

EXPERIMENTAL RETINA'S DYSTROPHY AND THE CURCUMIN RECOVERY EFFECT ON THE EVOKED ACTIVITY OF VISUAL SYSTEM STRUCTURES

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The rehabilitative curcumin effect on visual system function was investigated in studies conducted on awake, unanesthetized rabbits. Analysis of the results obtained showed that after curcumin administration, certain changes in the evoked activity of the retina, superior colliculus, lateral geniculate body, and primary visual cortex were observed in the model of retinal dystrophy. The neuronal apparatus of the glial layer of the retina damaged in moderate retinal dystrophy led to functional disintegration of the mechanisms of electrogenesis. The curcumin administration led to an increase in the amplitude parameters of evoked potentials in all structures. The most pronounced curcumin effect was observed in the potentials of the visual cortex evoked by light stimuli, where certain changes in the configuration of evoked responses were noted.

Key words: colliculus superior, lateral geniculate body, visual cortex, evoked potentials, retinal dystrophy, curcumin.

INTRODUCTION

There is enough information in the modern literature to indicate that curcumin has various biological and pharmacological properties. This plant has antioxidant properties [3] and is used worldwide as an anti-cancer and anti-inflammatory agent [5, 10]. Information about the successful use of curcumin in the treatment of eye diseases is also often found in the literature [4, 8, 9, 12]. Curcumin reduces cell death in the retinal epithelium as a result of light and oxidative stress by promoting the transport of aggregated proteins into retinal cells, which in turn prevents the development of macular degeneration. So, curcumin has the ability to modulate it by activating the regulatory system [6, 7, 11].

Despite the use of various methods in the treatment of dystrophic diseases of the retina, correction of the dysfunction in many cases does not give a positive result due to the wide variety of etiologies [2]. In its diversity, trophic supply is fundamentally disrupted in all types of retinal dystrophy. For this reason, it is important to reduce oxidative and inflammatory processes in the retina and activate the cytoprotective mechanism, which protects the retina from intense apoptotic damage. So, we consider that curcumin may be effective in the prophylactic treatment of retinal dystrophy.

MATERIAL AND METHODS

Experiments were carried out on Chinchilla rabbits weighing 2.5-3 kg. Nichrome

electrodes were applied to the subcortical structures of the brain (colliculus superior (CS), lateral geniculate body (LGB), and visual cortex (VC)) in accordance with the coordinates of the stereotaxic atlas [1]. Experimental retinal dystrophy was caused by the introduction of moniodoacetic acid (MIAA) into the ear vein (18-22 mg/kg). The electroretinogram was recorded using a contact lens. Photostimulation of the retina was performed at a distance of 25-30 cm from the animal's eyes using a photostimulator FS-2 (1.4C, 150 microns/sec). The results obtained were analyzed using the Neuro-KM software package. Animals drank curcumin dissolved in milk for 30 days. Statistical analysis was performed in Microsoft Excel using Student's t-test.

RESULTS AND DISCUSSION

Experimental studies were carried out in several stages. First of all, the parameters of the amplitude of the evoked potential (EP) of individual components (total, positive, and negative) were recorded in all studied structures in intact animals. Then, in accordance with Noel's methodology, an experimental model of retinal dystrophy was created by injecting MIAA into the ear vein of animals. Experimental retinal dystrophy of a moderate degree formed within 28–30 days. 30 days after injection, EP was recorded again, and a corresponding decrease in the amplitude parameters of EP in each structure was observed. The decrease was 40–50% in CS and LGB and 20–25% in the VC compared to the control. Then curcumin was added to animal food for 30 days. After that, the EP parameters were recorded again. From the results obtained, it became known that the amplitude parameters of EP in all structures after taking curcumin partially increased. However, the positive effect of curcumin on the amplitude parameters of EP in CS and LGB structures was much less than in VC (Fig. 1).

The main highlight in the results of these experiments appeared in the EP configuration in the VC; that is, a change caused by the second positive wave was observed. It is known that

initial responses are indicators of physical parameters, while delayed components are indicators of cognitive process formation. Hence, it can be concluded that curcumin positively affects the rehabilitation of cognitive mechanisms. A weaker effect appeared in the initial positive and negative waves that were associated with the perception of physical parameters.

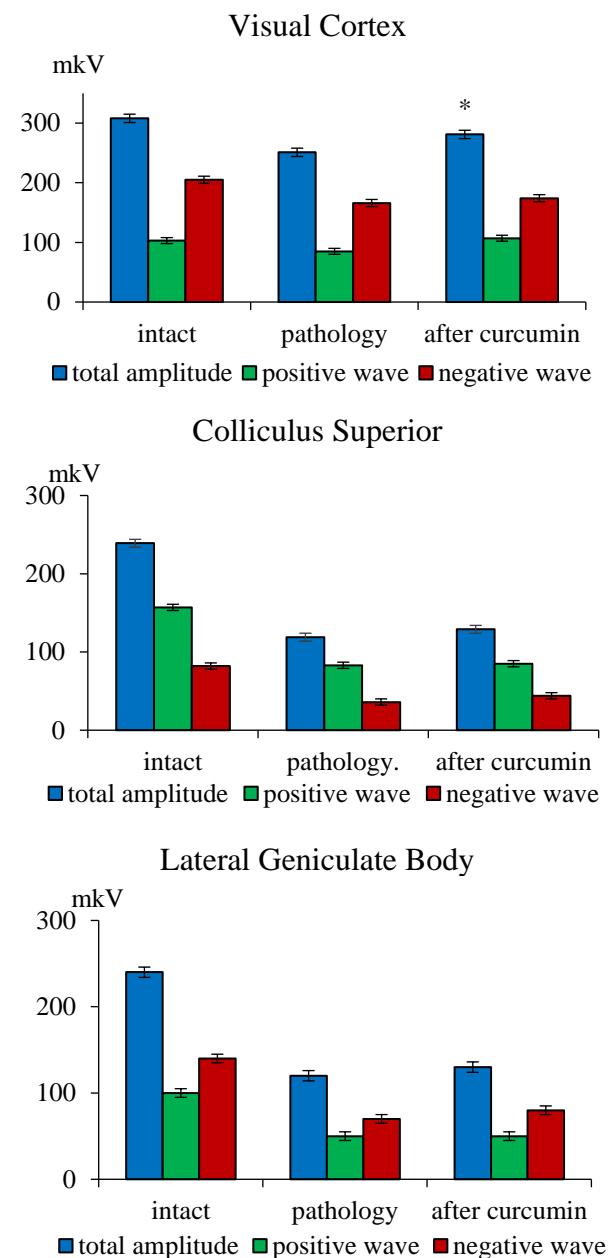


Figure 1. Influence of curcumin on the amplitude parameters of the evoked potentials (mkV) in the structures of visual analyzer. $M \pm m$, $n=10$. *- $p<0.05$

CONCLUSION

From our results, we can conclude that curcumin, having a neuromodulating function, is able to restore the electrogenesis of the retina, having a positive effect on the amplitude parameters of EPs in the central structures of the visual analyzer.

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**TORLU QIŞANIN EKSPERİMENTAL DİSTROFIYASI VƏ GÖRMƏ
STRUKTURLARININ YARADILMIŞ POTENSİALINA SARIKÖKÜN BƏRPAEDİCİ
EFFEKTİ**

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Dovşanlar üzərində aparılan eksperimental tədqiqatlarda görmə analizatorunun funksiyasına sarıkökün təsir effektləri tədqiq edilmişdir. Əldə edilmiş materialların analizi nəticəsində müəyyən edilmişdir ki, sarıkök məhlulunun uzunmüddətli qəbulundan sonra görmə analizatorunun tədqiq edilən strukturlarının (dördtəpelinin yuxarı qabarlarının, xarici dizəbənzər cisim və görmə qabığının) elektrik aktivliyində normada və torlu qışanın distrofiyası fonunda müəyyən dəyişikliklər əmələ gəlir. Torlu qışada ayrı-ayrı sinir elementlərinin zədələnməsi və elektrogenez mexanizmlərinin funksional dezinteqrasiyası ilə müşayət olunan orta dərəcəli eksperimental distrofiya modeli yaradılmış heyvanlarda sarıkök məhlulunun qəbulundan sonra bütün strukturlarda yaradılmış potensialların amplitud parametrlərində artma müşahidə edilmişdir. Sarıkökün təsir effektləri digər strukturlarla müqayisədə görmə qabığında daha qabarlıq şəkildə özünü göstərərək, bu strukturda yaradılmış potensialın konfiqurasiyasında da müəyyən dəyişiklik əmələ getirmişdir.

Açar sözlər: dördtəpelinin yuxarı qabarları, xarici dizəbənzər cisim, görmə qabığı, yaradılmış potensial, torlu qışanın distrofiyası, sarıkök.

**ЭКСПЕРИМЕНТАЛЬНАЯ ДИСТРОФИЯ СЕТЧАТКИ И
ВОССТАНОВИТЕЛЬНЫЙ ЭФФЕКТ КУРКУМЫ НА ВЫЗВАННУЮ АКТИВНОСТЬ
СТРУКТУР ЗРИТЕЛЬНОЙ СИСТЕМЫ**

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В исследованиях, проведенных на бодрствующих ненаркотизированных кроликах, изучалось реабилитирующее влияние куркумы на функцию зрительной системы. Анализ полученных результатов показал, что после приема куркумы наблюдались определенные изменения вызванной активности сетчатки, верхних бугров четверохолмия, наружного коленчатого тела и зрительной коры на модели дистрофии сетчатки. При дистрофии сетчатки средней тяжести наблюдается поражение нейронального аппарата глиального слоя, приводящее к функциональной дезинтеграции механизмов электрогенеза. Прием раствора куркумы приводил к возрастанию амплитудных параметров вызванных потенциалов во всех исследуемых структурах. Наиболее выраженный эффект куркумы наблюдался в отношении вызванных световыми стимулами потенциалов зрительной коры, где также отмечались определенные изменения конфигурации ответов.

Ключевые слова: верхние бугры четверохолмия, наружное коленчатое тело, зрительная кора, вызванные потенциалы, дистрофия сетчатки, куркума

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