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The Effects of Lycopene Application on Sodium Fluoride (NaF) Applied Renal Cell Line

Sedat ÇETİN[*1], Fatmagül YUR[2], Mehmet TAŞPINAR[3], Semiha DEDE[1], Veysel YÜKSEK[4]

[1]VanYüzüncü Yıl University, Faculty of Veterinary Science, Biochemistry Department, Van
[2]Muğla Sıtkı Koçman University, Faculty of Health Sciences, Muğla
[3]VanYüzüncü Yıl University, Faculty of Medicine, Medical Biology Department, Van
[4]VanYüzüncü Yıl University Özalp Vocational School, Van

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Abstract: The present study was planned to investigate the potential protective properties of lycopene, an antioxidant carotenoid, on NaF applied renal cell line**.** NRK-52E cells were cultured under standard in vitro conditions with regular passages. 10.000 NRK-52E cells were planted in each culture platelet. Cells were incubated for 24 hours at 37°C in an incubator with CO_2. After the incubation, the medium formed on the cells was removed and the prepared NaF and lycopene solutions were added. At least 4 wells were used for each dose. Culture vessels were incubated at 37°C in a CO_2 incubator for 6, 12, and 24 hours for transformation of non-soluble formazan crystals by MTT stain and the MTT assay was conducted. In conclusion, it was found that low lycopene concentrations reduced the toxic effect of NaF by 10-20%, while lycopene increased the toxic effect of NaF synergistically in the high concentration lycopene treated groups. Thus, it was concluded that administration of lycopene on NaF applied renal cell line exhibited different effects based on concentration and duration.

Keywords: NaF, Lycopene, Cell Culture, MTT, Kidney.

1. INTRODUCTION

Lycopene (Lyc) is a carotene with an acyclic structure and 11 conjugated double bonds, where the double bonds are in all-trans form. Chromophore in the polyene chain provides the molecule with a red color and antioxidant properties [1]. It was reported that Lycopene has several uses due to its anti-inflammatory, anticancer, and antioxidant properties [2]. Lycopene inhibits the inflammatory reactions, regulate slip oxygenase and cyclooxygenase enzymes and inhibits prostaglandin, prostaglandin, thromboxane and leukotriene synthesis [3]. It was reported that lycopene is protective against prostate, uterus and liver cancers, aging, Alzheimer's, and cardiovascular diseases [4]. The kidney is well known as the primary organ for fluoride excretion and retention, and the kidney is a sensitive organ that exhibits histopathological and functional reactions to fluoride overload [5]. Fluoride is a toxic substance

*Corresponding Author E-mail: sedatcetin@yyu.edu.tr

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that accumulates in the body. On average, only 50-80% of the fluoride ingested is excreted by kidneys, and the remainder accumulates in bones, pineal glands and other tissues [6].

2. MATERIAL and METHODS

The NRK-52E cells were reproduced in vitro at 37°C, in a medium that contained 5% CO_2 and 95% moisture. 10.000 NRK-52E cells were cultured in 96-well culture plates. It was determined that the IC_{50} value for sodium fluoride (NaF) was 6000 µM [7]. Cells were incubated for 24 hours at 37°C in an incubator with CO_2. After the incubation, the medium covering the cells was removed and the previously prepared NaF and lycopene solutions were added. At least 4 wells were used for each concentration. Culture vessels were incubated at 37°C in a CO_2 incubator and MTT assay was performed.

3. RESULTS

A cell vitality that was higher than the IC_{50} value was observed based on MTT dose and the time in lycopene applied groups after 6, 12, and 24 hours.The results demonstrated that all lycopene concentrations used in the present study were reliable. In the NaF+lycopene treated groups, an increase of 12-35% was observed in cell viability at low concentrations (1 µM, 2 µM, 5 µM, 10 µM, and 15 µM) (Figure 1). At the 12th and 24th hours, an increase of about 33% was detected in the groups treated with NaF+lycopene only at the concentration of 1 µM (Figure 2 and 3).

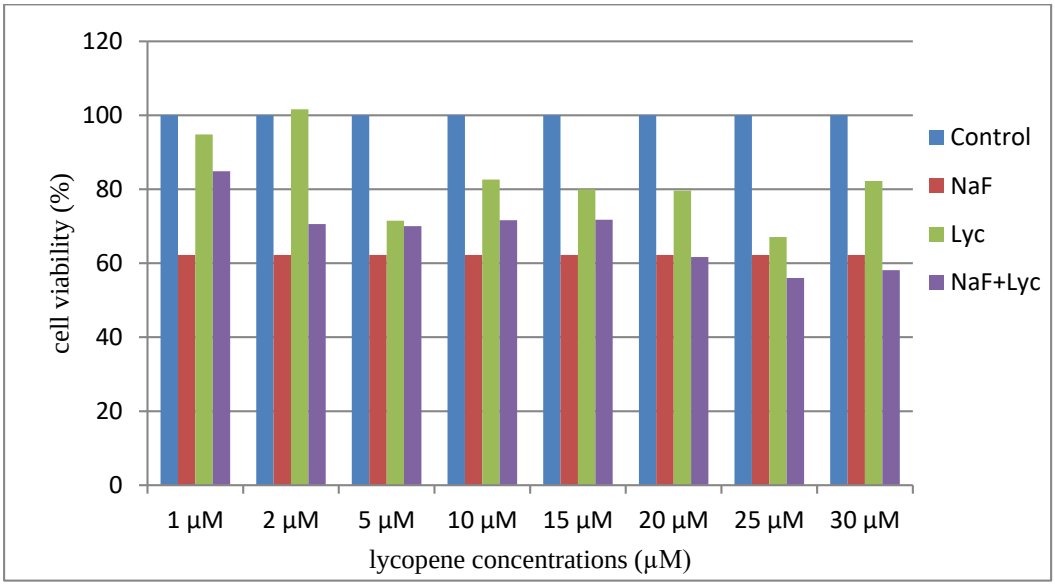

Figure 1. Effect of lycopene on MTT after 6 hours in NRK-52E cells treated with NaF

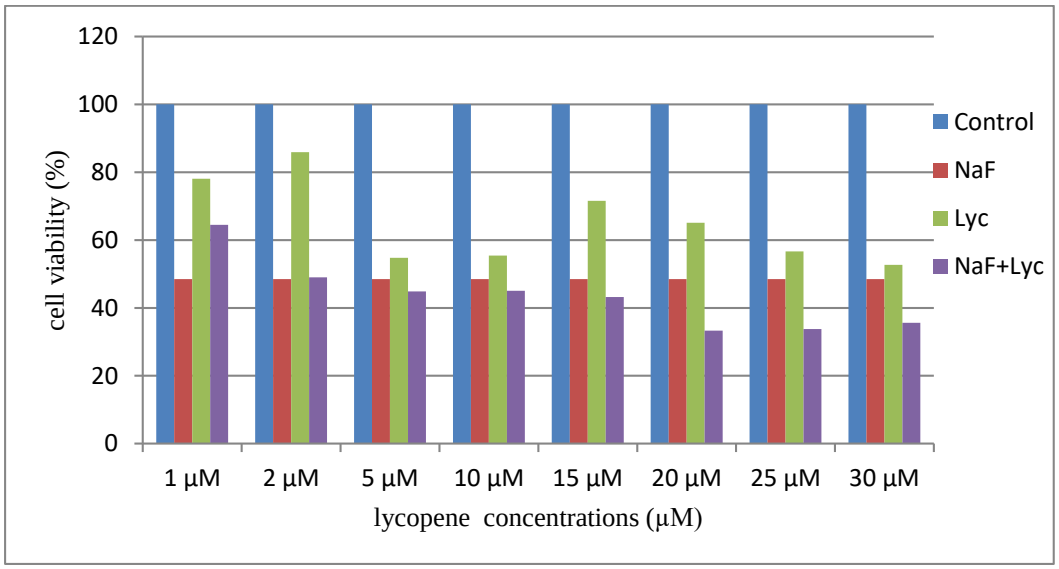

Figure 2. Effect of lycopene on MTT after 12 hours in NRK-52E cells treated with NaF.

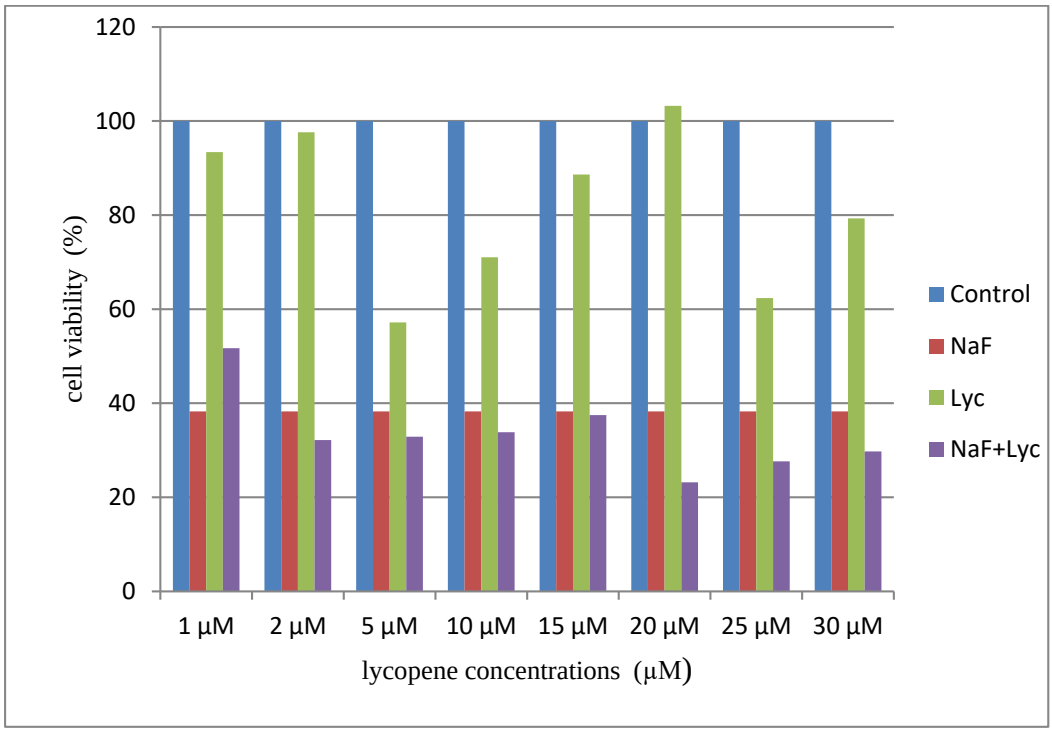

Figure 3. Effect of lycopene on MTT after 24 hours in NRK-52E cells treated with NaF.

4. DISCUSSION and CONCLUSION

While lycopene exhibited strong antioxidant properties under in vitro conditions, it also demonstrated protective properties against DNA, protein and lipid oxidation in vivo [8]. Li et al. (2017) reported that lycopene significantly affected NaF-induced ameloblast and tooth fluorosis by reducing oxidative stress and the caspase pathway [9]. Mansour and Tawfik (2012) demonstrated that lycopene administration to NaF-administered rats could reduce the toxic effects of fluoride that characterized the free radical and strong antioxidant activities of the fluoride [10].

In the present study, it was determined that low concentrations of lycopene (1 μM, 2 μM, 5 μM and 10μM) reduced the toxic effect of NaF, while in the high concentration lycopene treated groups, it increased NaF toxicity via its synergistic effect. In conclusion, it was demonstrated that lycopene administration in the renal cell line have different effects based on concentration and duration.

Conflict of Interests

Authors declare that there is no conflict of interests.

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