

# 網膜電図の新電位(暗所閾値電位, STR)の発生機構の基礎的および臨床的研究

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# 1991 Fiscal Year Final Research Report Summary

## Basic and Clinical Aspects of the Scotopic Threshold Response, (STR)

Research Project

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### Research Category

Grant-in-Aid for General Scientific Research (C)

### Allocation Type

Single-year Grants

### Research Field

Ophthalmology

### Research Institution

Kanazawa University

### Principal Investigator

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scotopic threshold response, STR / Muller cell / Fundus albipunctatus / Abetalipoproteinemia / 無β<sub>2</sub>リポ蛋白血症

### Research Abstract

The scotopic threshold response (STR) is a newly investigated component of the electroretinogram. Since the STR reflects post-photoreceptor processing in the retina at intensities near absolute threshold, the STR would be a useful index to evaluate the rod pathway in the proximal retina. A conventional ERG setup, however, involves difficulties in STR recording. Therefore we constructed a new recording system for the purpose. The characteristics of the apparatus are as follows : 1)A diffusing sphere provides full-field stimuli ranging from a very dim light near absolute threshold to a very bright light. 2)A remote-control system for changing filters is used to avoid breakdown of the dark-adapted status. 3)A software artifact rejection routine is used to exclude response influenced by eye movements and blinks. Using the apparatus we have examined the human STR and generally confirmed the previous findings. Fundus albipunctatus is known as having a prolonged dark adaptation in both rod and cone systems due to a disorder of visual pigment regeneration. We previously reported that the amplitude of the b-wave with a dim light and the early receptor potential with a bright flash recovered slowly along the course of progressive dark adaptation and ended up non-normal after 34 hours of dark adaptation in a case of the disease. The threshold of the b-wave is, however, about 3.5 - 4.0 log higher than the psychophysical threshold. Thus the relationship between psychophysical sensitivity and electrical response below the b-wave threshold has been missing. Since the threshold of the STR is lower than the b-wave threshold, the STR is an appropriate electrical index for evaluating scotopic activity. In a 7 year-old girl with fundus albipunctatus the characteristics of the STR from the fully dark adapted eye were normal, including the maximum amplitude, waveform, range of stimulus intensity and relationship to rod PII, suggesting a physiological deficit rather than a dystrophic involvement in the disease.

Abetalipoproteinemia (Bassen - Komzweig syndrome) is a rare autosomal ressesive disease characterized clinically by acanthocytosis, cerebeller ataxia, fat malabsorption and atypical retinitis pigmentosa. In a patient of the disease, findings of ocular fundus, fluorescein angiography, color vision, visual field and dark adaptation were all compatible to those of typical retinitis pigmentosa sine pigment. ERG and EOG findings recorded from the patient suggested that the main affected site of the disease is different from primary retinitis pigmentosa.

The scotopic threshold response (STR) was reported in the cat, sheep monkey and human. The STR has not yet been confirmed in the frog and rabbit. We recorded the ERG intensity series in the frog and rabbit, using dim (-7.7 log) to bright (O log : 280cd/m<sup>2</sup>) full field stimuli. The threshold of the b-wave in the frog was about -5.7 log intensity. Below the b-wave threshold (at the intensities of -6.3 and -6.7 log), a tiny negative wave (3 - 6[μV] with a long latency (450 msec) seemed to be barely observed indicating that the frog STR is a very tiny transient response if present. The threshold of the b-wave in the rabbit was about -5.3 log intensity. Below the b-wave threshold no negative wave was observed in the rabbit. On the hypothesis that membrane potential change of Muller cell in response to extracellular K

<sup>+</sup> concentration serves to generate the STR, the differences of the distribution of K<sup>+</sup> conductance of Muller cells among the species may account for the low STR amplitude in the frog and rabbit in comparison with the high STR amplitude in the cat and monkey.▲ Less

## Research Products (6 results)

All Other

All Publications (6 results)

[Publications] 若林 謙二,石坂 伸人,河崎 一夫: "暗所閾値電位(scotopic threshold response,STR)の種差に関する検討" 厚生省特定疾患網膜脈絡膜萎縮症調査研究班平成2年度研究報告書. 171-173 (1991) ▼

[Publications] 齋藤 友護,小田 典子,若林 謙二,河崎 一夫,八木 邦公,馬淵 宏: "無ベ-タリボ蛋白血症の1例" 厚生省特定疾患網膜脈絡膜萎縮症調査研究班平成2年度研究報告書. 222-224 (1991) ▼

[Publications] Yugo Saitoh, Kenji Wakabayashi, Nobuto Ishizaka and Yoji Segawa: "Scotopic Threshold Response (STR) in Fundus Albipunctatus." Report of Research Committee on Chorioretinal Degenerations, The Ministry of Health and Welfare of Japan. 1989. 56-58 (1990) ▼

[Publications] Kenji Wakabayashi, Yugo Saitoh, Nobuto Ishisaka, Yoji segawa, Kazuo Kawasaki, Motoshi Horita and Kohki Matsuura: "Recording System for the Scotopic Threshold Response." Acta Soc Ophthalmol Jpn. 95. 92-96 (1991) ▼

[Publications] Kenji Wakabayashi, Nobuto Ishizaka and Kazuo Kawasaki: "The Scotopic ERG Components Among Human, Frog and Rabbit." Report of Research Committee on Chorioretinal Degenerations, The Ministry of Health and Welfare of Japan. 1990. 171-173 (1991) ▼

[Publications] Yugo Saitoh, Noriko Oda, Kenji Wakabayashi, Kazuo Kawasaki, Kunimasa Yagi and Hiroshi Mabuchi: "Electrophysiological Findings of Abetalipoproteinemia (Bassen - Kornzweig syndrome)" Report of Research Committee on Chorioretinal Degenerations, The Ministry of Health and Welfare of Japan. 1990. 222-224 (1991) ▼

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