0.5-10.0 kHz. Apoptosis is established by the comparison of the impedance spectrum of the test cell with that of a reference cell. The reference cell is a vital cell, a cell targeted into an apoptotic or necrotic condition, and preferably of the same cell type as the test cell. The impedance spectrum of an apoptotic cell shows changes in a frequency range of 1 Hz to 100 kHz and especially 0.5-10.0 kHz in comparison with a vital or necrotic cell. At least one cell is held simultaneously suspended in focus, in an optical trap, on the rotation speed and/or the dielectrophoresis spectra and/or impedance spectra in at least one frequency. At least two rotation speeds and/or the dielectrophoresis spectra and/or the impedance spectra are taken with a time function. An Independent claim is included for a procedure to identify substances which influence apoptosis. At least one test cell culture sample is prepared, to which is added a substance which affects apoptosis or a mixture of at least two such substances. The treated cell culture sample is passed into a micro system to determine at least one measurement parameter which is characteristic of the cell vitality state. The apoptosis-affecting characteristics are determined by the comparison of the condition of at least one test cell with a reference cell.

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