Method and kit to predict cell death in response to biotic and/or abiotic stimuli

Abstract

The patented invention relates to the field of biotechnology and diagnostics in that it describes an in vitro and ex vivo method for predicting cell fate and/or cell death in response to stimuli and/or stress based on the analysis of gene expression and on the processing of the data obtained and its use in laboratory and clinical research.

State of the art

Predicting signalling pathways in cancer cells could help in the rational design of personalised therapeutic strategies targeting signal transduction pathways or for an early prediction of the strategy's efficacy on a specific cellular system. Known state-of-the-art processes have several drawbacks. They can usually predict one type of cell fate per experiment, because they are based on the analysis of single pathways or allow the identification of one type of stress or disease condition at a time. In addition, the methods available to date take about 1-2 months to detect cell response to stimuli and/or cell death, whereas the result of early assessment is much more advantageous for changing therapy or testing its effects.

Invention Description

The present invention provides an in vitro or ex vivo method for the prediction of cell development, fate and death in response to external or internal stimuli and stresses, which can be used for research and/or clinical purposes and for testing cell cultures in vitro (Fig. 1).

External or internal stimuli and stresses are defined as any biotic and abiotic factors that can induce cell death, such as drugs, drug active ingredients, and environmental factors, environmental contaminants. The present invention allows the simultaneous analysis of various genes involved in a variety of cellular pathways and, through the aid of an algorithm designed ad hoc, it also allows to provide reliable and fast predictive data on the prediction of the cellular response that is being activated, in many conditions (physiological and / or pathological).
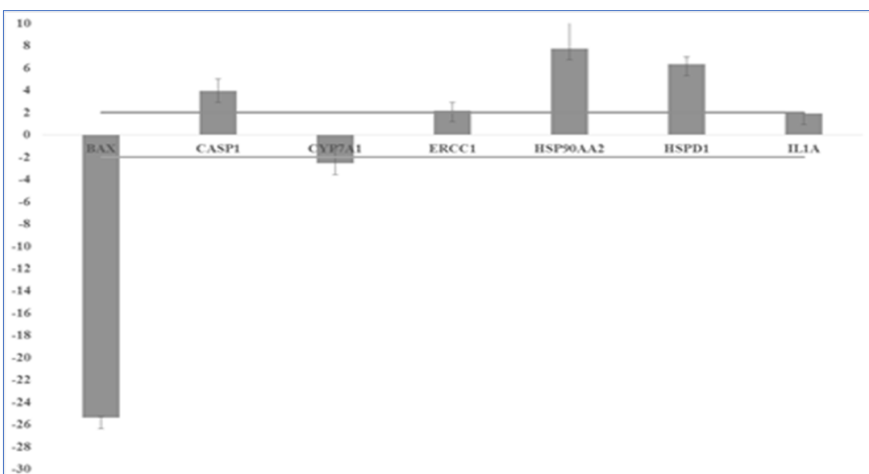

Figure 1 - Over-regulation of key genes involved in the formation of pyroptosis by inflammatory cell death through activation of caspase-1 on the lung adenocarcinoma cell line treated with a pure chemical fraction isolated from the marine microalga Cyclotella cryptica

Industrial Property

European regional phase no. 20751143.7 of PCT/EP2020/071981 filed with priority on 05/08/2020.

Italian patent granted with no. 102019000012624, filed on 26/08/2019

INVENTORS:
- Clementina Sansone
- Maria Luisa Chiusano
- Giovanna Romano
- Adrianna Ianora
- Christophe Brunet
- Christian Galasso
- Michael Tangherlini

TTO (Technology Transfer Office):
- Ornella Papaluca

Method and kit to predict cell death in response to biotic and/or abiotic stimuli

Advantages

The patented invention allows:

- simultaneous monitoring of different pathways involved in the cellular response to stimuli;
- early assessment of cellular response to external or internal stimuli and stresses, providing indications for changing therapy or testing its effects;
- the use of a fast and predictive diagnostic tool for short and long term health status in the establishment of an inflammatory process and in the effect of the therapeutic procedure adopted.
- The time and costs saving from samples analysis, cell fate response and the evaluating the cell signaling pathwayfrom (about 24 hours).

Applications

The patented invention finds application in the following areas:

- biomedical research (in vitro testing);
- clinical purposes (predictive diagnostics);
- environmental assessment and monitoring.

The industrial applications of the present invention are shown in the figure 2.

Development stage

Current TRL: 4.

In vitro and ex vivo experiments were carried out to evaluate the effectiveness of the invention. The invention has been validated in experimental analyzes.

Perspective TRL: 6 (7)

The context of application of the invention can be expanded. The diagnostic kit lends itself to be rapidly put on the market for diagnostic and prognostic analysis in clinical trials in order to optimize the parameters in the clinical field. It can be brought to a phase of consolidated use in classical clinical diagnostics in a short time.
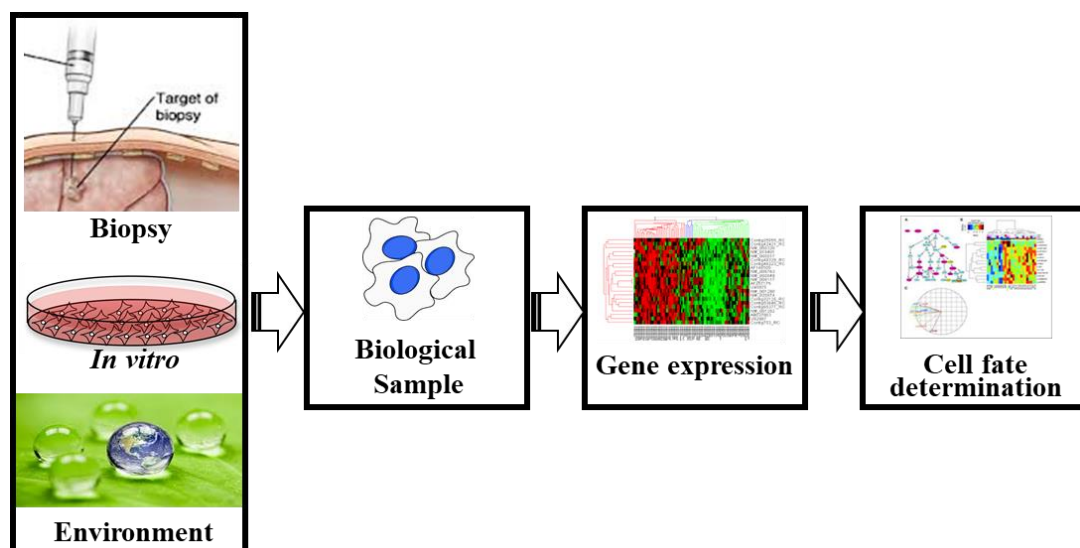

Figure 2 -Graphical representation of potential applications of the patent.

CONTACTS: Clementina Sansone (clementina.sansone@szn.it) ; TTO - Ornella Papaluca (tech.transfer@szn.it)