QUERCETIN AND LOW POWER LONG WAVELENGTH LASER IRRADIATION EFFECTS SEEN IN HUMAN T CELLS

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M.Dumitrescu[1], T.Seremet[1], S.Radesi[1], Gy.Katona[1], E.Radu[1], J.Horváth[2], E.Tanos[2], L.Katona[1], E.Katona[1]

[1]"Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

[2]LASEUROPA, Budapest, Hungary

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Aims:

to unravel molecular and cellular mechanisms involved in soft laser irradiation effects by monitoring therapeutic red and infrared laser induced changes in

- mitochondrial membrane potential
- cell viability
- cell cycle progression

MATERIALS AND METHODS

Cells:

Human Leukemia T Lymphoblasts : Jurkat

Human peripheral blood lymphocytes : Ly

Peripheral blood mononuclear cells separated from venous blood by Ficoll-Hypaque density gradient centrifugation : ~ 65-70 % aCD3+ T cells

Cell culture media:

G - glucose containing standard RPMI medium supplemented with 10 % (v/v) fetal calf serum (FCS) and 2mM glutamine, as well as 100units/mL Penicillin, and 100µg/mL Streptomycin

G0 - G without 10 % FCS

G01 - G containing 0.1mM NaCN

G1 - G containing 1mM NaCN

G5 - G containing 1mM NaCN G10Q - G containing 10µM Quercetin

G100Q - G containing 100µM Quercetin

AlGaInP/GaAs Lasers: Philips CQL806D, Sony SLD202-D3

680 nm, 25 mW

emitted laser power density in the expandor–increased speckle area : 45 mW/cm² = 0.45 kW/m²

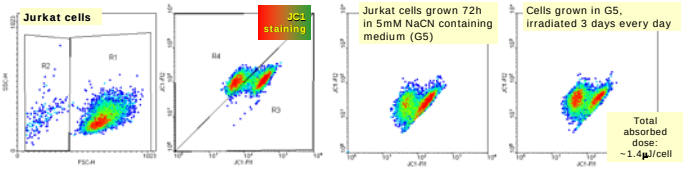
830 nm, 55 mW

emitted laser power density in the expandor-increased speckle area: 100 mW/cm² = 1 kW/m²

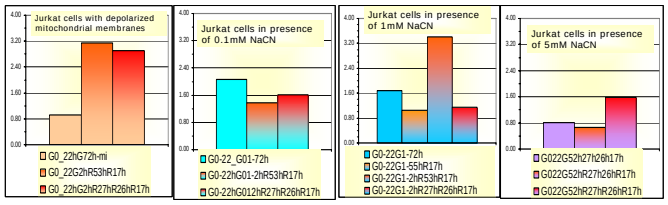
Irradiation regimes: **once** or **twice per day**, or **every second day** with single doses of **(1÷5)x10¹²photons/cell** [~(0.2-1.5) µJ/cell]

Total irradiation doses:~ **(1-15) µJ/cell**

LASER IRRADIATION EFFECTS on the MITOCHONDRIAL MEMBRANE POTENTIAL



680 nm, single irradiation dose (R) : ~1.5x10¹² photons/cell = ~ 0.44µJ/cell



CONCLUSIONS

Low power 680nm and 830nm laser lights effects seen in human T lymphoblast cells (Jurkat) and in peripheral blood lymphocytes are total dose, irradiation regime and cell state dependent.

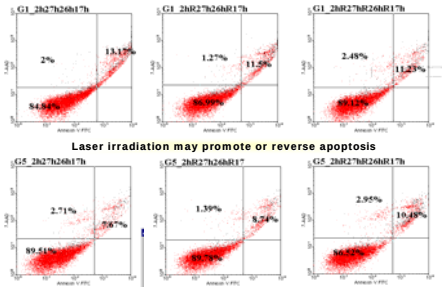
Changes are evident in the mitochondrial membrane potential, cell viability and cell cycle progression.

Bioflavonoid quercetin in high micromolar concentration impedes cell cycle progression of of human leukemia lymphoblast T cells (Jurkat).

Laser irradiation may worsen/reverse quercetin and cyanide-induced toxicity in pertinent conditions

LASER IRRADIATION EFFECTS on CELL VIABILITY

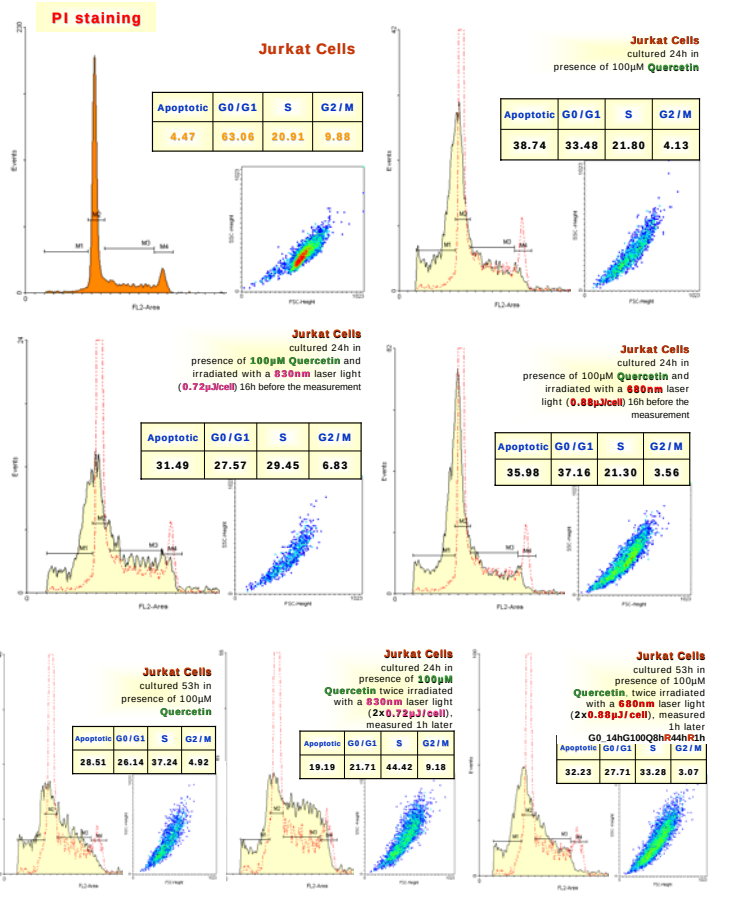
AnnexinV-FITC - 7AAD staining

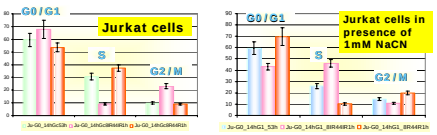


Single irradiation : ~3x10¹² photons/cell = ~ 0.88µJ/cell (R) / ~ 0.72µJ/cell (IR)

LASER IRRADIATION EFFECTS on CELL CYCLE PROGRESSION

PI staining





Single irradiation : ~3x10¹² photons/cell = ~ 0.88µJ/cell (R) / ~ 0.72µJ/cell (IR)

Laser irradiation (R, ~ 0.88µJ/cell) and IR ~ 0.72µJ/cell) significantly influences cell cycle progression of both control and cyanide treated Jurkat cells