



RADIOPROTECTIVE ACTIVITY AND GENOTOXIC EFFECTS OF CURCUMIN IN HUMAN LYMPHOCYTES CULTURES

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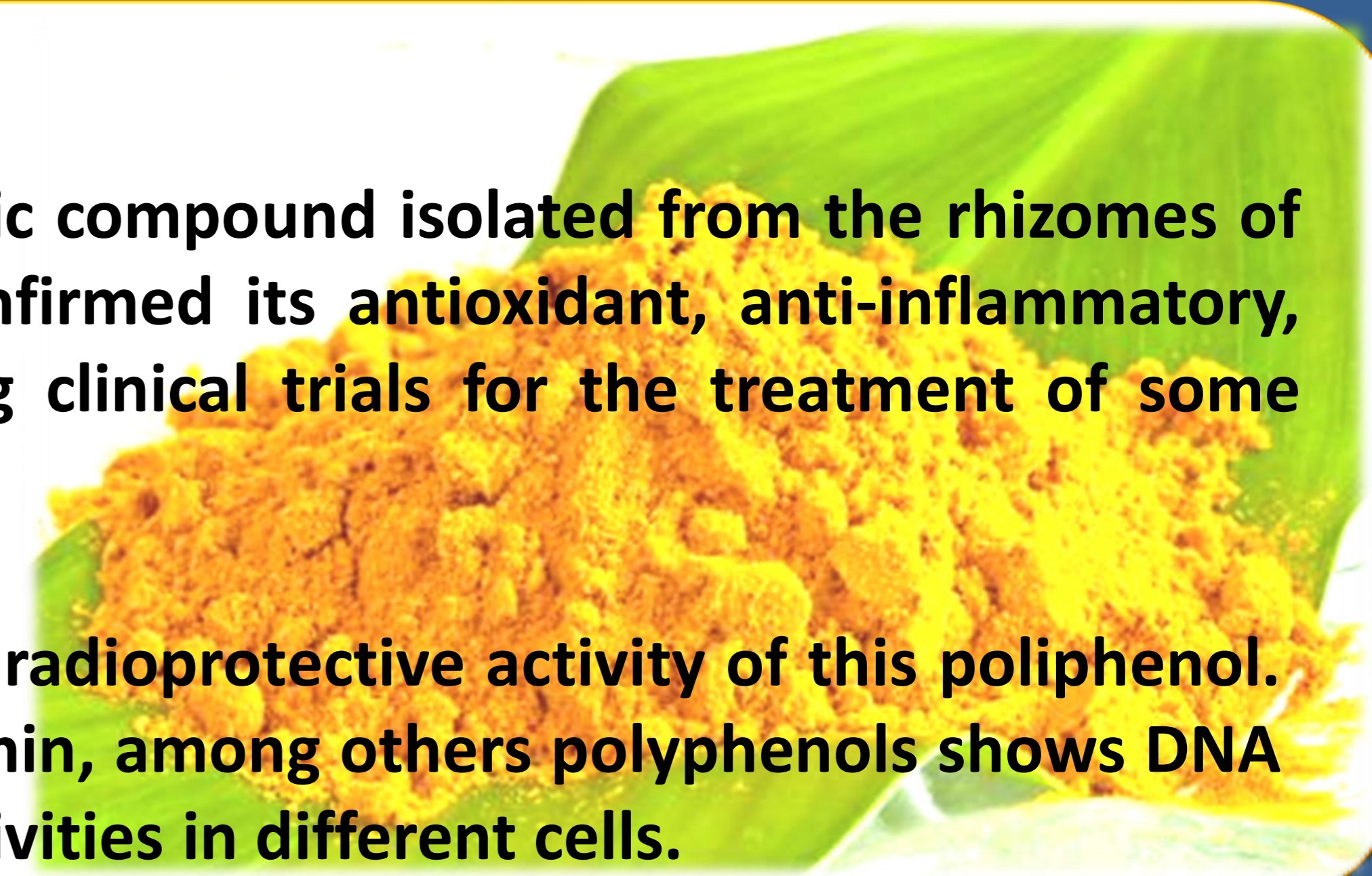


INTRODUCTION

Curcumin (1,7-bis(4-hydroxy 3-methoxy phenyl)-1,6-heptadiene-3, 5-dione) is a major polyphenolic compound isolated from the rhizomes of turmeric (*Curcuma longa*). In the last half century hundreds of scientific publications have confirmed its antioxidant, anti-inflammatory, antibacterial, antiparasitary or antiamyloid properties and nowadays there are several ongoing clinical trials for the treatment of some cancers that are including curcumin⁽¹⁾.

OBJECTIVE

Because of its several properties, concretely its antioxidant characteristic, we aimed to study the radioprotective activity of this polyphenol. Moreover, we evaluated the genotoxic effects of curcumin since some reports suggest that curcumin, among others polyphenols shows DNA damaging property in cells prompting that curcumin exhibits both antioxidant and pro-oxidant activities in different cells.



MATERIAL AND METHODS

Radioprotective activity of curcumin ⁽²⁾

Blood extraction
Curcumin addition

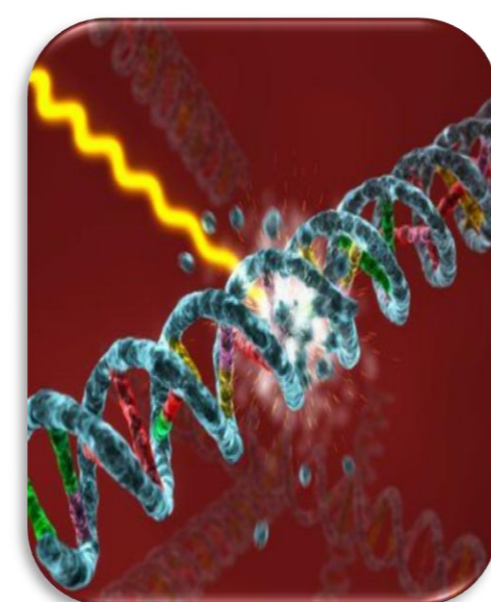
Irradiation at 2Gy in a Teletherapy unit Cobalt 60 (IAEA 2001)

Culture samples in PB-Max medium + BrdU

150 µL of Colcemid was added 2 hours before harvesting

Culture stopped at 48h

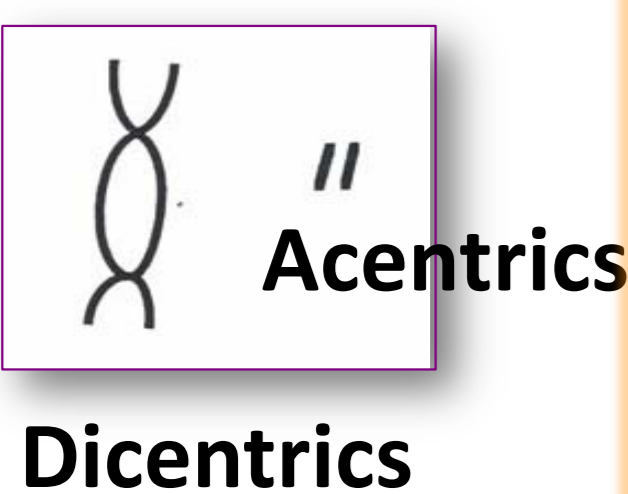
Two- to three-old days slides were stained with the technique "C banding staining"



Metaphases analysis

Biomarker

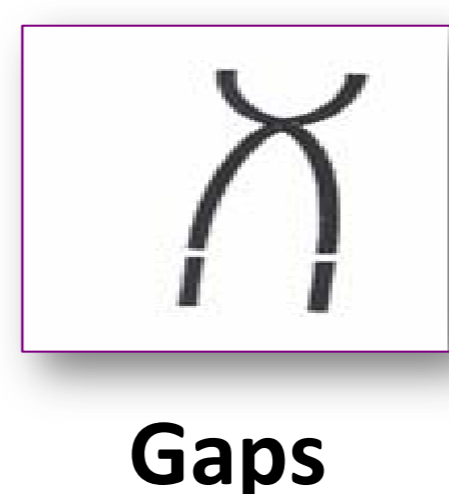
Chromosomal aberrations (CAs)



Rings



Breaks



Gaps

Genotoxic activity of curcumin ⁽³⁾

Blood extraction

Curcumin addition

Culture samples in PB-Max medium + BrdU

150 µL of Colcemid was added 2 hours before harvesting

Culture stopped at 72h

Two- to three-old days slides were stained with the technique "Giemsa plus Fluorescence staining"

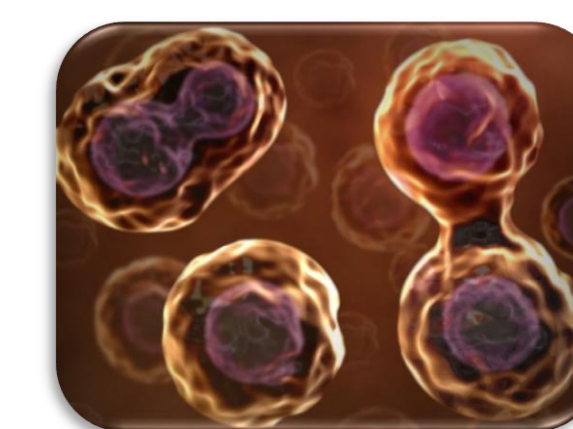
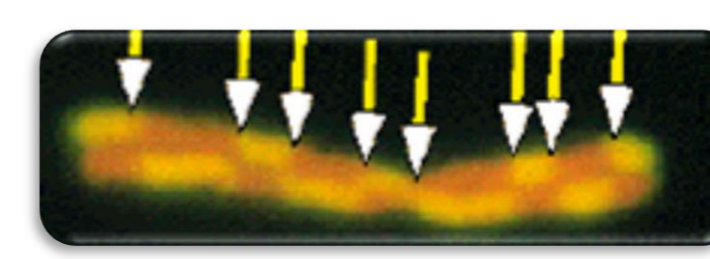
Metaphases analysis

Chromosomal aberrations (CAs)

Mitotic Index (MI)

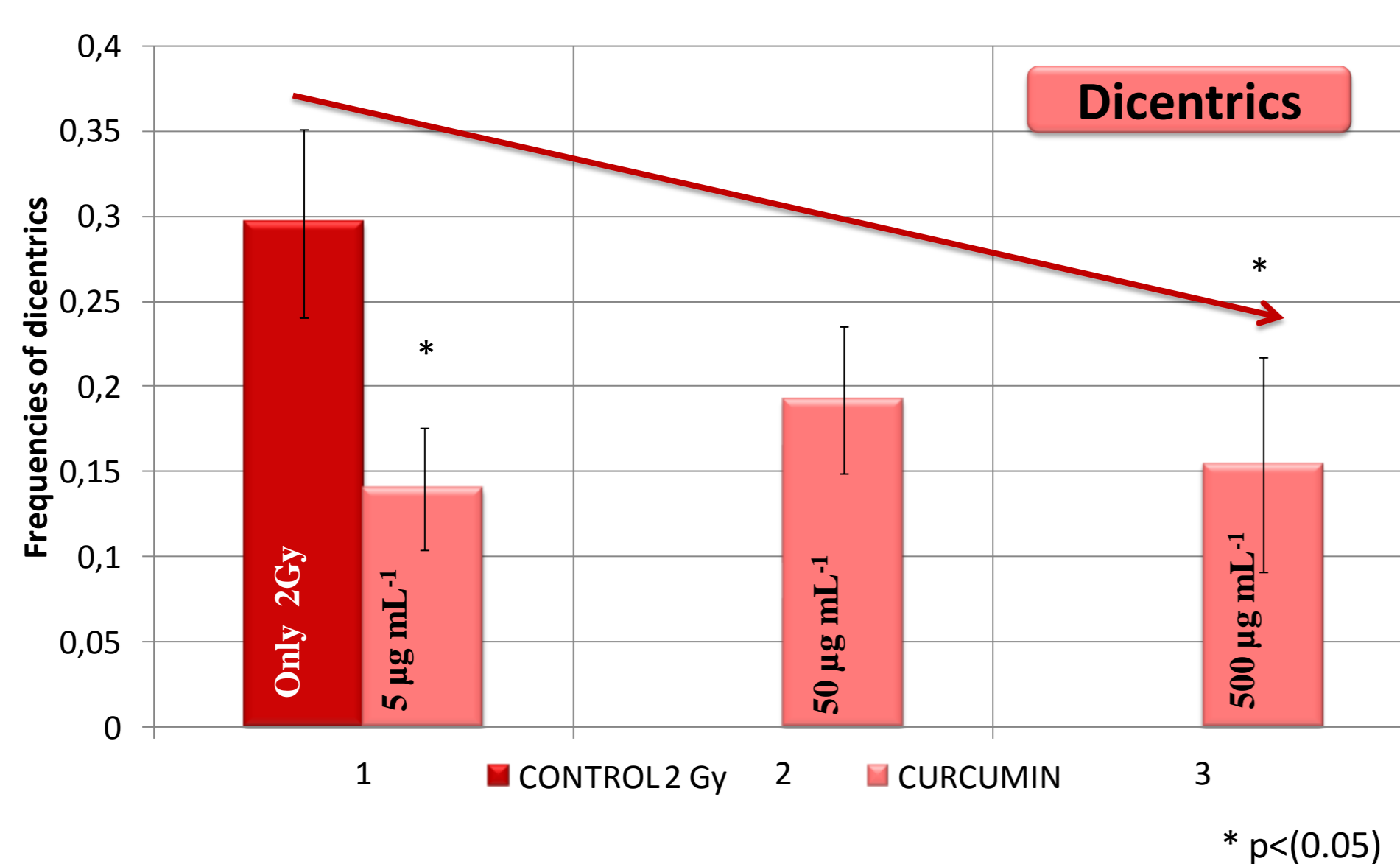
Proliferation Index (PI)

Sister Chromatid Exchange (SCE)



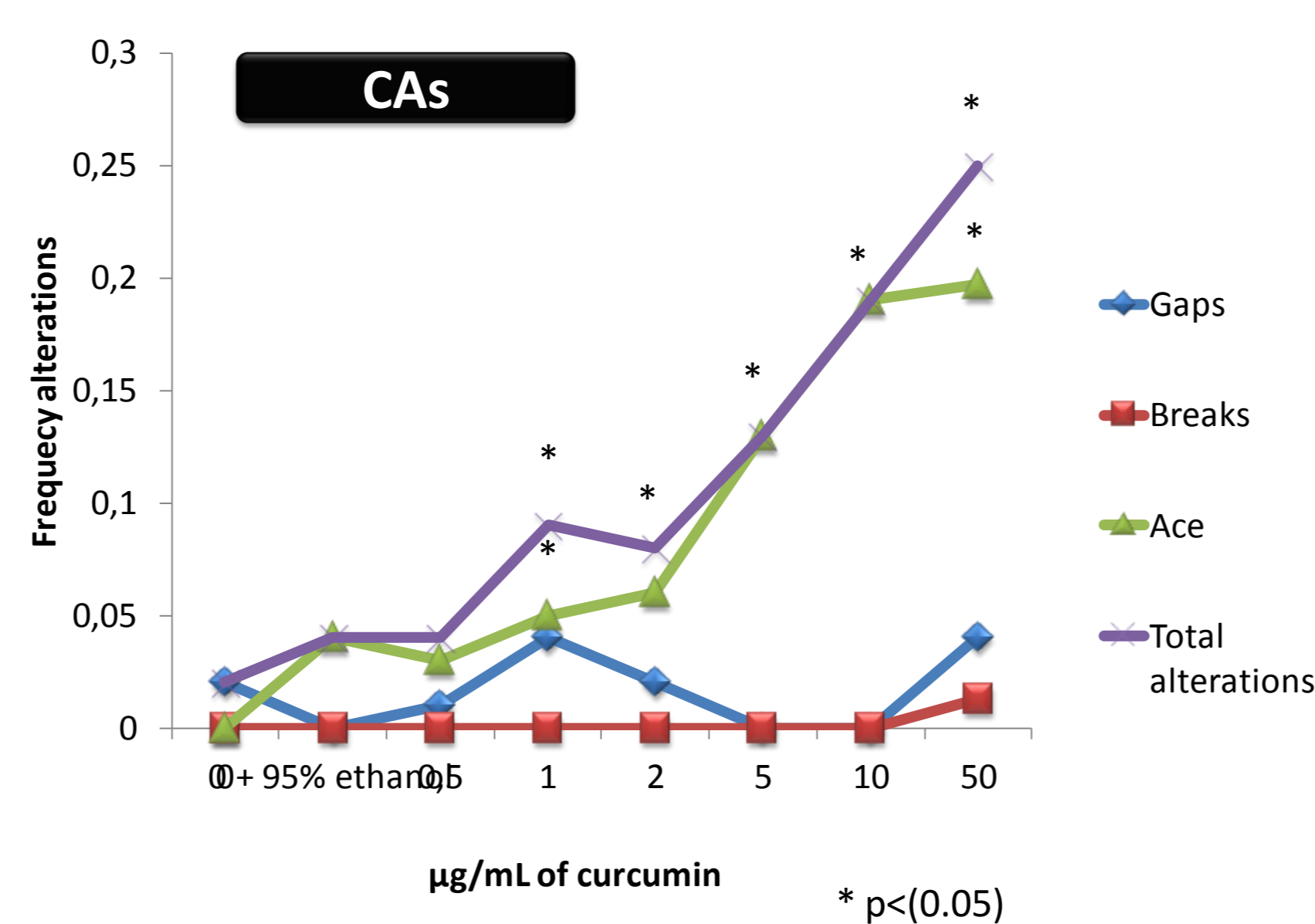
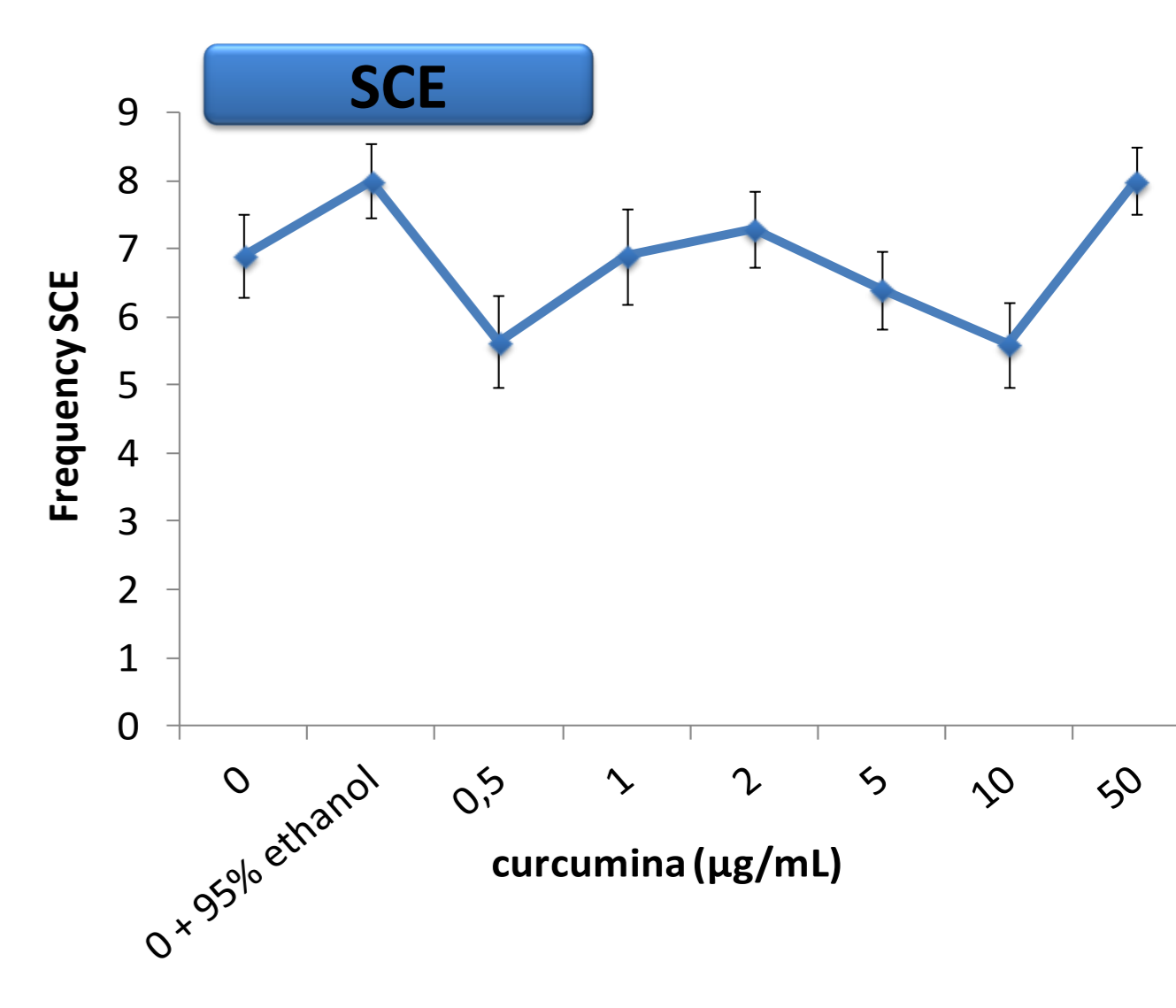
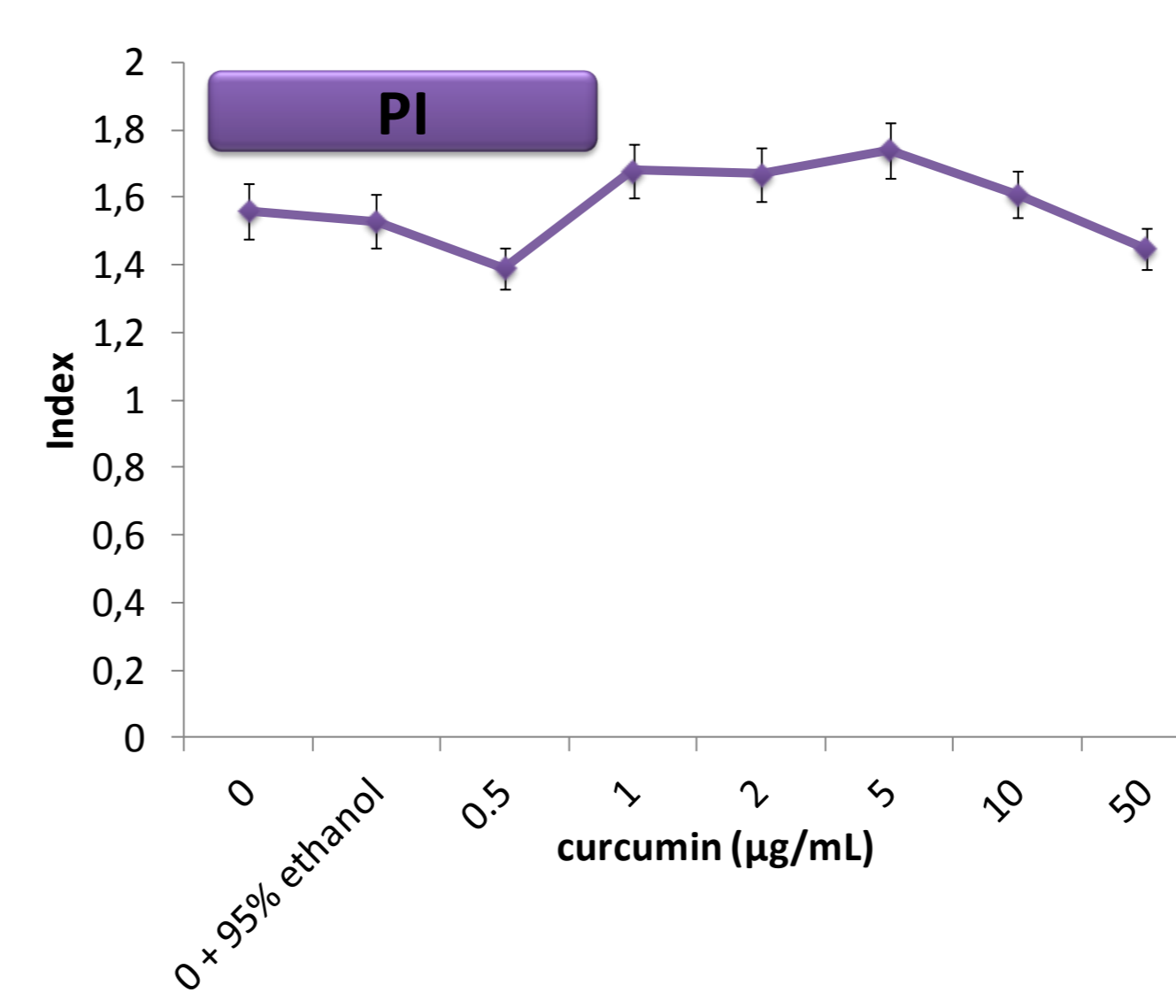
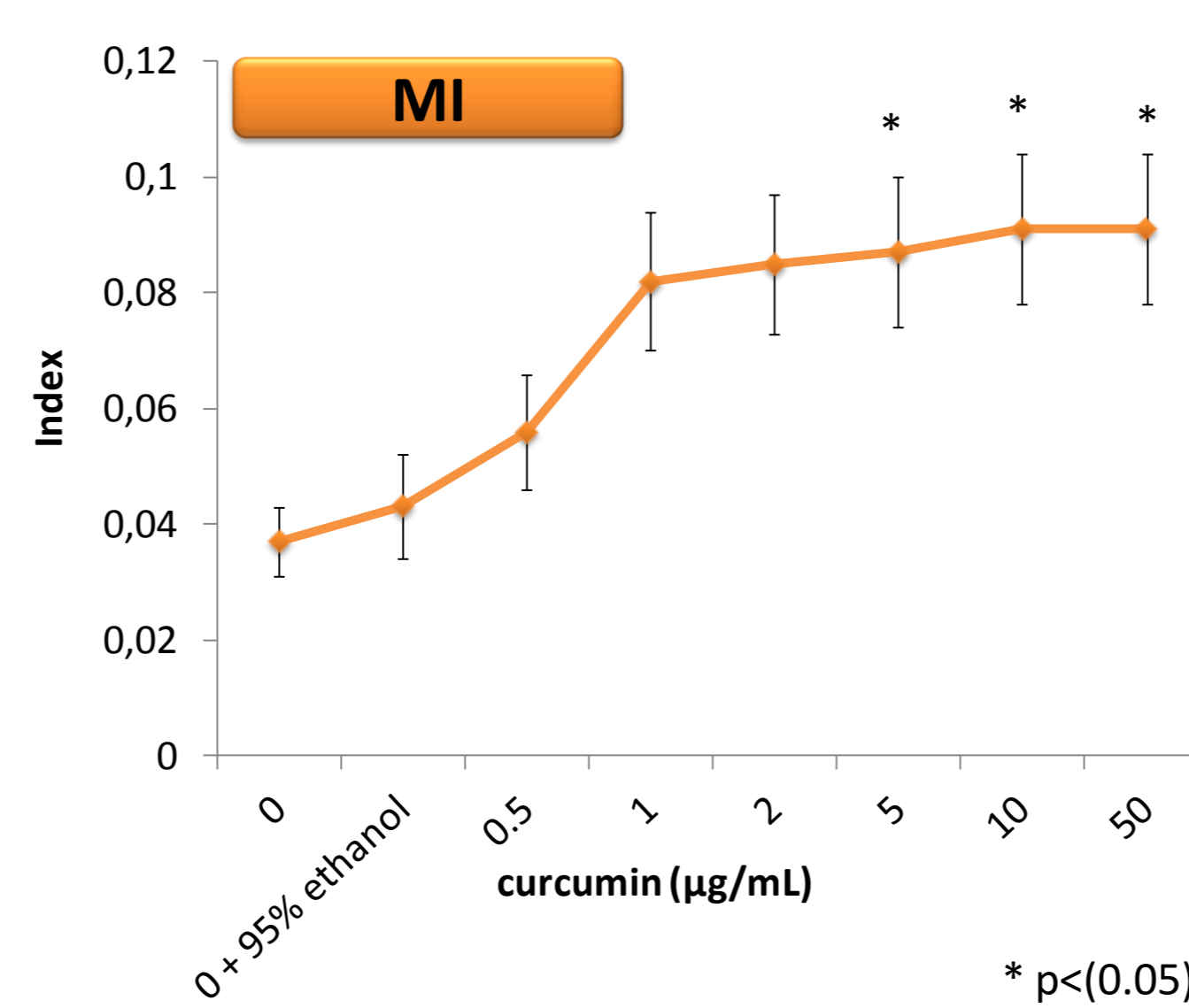
RESULTS AND DISCUSSION

Radioprotective activity of curcumin



- Curcumin reduced radiation-induced chromosomal damage compared with cells irradiated alone at 2Gy at all concentration of curcumin studied.
- Maximum damage protection was observed at the concentration of 5 µg/mL.
- The ability of curcumin to protect cells from DNA damage could be explained in part for the hydrophobic properties passes easily through plasma membrane into cytosol and directly scavenges the free radicals ⁽¹⁾.

Genotoxic activity of curcumin



- All the curcumin concentrations tested induced a MI higher than the MI obtained in the control sample.
- All the curcumin concentrations tested, except at 0.5 and 50 µg/mL, induced a PI higher than the PI obtained in the control sample.
- SCE was not statistically different for any concentrations of curcumin studied.
- Acentric chromosomes were the most frequent the chromosomal aberration found in all concentrations studied may be due to its prooxidant properties ^(1,5).

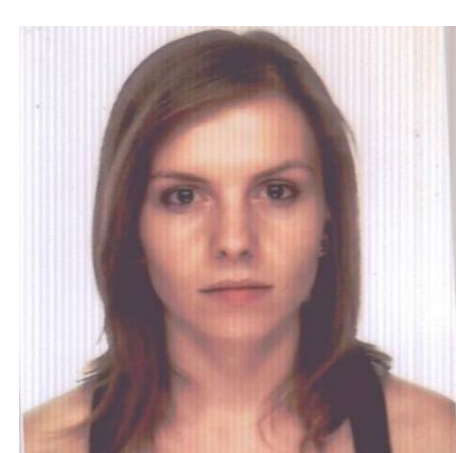
References

- (1) Kunwar et al. Biochimica et Biophysica Acta 1780 (2008) 673–679.
- (2) Montoro et al. Radiation Protection Dosimetry 115 (2005) 461–464.
- (3) Fernandes et al. International Journal of Radiation Biology 84 (2006) 703-711.
- (4) Montoro et al. Food and Chemical Toxicology 50 (2012) 216–221.
- (5) Banerjee et al. Chemico-Biological Interactions 174 (2008) 134–139

CONCLUSIONS

Concerning its **radioprotective properties**, pretreatment with curcumin gives *in vitro* protection to lymphocytes against γ -radiation induced cellular damage measured as chromosomal aberrations due in part to its antioxidant properties.

Concerning its **genotoxic and cytotoxic properties**, curcumin can exert act as a clastogenic and mitogenic agent at high concentrations. However, according to SCE parameter it seems that curcumin has no genotoxic properties to lymphocytes. The concentration of curcumin is a extremely important factor for its toxicological properties ⁽¹⁾.



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