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PHOTODYNAMIC THERAPY WITH BENZPHORPHYRIN DERIVATIVE MONOACID RING A IN THE CHICK CHORIOALLANTOIC MEMBRANE AT 576 nm

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Background and Objectives: Photodynamic therapy using Benzophorphyrin derivative monoacid ring A, BPD, (Verteporfin, QLT, Vancouver, Canada) and 690 nm light has been used clinically for vascular destruction. BPD also has an absorption peak at 576 nm. This shorter wavelength may be advantageous for treatment of cutaneous vascular malformations such as Port wine stain. We evaluate the effect of BPD and 576 nm light on vasculature utilizing a chick chorioallantoic membrane model.

Study Design/Materials and Methods: Thirty microliters BPD solution was administered intraperitoneally into chick embryos at day 12 of embryonic development. Vessels were videotaped prior to and then 1 hour post-intervention. Vessels were assessed for damage based on the following scale: 0, no damage; 1, coagulation; 1.5, vasoconstriction; 2.0, coagulation + vasoconstriction; 2.5, angiostasis; 3.0, hemorrhage. Damage scores were weighted by vessel "order." Study groups were: (1) control (no BPD, no light), (2) drug only, (3) continuous wave (CW) irradiation (60 mW/cm^2, 125 seconds) only, (4) BPD + CW irradiation.

Results: Groups 1 and 2 showed no damage. BPD + CW irradiation and CW irradiation alone resulted in damage scores + of 2.8 ± 0.70 (SEM) and 3.8 ± 0.72 (SEM), respectively.

Conclusions: At 576 nm, less damage was observed with CW irradiation alone than BPD + CW irradiation. Further studies are planned.

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THE IMPORTANCE OF THE WAVE ASPECT OF ELECTRONS IN REGARD TO THE MITOCHONDRIAL ENERGY TRANSFER

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Background and Objectives: Biochemical models of the cellular energy transfer regard the classical corpuscular aspect of electrons as the responsible energy carriers thereby ignoring the wave–particle dualism of the electrons and the import of radiation energy of this process.

Results: Because of the inherent wave–particle dualism of the electrons, it is obvious to regard radiation phenomena in order to explain the cellular energy transfer. The connection between the energy transport by radiation and the order in structures maybe understandable, if structurally bound energy is released during the dissolution of structures (oxidation of foodstuffs) or is again manifested (finally reduction of oxygen to water). Regarding the energy values relevant for the respiratory chain, the import of electromagnetic radiation of characteristic ranges of wavelengths on the cellular energy transfer becomes evident. Depending on its wavelength, electromagnetic radiation in the form of light can transfer energy to electrons. LLL-Light corresponds well with the characteristic absorption levels of the relevant components of the respiratory chain. This laser stimulation vitalizes the cell by increasing the mitochondrial ATP-production.

Conclusions: With regard to the wave aspect, it is possible to explain the increase of ATP-production by means of LLLL on a cellular level.

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EXCIMER LASER IRRADIATION ALTERS PLATELET AGGREGATION BASED ON TOTAL ENERGY

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Background and Objectives: It has been reported that excimer laser reduces platelet aggregation. We evaluated the effect of various excimer catheters and laser energy levels on platelet aggregation.

Study Design/Materials and Methods: Platelet rich plasma from nine rabbits was circulated in a dual flow chamber system. Platelets in one chamber were irradiated (308 nm; 5 min; 45 mJ/mm^2; 25 Hz) using varying catheter diameters (0.7–2.0 mm) with corresponding total energy levels (2.3–32 mJ). Platelet aggregates were determined by a laser light scattering technique using the ratio of the angle of He–Ne light scattering (1°/5°) and by Coulter counter. ADP reversible platelet aggregation was evaluated.

Results: Low laser energies did not have significant platelet aggregation. However, high energies resulted in aggregation by light scattering but not by Coulter counter measurement. Laser caused a delay in ADP reversible aggregation.

Platelet lasing	Control (n = 9)	2.3 mJ (n = 3)	5.9 mJ (n = 2)	13.1 mJ (n = 2)	32 mJ (n = 2)
Light Scattering (1°/5°)	1.06 ± 0.09*	1.11 ± 0.12*	1.04 ± 0.09*	2.00 ± 0.70**	2.17 ± 0.83**
Coulter Counter†	21.5 ± 1.2	21.9 ± 1.5	22.4 ± 1.5	21.7 ± 1.5	22.4 ± 1.5

*to **: $P < 0.04$; * to *, ** to **, †: P = ns.

Conclusions: Lower excimer laser energy caused no aggregation, while higher energy caused statistically significant platelet aggregation that was associated with few particles of greater size than a larger number of particles. Lased platelets were activated and had slower disaggregation following ADP.