Effects of ROS in human adrenocortical carcinoma SW-13 cells

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Background

- Herbicide “paraquat” is known as an inducer of active oxygen, which causes oxidative stress in the living body.
- Active oxygen is reported to be a bioactive factor such as cell proliferation and differentiation.

PQ (paraquat) is a non-selective herbicide that shows strong toxicity against humans and mammals besides plants.

The relationship between PQ and cell proliferation/differentiation is unknown.

Purpose of this study

Verify the effect on cell morphology and activation signal by exposing PQ on human adrenocortical carcinoma SW-13 cells.

Result 1: Cell morphology

- PQ exposure caused SW-13 cells to differentiate neural-like filament.
- Neural induction supplement also differentiated the cells to neural-like filament.

It was suggested that SW-13 had neural differentiation potential, and the differentiation switch was turned ON even by oxidative stress.

Result 2: Calcium dynamics

- Exposed the cells with PQ 1 mM and monitored Ca2+ dynamics
- Normal SW-13 cells (0 min) showed that Ca2+ concentration changed wavy around the nucleus at the 90-sec cycle.
- PQ exposure caused an increase in the intracellular Ca2+ concentration and exerted some influences around the nucleus after 2:30.
- SW-13 cells seemed to control the Ca2+ concentration in the nucleus for 20 min after exposure, however, their control behavior was no longer observed after 30 min, which resulted in the cell death.

Result 3: Cell toxicity

- Cell proliferation increased with PQ concentration dependent manner. (The cells died with 1 mM or more PQ within 24 h).
- It was suggested that PQ stimulation induced apoptosis which was mediated via the caspase pathway.

Conclusion & Future study

- SW-13 cell proliferation was increased by PQ exposure.
- It has been reported that a low concentration of drug stimulation promotes cell proliferation, and PQ also worked similarly.
- PQ differentiated SW-13 cells to neural-like cells.
- We will examine the association between SW-13 neuronal differentiation ability and oxidative stress and analyze gene expression during neural differentiation.
- PQ increased intracellular Ca2+ concentration and affected around the nucleus, in particular.
- It is conceivable that the nucleus tried to control the fluctuation of Ca2+ concentration to get back to usual state in order to cell survival.