ARMORED FORCE MEDICAL RESEARCH LABORATORY
Office of the Commanding Officer
Fort Knox, Kentucky

Project No. 2-8
File No. 724.3

October 20, 1942

REPORT ON RESULTS OF DESERT FIELD STUDY

1. PROJECT: Effect of Desert Conditions on Personnel.

a. Authority: Letter Commanding General, Armored Force Headquarters, GNOHD 400.112/6, dated September 24, 1942.

b. Purpose: To study the effects of desert heat on troops moving into the Desert Training Area, Camp Young, California during July and August, 1942, with observations on heat exhaustion, dehydration, heat stroke, water requirements and effect of dust on personnel.

2. DISCUSSION:

a. Information was obtained from case records, discussion with military surgeons and personal observation in the desert.

b. Cause of heat exhaustion:

(1) The main cause of heat exhaustion is unaccustomed exertion in an unusually hot environment, in many cases associated with water and salt depletion.

(2) Predisposing causes were found to be:

(a) Lack of suitable period of adjustment to desert environment.
(b) Over indulgence in alcohol.
(c) Constipation or diarrhea.
(d) Recent jaundice or other illness.
(e) Lack of sleep or rest.
(f) Failure to eat.

3. CONCLUSIONS:

Casualties from the heat during the early period of entry to the desert resulted largely from lack of a period for adaptation, and excessive muscular work during the worst heat of the day. Certain conditions such as previous sickness, disturbed bowel habits, alcoholic indulgence and failure of proper use of water and salt were predisposing factors. When they were corrected

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particularly with reference to rest periods during heavy work; water and salt indoctrination, and careful supervision of the men during activity so that early cases could be recognized and treated, the results were very good, as may be seen in the appended chart. The 5th Division put into practice many of these procedures and suffered much less from the serious effects of the heat.

4. RECOMMENDATIONS:

a. When troops are moved into the desert they should be given a period of from 3 days to one week for acclimatization during which they do very little heavy work. Activity should increase gradually.

b. Soldiers convalescing from any moderately severe illness should not be sent to the desert.

c. The increased salt needs should be satisfied by increased salt used in cooking and at meal time to insure an intake of 20 grams daily and/or by the addition of salt to drinking water to a concentration of 0.1%. Salt tablets produce vomiting in enough cases to interdict their general use.

d. Usd of alcohol should be restricted among desert troops, at least during the early period of adaptation.

e. Careful instruction should be given troops and medical officers concerning the effect of heat on men and the increased needs for water and salt. A short course for indoctrination with lectures and movies should be considered.

f. Physical work done in the cooler parts of the day, early morning and late evening, and particularly at night is much more economical of water and when water supply is a problem much could be conserved by working at night. The middle of the day should be a period of inactivity insofar as is possible.

g. Studies of differences in adaptability and capacity to work among negro and white personnel will be made.

Reported By:

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Director

Incl.
(1) Appendix

APPENDIX

1. HEAT EXHAUSTION.

a. Symptoms.

(1) Insidious or sudden onset of fatigue, loss of interest, incoordination, cloudy vision and poor judgment.
(2) Dizziness.
(3) Weakness.
(4) Thirst (often absent).
(5) Nausea and loss of appetite.

b. Signs.

(1) Flushed skin, often following a period of pallor.
(2) Cramps in muscles, often with tetany.
(3) Moderate temperature rise up to 102-3°F.
(4) Dehydration, usually mild, occasionally with marked hemoconcentration.
(5) Vomiting.
(6) Rapid pulse and low blood pressure.
(7) Collapse and shock.
(8) There was no evidence of cessation of sweating.

c. Treatment.

(1) Rest in bed in as cool a place as is available.
(2) Fluids and salt by mouth if possible, by intravenous injection if necessary.
(3) Use of wet towels, ice packs or other methods of cooling.

2. HEAT STROKE.

a. The incidence of high temperature (over 105°F) was about 5% of the total cases.

b. Otherwise the symptoms were much the same as in heat exhaustion.

c. One fatality occurred.

3. WATER CONTAINERS.

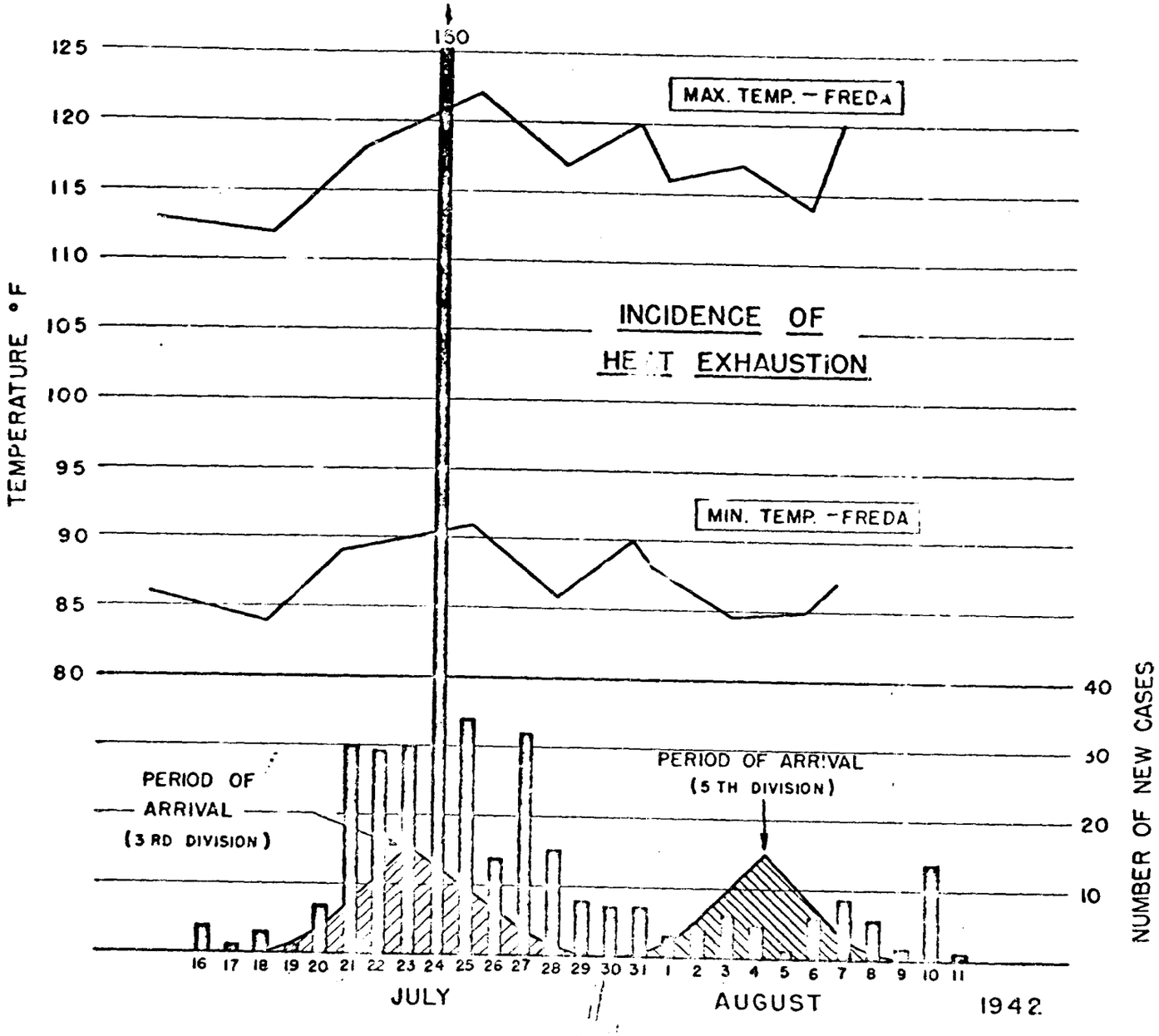
a. Drinking water was carried in desert bags and GI canteens which were supplied from standard 5-gallon containers. During very hot days water in the canteen became too hot to drink (138°F) if it was placed on or against metal in the vehicles, or exposed to the sun. Even at lower

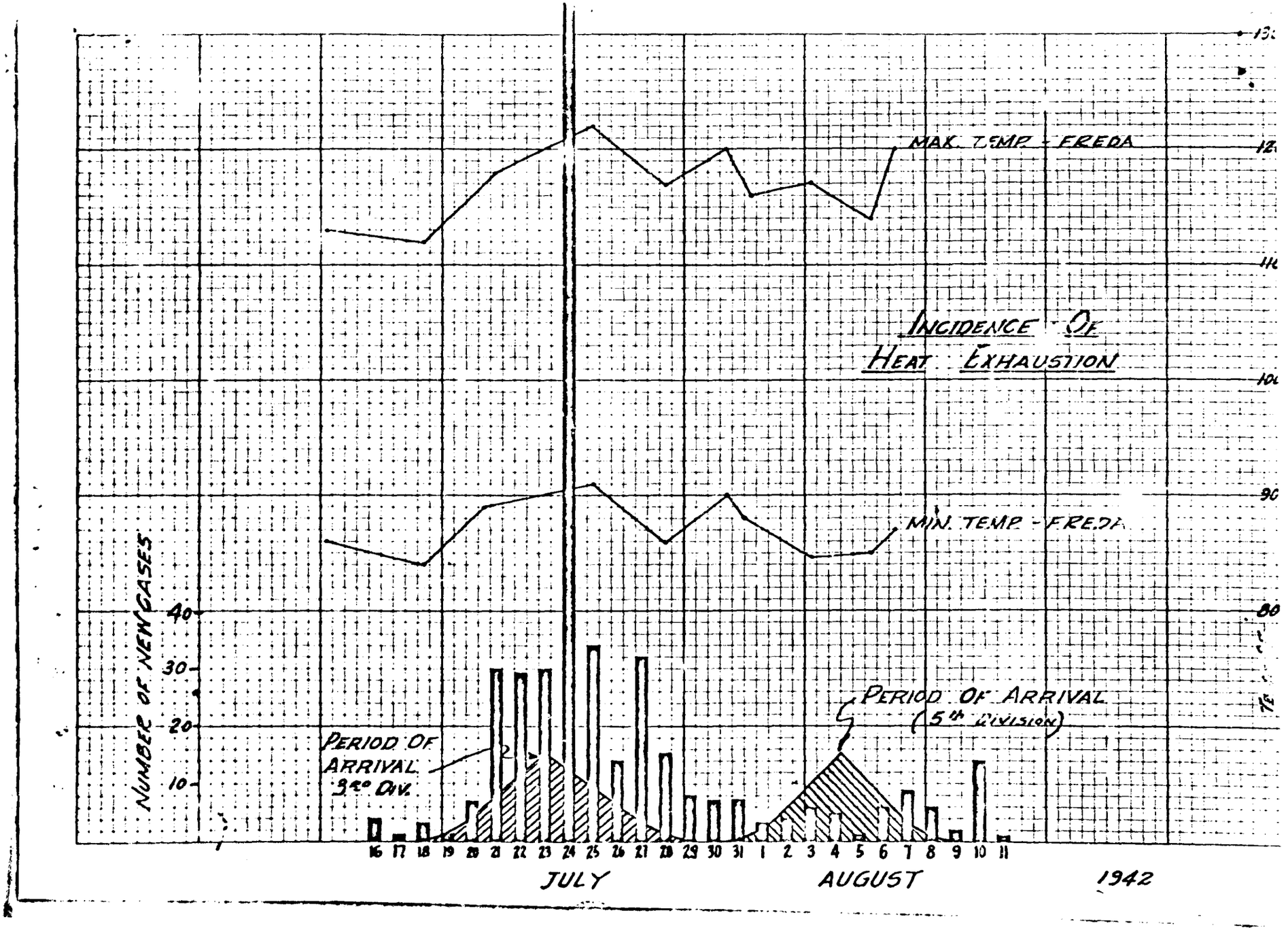
temperatures (110°F) the water is unpleasant, and does not produce refreshing sensations. At the higher temperatures it is intolerable. When the canvass desert bag is kept out of direct contact with metal, and not exposed to high winds, the evaporation within 24 hours rarely exceeds 15%. The water at temperatures of 65-78°F encountered in these tests at the maximum heat of the day, is refreshing and pleasant.

4. DUST

a. Dust and sand are among the most disagreeable of the environmental hazards of the desert. Respirators issued to the men were used very little during several problems we observed. The most common protection was a cotton handkerchief tied or held over the nose and mouth. Surgical masks were used when available, with good results. Some expendable gauze or cloth respirator is highly desirable. In spite of the use of goggles, some soldiers, especially tank drivers and assistant drivers, developed irritative conjunctivitis. The inflammatory reaction was particularly prominent in the lateral aspect of the conjunctivae. The reaction ordinarily subsided two ro three days after the exposure to heavy concentrations of dust was terminated.

A detailed report of the data and conclusions is on file at the Desert Warfare Board, Camp Young, Indio, California, and at the Armored Force Medical Research Laboratory, Fort Knox, Kentucky.


150
125
120
115
110
105
100
95
90
85
80
TEMPERATURE °F
MAX. TEMP. – FREDA
INCIDENCE OF
HEAT EXHAUSTION
MIN. TEMP. – FREDA
40
30
20
10
NUMBER OF NEW CASES
PERIOD OF
ARRIVAL
(3 RD DIVISION)
PERIOD OF ARRIVAL
(5 TH DIVISION)
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11
JULY
AUGUST
1942


INCIDENCE OF
HEAT EXHAUSTION
MAX. TEMP - FREDA
MIN. TEMP - FREDA
NUMBER OF NEW CASES
40
30
20
10
PERIOD OF
ARRIVAL
3rd DIV.
PERIOD OF ARRIVAL
(5th DIVISION)
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11
JULY
AUGUST
1942