



OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

26 July 1965

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MEMORANDUM FOR (See Distribution)

SUBJECT: Minutes of the Forty-Eighth Joint Medical Research Conference

The following were present at the forty-eighth conference in Room 3-D-1021, The Pentagon, 0900 - 1120, 8 July 1965:

Dr. F. J. Frese, Jr., OAD/R, ODDR&E
R/Adm Calvin B. Galloway, MC, USN, Guest
Dr. Frank Hartman, AFMSPA, D/AF
Col Donald L. Howie, MC, USA, AMR&DC, D/A
Capt James R. Kingston, MC, USN, ONR, D/N
L/Col John J. Kovaric, MC, USA, AMR&DC, D/A
Dr. Carl Lamanna, ARO, D/A
Dr. Gerald M. McDonnel, The Center for Health Sciences, U.C.L.A., Chairman
R/Adm Langdon C. Newman, MC, USN, BuM&S, D/N
Capt John A. O'Donoghue, MC, USN, BuM&S, D/N
Col Henry S. Parker, MC, USA, ODASD(H&M), OASD/M
Capt Carl E. Pruett, MC, USN, ODCNO(Dev), D/N
Col Robert K. Quinnell, USAF, MC, AFMSPA, D/AF
L/Col Robert E. Robards, USAF, MC, AFRST, D/AF
Capt John R. Seal, MC, USN, NMRI, D/N
Col Colin F. Vorder Bruegge, MC, USA, AMR&DC, D/A

The Chairman, Dr. McDonnel, called the meeting to order. The minutes of the forty-sixth conference, distributed at the last meeting, were accepted as written. The minutes of the forty-seventh conference were not available due to the pressure of the budget cycle reviews. They will be distributed before the next meeting.

Dr. McDonnel welcomed to this fourth anniversary meeting a former member R/Adm (ret) Calvin B. Galloway. He also read a note from the former chairman, Dr. Richard Kern, expressing regret that previous commitments prevented his joining the group for this meeting. Finally, the Chairman announced that the anniversary lunch had been arranged at the Officers' Club, Fort Myer, and would follow after the meeting.

At the request of the Chairman, the executive secretary gave an estimate of the effects of Congressional action on the R&D budget. Col Vorder Bruegge said that the amounts mentioned would require Army to cut a sizeable portion of its contract research. Captain Kingston said that such amounts would cut Navy medical research below the FY'65 level. L/Col Robards said they would hold Air Force efforts at the FY'65 level.

L/Col Kovaric made the scheduled report by Army on the current status of research on the biological effects of lasers. His summary of this report is attached.

At the conclusion of this report and the discussion thereof, Dr. McDonnell asked the conference if they thought that medical research in this area was matching the progress being made by the physical and engineering sciences. The consensus was that the medical research was way behind, and would in the future fall even further behind because of inadequate funding. L/Col Kovaric estimated that at least \$1.5 million per year would be needed to keep up with engineering developments.

Dr. McDonnell thanked L/Col Kovaric for his excellent presentation. He then asked the executive secretary to take the necessary action to have L/Col Kovaric designated as the conference's liaison representative with AGED, vice L/Col Glew, whose recent illness will make it impossible for him to continue in this capacity. (Copy of required memo attached.)

The Chairman gave a brief report on the transactions of the NASA-sponsored National Academy of Sciences symposium at Woods Hole on "Man in Space." Since these transactions will be reported officially elsewhere, they will not be incorporated in these minutes.

There being no further business before the conference, it was adjourned by the Chairman at 1120.

The next meeting will be at 0900, 12 August 1965, in Room 3-D-1021, The Pentagon.



FREDERICK J. FRESE, JR.
Colonel, USAF MC
Chief, Biological & Medical Sciences Div.
Ofc Asst Director (Research)

LASER PROGRAM

AFIP

The absorption coefficients of tissue (except the eye) = 20 cm^{-1} .
At 1 cm, one billionth of the energy remains.

By focusing a trackless lesion cannot be produced. Absorption decreases the intensity so no gain is possible.

The thermal effects of laser irradiation are 1) denature tissue proteins (72 joules/gram) 2) vaporize water (2160 joules/gram) 3) ablate tissues (3000 joules/gram).

The temperature of the plume has been calculated at 6000° K .

Pressure created is critical beyond which shock waves occur. It has been estimated that in soft tissue this is 10^7 dynes/cm^2 and in bone $10^{10} \text{ dynes/cm}^2$.

The gas generated by the heat of vaporization is under 20 atmospheres of pressure.

Of considerable significance has been the discovery of trans-scleral transmissions of laser radiation. This produces injury to the underlying retina and to the distant retina, not necessarily in line with the beam. These results were not predicted.

Ft. Knox

Using a Maxwellian view, i.e., focusing the beam on the lens energies of 5-250 joules in 2 milliseconds were studied.

The lens disrupts at levels greater than 10 joules.

At 5-10 joules bubbles appear in the vitreous.

There is total atrophy of the globe at 250 joules.

Melanin granules are blown as microprojectiles which can tear holes in the retina, and can be found in the vitreous and sclera.

Barnes, University of Colorado

Laser radiation directed at cell culture media kills adjacent cells with shock waves.

Four millijoules will kill a cell if directed. Eight millijoules is sufficient to produce a shock wave ranging from 0.2-0.6 atmospheres. The pressure across a 16 u cell is 2 mm Hg or 2.56×10^3 dynes/cm².

When all but one of the blastomeres of a fertilized rabbit ova is destroyed by laser irradiation (in 2-4-8-16 cell stages), this remaining cell continues to cleave in-vitro, demonstrating totipotency.

Chick eggs radiated directly at the blastoderm grew into deformed masses of "heart islands".

The short pulsed focused laser allows very little diffusion. It has been estimated that given a point source of 1 u, the temperature at a radius of 1.6 u is only 0.05 that of the source.

Coherent light (continuous wave of He-Ne) as a source to improve phase contrast microscopy has been shown to be a marked improvement, so far for unknown reasons.

Rounds, Pasadena Foundation

One hundred percent oxygen at hyperbaric pressures produces cytoplasmic vacuolization and death for human cell cultures. When combined with irradiation it leads to the accumulation of giant cells.

In checking the effects of non-coherent but monochromatic light it was found that green (5300 angstroms) destroys the heme portion of hemoglobin within intact erythrocytes without rupturing their membranes.

Central nervous system cells in culture are particularly sensitive to 5300 A, apparently by injuring cytochrome C in the mitochondria.

Laser irradiation was found to have a synergistic effect to gamma irradiation. Using human adenocarcinoma cell cultures, the ruby laser depressed cell growth 13%; the theoretical additive effects was 28%; the actual additive effect was 51%. This synergism lasted 6 to 48 hours following laser irradiation.

Klein - Fine

Northeastern University, Boston, Massachusetts, and Roswell
Park Memorial Institute, Buffalo, New York

A continuous wave argon laser (blue-green with a maximum output of 5 watts) has been used and found to produce intermediate effects between those of an arc and a pulsed laser.

The lesions produced are discrete and continuous, related to the time of exposure. No hair changes or effects on the melanin system were noted. A semiconductor GaAs laser was built at Northwestern which has an output of 100 milliwatts (8500 Å).

Other tissue damage attributable to the pulsed ruby has been found in the CNS (spinal cord) and in the bones and joints. These findings are too new to correlate with histology.

Protective glasses are effective only for specific wavelengths (for example, 6943 Å for American Optical), but are NOT effective against back scattered irradiations (which have different wavelengths).

Ham; Richmond, Virginia

The most widely used criteria for minimal threshold damage to the eye is that of Ham's. His definition is that energy necessary to produce a lesion 1 mm in diameter visible 5 minutes after exposure. Evidence to date that the energy (at the retina) to produce this lesion is:

0.7 joules/cm² at 200 microseconds,
0.07 joules/cm² at 30 nanoseconds.

JOHN J. KOVARIC
Lt. Colonel, MC
Assistant Chief, Surgical
Research Branch

MEMORANDUM

TO : Secretariat of the ODDR&E Advisory Group 15 July 1965
on Electron Devices
THRU : Asst. Director (Communications & Electronics)
FROM : Executive Secretary, Joint Medical Research Conference

SUBJECT: Non-voting Liaison Representatives

1. Some time ago, by verbal agreement, our two groups agreed to designate respectively non-voting liaison representatives to each other. For our group the designee was Lt. Col. Donald H. Glew, Jr., MC, USA; for yours Lt. Col Edwin N. Myers, USAF.

2. I regret that the recent severe illness of Lt. Col. Glew will prevent him from continuing as liaison representative, and recommend for your consideration Lt. Col. John J. Kovaric, MC, USA, as his replacement.

FREDERICK J. FRESE, JR.
Colonel, USAF MC
Chief, Biological & Medical Sciences Div.
Ofc Asst Director (Research)

DISTRIBUTION LIST

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