

MEDEC-ZG(15 Nov 65)
 SUBJECT: Flashblindness Treatment

THRU: ~~Director, WRAIR~~ FROM: Dir, Div Biochem DATE: 6 Dec 65 CMT 2

TO: Ch, Rsch Div
 US Med R&D Comd
 ATTN: MEDDH-RS

1. The QMDO for Chemical Treatment of Night Blindness has been examined and the following comments pertain:

a. Has the full potential of use of a filter (glasses) been investigated by measuring the spectrum of the character of light flashes at night and the intensity of the illumination? Rhodopsin has a maximum activity with white light in the range of 500 mu with very little effect past 600 mu. Is there any possibility of developing a night glass that will substantially reduce the white light response between 475 and 550 mu? This might be a feasible way of preventing the overwhelming effect of flash blindness.

b. Illumination of rhodopsin by white light produces retinine (a carotenoid) and opsin (a protein) as well as some unstable orange pigments. This reaction produces the image impulse. Some of the retinine and opsin will recombine spontaneously to regenerate rhodopsin; however the reaction is not quantitative. Further acceleration depends on the reduced form of Flavin-Adenine Dinucleotide (FADH) (also known as DPNH) and vitamin A1 in the isomeric forms. For active rod vision to continue the active cis isomer of retinine must be supplied from the circulation or by the isomerization of trans vitamin A or retinine. The vitamin A aldehyde formed is trapped by the opsin of the photochemical reaction to further regenerate rhodopsin in the dark. These are only a few of the reactions involved and merely serve to illustrate that the chemistry of vision is very dependent on wavelength and light intensity measurements. Since these are chemical reactions it is possible that substances required for regeneration in the dark may be supplied to accelerate the overwhelming effect of a light flash. It is known that night blindness will respond to dietary increases of vitamin A enriched foods (carrots, etc). Acceleration of the chemical reaction returning rhodopsin to normal levels, might conceivably be accomplished by regulating constituent species.

2. To specifically answer the questions posed: (a) There may be a potential to treat flashblindness by drugs (chemicals regulating rhodopsin regeneration); (b) The treatment would require basic research regarding light intensity levels and chemical interactions. A full literature search was not accomplished in this case, but it is felt that from the survey done that there is not sufficient specific knowledge to allow development of a drug as outlined by the QMDO. Too many intangibles exist where effects of drugs on photosensitive responses are concerned.

1 Incl
 Draft

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TITLE. Draft Proposed Qualitative Materiel Development Objective for Flashblindness Treatment and/or Mitigation, Individual

Prepared by: U.S. Army Combat Developments
Command Medical Service Agency

Date prepared: OCT 4 1965

Nature of action: This is a draft proposed
QMDO originated by this agency against CDOG
paragraph 1412a(2).

Section I - Statement of Objective

1. Statement of Objective.

a. Flashblindness Treatment and/or Mitigation, Individual.

b. The objective is to provide a treatment substance and/or prophylactic drug that will insure the accelerated return to combat effectiveness military personnel temporarily blinded by an intense brilliant flash of light.

Section II - Operational Concepts

2. Operational Concepts. The treatment substance and/or prophylactic drug developed as a result of this QMDO will be issued to all U.S. Army personnel as authorized by Department of the Army. It is envisioned that this treatment substance and/or prophylactic drug will be of such small size and weight that it can be carried in a manner similar to the atropine syrette. Supply and maintenance of this treatment substance and/or prophylactic drug will be accomplished through existing medical supply channels.

3. Organizational Concepts. The treatment substance and/or prophylactic drug envisioned will be an expendable item for individual issue. Training in the operation and utilization of this item will be required; however, it is believed that the item developed as a result of this QMDO might be utilized in a fashion similar to the atropine syrette. Maintenance problems are anticipated to be negligible.

Section III - Justification and Priority

4. Reasons for the Requirement.

a. The threat of flashblindness to individual military personnel with its resultant impact on the effectiveness of combat operations is a current, active, hazard. Although extensive research has been, and is being, expended to develop a device to provide flashblindness protection, no device is 100 percent foolproof, or

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effective, at all times. This is particularly true when the operational environment is the combat zone; therefore, it is reasonable to assume that a substantial portion of the personnel exposed to the flash from a nuclear weapon may be rendered combat ineffective by reason of temporary (one minute to one hour) blindness. In all probability, the number of personnel rendered combat ineffective due to flashblindness would seriously endanger, or completely negate, the success of a unit and/or individual operational mission.

b. CDOG paragraphs which support this requirement: 110 and 1410b(2)(a).

5. Priority - I. This priority is recommended for the following reasons:

a. Flashblindness is a current operational hazard.

b. Successful development of the objective stated in this QMDO may eliminate the requirement for numerous, individual, flashblindness protection devices.

Section IV - Other Considerations

6. Background Data.

a. Medical textbooks expound on the significance of the visual pigments in the human eye and the role they play in visual processes and it is postulated that the bleaching of the visual pigment "rhodopsin" by intense light is the reason for the temporary loss of visual acuity. It appears that this bleaching of rhodopsin is essentially chemical in nature, therefore, it is conceivable that a pharmacological means can be developed to raise the threshold level for flashblindness and/or accelerate the reformation of the affected visual pigments thereby decreasing the duration of flashblindness.

b. Conjectures, assumptions, and envisioned methods of utilization used in describing what the objective is to achieve should not in any way be construed as limiting research approaches to satisfy the objective, i.e., while the QMDO envisions a syrette-type item, novel and revolutionary research findings may show that the objective can be reached in part or whole in other ways, such as through the use of dietary additives, water additives, or daily pill ingestion.

c. This material requirement is identified as USACDC Action Control Number 4946. The project supports the following:

- (1) Army Concept Program: Army 90.
- (2) Army Missions:
 - 1. High Intensity Warfare.
 - 2. Mid Intensity Warfare.
- (3) Phase: Materiel.
- (4) Function: Service Support.