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## Abstract from the Literature

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Canfield D, et al. Abnormal glucose levels found in transportation accidents. *Aviat Space Environ Med* 2001; 72(9): 813-815.

### BACKGROUND

THE FEDERAL AVIATION ADMINISTRATION'S Office of Aerospace Medicine is responsible for the certification of pilots with diabetic conditions. The present study evaluated the use of postmortem vitreous humor and urine glucose levels in transportation accident fatalities as indicators of potentially incapacitating medical conditions or performance impairment.

### METHODS

Vitreous humor and/or urine from 192 accident fatalities were analysed for glucose using a hexokinase method. Cases with values below the lower limit of detection (10 mg. d1-1) and above three standard deviations (SD) from the mean were not included in the final statistics. All cases more than five SD above the mean were deemed abnormal and a full case history was evaluated based on the available medical history.

### RESULTS

The mean vitreous humor glucose concentration was  $30 \pm 21$  mg · d1-1 (N=98), while it was  $27 \pm 16$  mg. d1-1 in urine (N= 127). Of the 192 cases, nine were identified as having abnormal glucose levels. Abnormal glucose levels were found in five of the eight cases with a known diabetic condition. Glycosuria or low renal threshold was reported in two fatal pilots; one of these pilots had an abnormal glucose level.

### CONCLUSIONS

Hyperglycemia can be established from the vitreous humor and urine glucose levels. All of the abnormal glucose cases detected were previously identified during the medical certification process or had a medical reason for the abnormal level. Elevated vitreous humor and urine glucose levels have proven useful in identifying individuals with a pre-existing diabetic condition that might have been a factor in the accident.

### COMMENT

*The expectation clearly was that some people would have had previously unrevealed glucose intolerance/diabetes. That none were detected is remarkable in itself. What is not determined is how compliant with restrictions and management were those who were already known to the FAA. That the vitreous glucose levels were raised suggests control was suboptimal. Cause of the accidents had not been made public in most cases.*

Patterson JC, Jones DR, Marsh RW, Drummond FE. Aeromedical management of US Air Force aviators who attempt suicide. *Aviat Space Environ Med* 2001; 72(12): 1081-1085.

### BACKGROUND

Little has been published about the aeromedical management and disposition of aviators who attempt suicide, and almost no such information about military aviators exists in the open literature. The few available data are scattered and frequently anecdotal.

### METHODS

The authors reviewed all case reports of fliers evaluated at the USAF School of Aerospace Medicine's Aeromedical Consultation Service (ACS) between 1981-96 for a possible return to flying duties after a suicide attempt and prepared a representative case report.

## **RESULTS**

Between 1981 and 1996, the ACS evaluated 14 trained aviators (pilots and other aircrew members, excluding flight surgeons) who had attempted suicide. Of these, 11 (79%) ultimately received a recommendation for return to flying duties.

## **CONCLUSIONS**

In most instances, the underlying stressors included failed intimate interpersonal relationships, administrative or legal problems, psychiatric disorders, death of spouse, or job conflicts. Evidence of abuse of alcohol or other substances was found in 54% of an earlier, larger data set of attempters. Some data on aircrew suicide completion were available and are reported. The top medical priorities after such attempts should be to diagnose what is wrong, and to treat it. In spite of the common assumption that a suicide attempt inevitably ends a military flying career, some attempters can return to safe and effective flying duty after appropriate psychotherapy. If the flier regains physical and mental health and maintains them for at least 6 months after treatment, then that flier may be evaluated by an outside aeromedical psychiatric consultant such as the ACS (to avoid transference issues between flier and therapist) for possible return to flying duties. Waiver action should be based on the underlying psychiatric diagnosis, not the suicidal attempt itself. Follow-up may be accomplished through periodic mental health evaluations in conjunction with routine physical examination procedures. Issues involving substance abuse and security clearances must be handled through the appropriate channels.

## **COMMENT**

*Attempted suicide is of grave concern in the aviation environment, having been graphically demonstrated by the Silk Air and Egypt Air crashes of recent years, which were the result of intentional acts by the pilot. Thus, putting a pilot back in the air after an episode of attempted suicide is one of great moment. That so many were returned to flying status after such an event is very significant. The 14 considered by ACS were a select group; many others were permanently grounded locally and were not sent to ACS at all. The assumption was that return to flying status was the successful endpoint; what is really needed is a long term follow up on their outcome.*

**Paul MA, Brown G, Buguet A, Gray G, Pigeau RA, Weinberg H, Radomski M. Melatonin and Zopiclone as pharmacologic aids to facilitate crew rest. *Aviat Space Environ Med* 2001; 72:974-84.**

## **PURPOSE**

In response to mission imperatives, transport aircrews must often sleep at inappropriate circadian times resulting in inadequate sleep. This study was undertaken to determine whether either melatonin or zopiclone could facilitate early circadian sleep, and to assess whether either of these medications would result in a psychomotor performance decrement, which would preclude their use in aircrew.

## **METHOD**

Thirteen subjects from DCIEM completed a double-blind cross-over protocol. All subjects were assessed for psychomotor performance during three drug conditions (placebo, 10 mg melatonin, and 7.5 mg zopiclone), which were separated by one week. Each of these conditions involved two nights of sleep, back-to-back, with the first night being a normal circadian control sleep (23:00 h bedtime, arising at 06:45 h), and the second night being an early circadian drug sleep (drugs at 16:45 h, 17:00 h bedtime, arising at 23:45 h). All subjects were tested for psychomotor performance, on both nights of each of the three-drug conditions, pre- and post-sleep. Further, during the early circadian drug night, all subjects were tested every hour after arising at 23:45h (24:00h until 07:00h). At the beginning of each psychomotor test session, subjects were asked for their subjective levels of sleepiness and fatigue.

## **RESULTS**

Relative to placebo (339.5 min) the subjects slept more on melatonin (370.2 min,  $p < 0.01$ ), and zopiclone (373.3 min,  $p < 0.01$ ). Performance in serial reaction time (SRT) task ( $p < 0.001$ ), logical reasoning task (LRT) ( $p < 0.001$ ), serial subtraction task (SST) ( $p < 0.02$ ), and Multitask (MT) ( $p < 0.03$ ) were impaired for all three drug conditions immediately on a waking, compared with pre-sleep performance, as a result of a sleep-inertia effect. With respect to the subjective data, sleep inertia effects were evident for sleepiness ( $p < 0.001$ ), mental fatigue ( $p < 0.002$ ), and physical fatigue ( $p < 0.05$ ). For SRT, LRT, and SST, performance recovered to pre-sleep levels within 1.25 h of awakening, and for MT recovery occurred 2.25 h after awakening. There were no differences in the performance or subjective measures between placebo, melatonin and zopiclone.

## CONCLUSIONS

Both zopiclone and melatonin improved sleep relative to placebo. After sleep inertia, performance recovered to pre-sleep levels for all tasks and was sustained at that level throughout the balance of the testing period. There was no impact of melatonin or zopiclone on performance measures compared with placebo.

## COMMENT

*Well, more sleep, but if the performance following sleep was not improved, what of it? The study needed to go further to look at longer-term effect and performance towards the end of the day following sleep to see if performance is sustained in the medicated personnel versus the placebo.*

## Hendriksen IJM, Elderson A> The Use of EEG in Aircrew Selection. *Aviat Space Environ Med* 2001; 72:1025-33.

The value of the electroencephalograph (EEG) as a screening device in aviation medicine is questioned because few subjects are disqualified on grounds of an EEG exam. At the Netherlands Aeromedical Institute, pilot applicants are rejected with a diagnosis of epilepsy or with severe EEG abnormalities (including epileptiform patterns where epilepsy is highly suspected). Although several studies have shown a low incidence of epileptiform EEG abnormalities in candidate pilots, subjects with an epileptiform EEG have a substantially increased risk of sudden incapacitation during their flying careers. In this review, we calculate the probability that a candidate with epileptiform EEG, but no history of epileptic seizures, will develop seizures during his flying career. This probability is about 25%, more than 12 times higher than for subjects with normal EEG and no history of epileptic seizures (2%). Subjects with epileptiform EEGs not only have increased risk of future epileptic seizures but additionally, it is recognised that epileptiform EEG discharges may be associated with episodic functional impairment, which can be a danger when a subject is flying. Taking this into account, one should consider rejecting all candidates with epileptiform EEGs in the future. This is at the expense of a small group of subjects with false-positive EEGs, but we believe that concern for public safety must override other considerations in these rare cases. To improve the understanding of the usefulness of the EEG in pilot screening procedures, an international classification and coding system should be developed, so that data from different countries can be compared.

## COMMENT

*The use of EEGs during pilot screening has not been popular in western countries. The feeling is that EEG changes, in the absence of clinical changes, are very subjective with many false positives.*

## Schwartz RB, Ledrick DJ, Lindman AL A comparison of carbon monoxide levels during the use of a multi-fuel camp stove. *Wilderness Environ Med* 2001; 12(4): 236-238.

## OBJECTIVE

The use of camp stoves in an enclosed or poorly ventilated space is clearly not recommended due to the risk of carbon monoxide (CO) poisoning. Instances may arise, however, when use for a limited time is necessary. We sought to find differences in CO levels between various fuels used to power a commercially available camp stove.

## METHODS

A comparison was made between unleaded gasoline, kerosene, and white gas (Coleman fuel). The stove, fuels, and CO detector were all purchased from local retailers. A 0.4-m<sup>3</sup> space was constructed with a cardboard box. Three trials were performed using each fuel in which water was heated over the stove for five minutes. Measurement of the CO level within the box was taken every 30 seconds.

## RESULTS

Kerosene created CO levels of 714 (SD = 113.5) parts per million (ppm) at two minutes but was out of the measurable range of >999 ppm within four minutes on each of its trials. White gas burned the cleanest, with an average of 212 ppm (SD = 27.8) at two minutes and 348 ppm (SD = 76.0) at five minutes. Unleaded gasoline created 305 ppm (SD = 27.1) at two minutes and 464 ppm (SD = 31.6) at five minutes.

## CONCLUSION

All of the fuels created a high level of CO in a short period of time. White gas burned the cleanest and would be preferred to unleaded gasoline or kerosene in the event that the unvented use of a camp stove was necessary.

## COMMENT

*Take home message: ALWAYS vent when using a camp stove. This will be of significance if in an escape and evade situation, trying to minimise heat generation, but really there should be few times when some venting is not possible.*

**Farstad OJ, Chow T. A briefcase report and review of ciguatera poisoning. *Wilderness Environ Med* 2001; 12(4): 263-269.**

Although ciguatera fish poisoning is generally a mild, self-limited disease, both life-threatening acute reactions and troublesome chronic symptoms can occur. Because ciguatera has been largely confined to tropical locations, a relative lack of recognition exists among many US physicians. As the access to tropical locations has increased, so has the distribution of ciguatera. Herein, we present a case report and review the current literature on ciguatera.

## COMMENT

*Slightly more common in Australia area of interest but still not something a clinician will recognise immediately. A useful review of the condition.*

**Schwartz R, Charity B. Use of Night Vision Goggles and Low-level light source in Obtaining Intravenous Access in Tactical Conditions of Darkness. *Mil Med* 2001;166(11): 982-983.**

## OBJECTIVE

The tactical environment of the nighttime battlefield precludes the use of white light to perform medical procedures. This study sought differences between two alternatives to white light to facilitate intravenous access. A comparison was made between Night Vision goggles (NVGs) and a low-level light source (Fingerlite).

## METHODS

Fifty-eight volunteers were paired. Each member of the pair attempted intravenous access on his or her partner in darkness using both techniques. One attempt per method was allowed. Success was confirmed by the free flow of blood from the catheter.

## RESULTS

Of the 58 attempts using NVG, 32 were successful and 26 failed. In the Fingerlite group, there were 46 successful attempts and 12 failures. These differences reached statistical significance ( $p < 0.02$ ).

## CONCLUSION

This study suggests that in conditions requiring darkness a Fingerlite offers a clinical advantage over NVG in obtaining intravenous access.

#### **COMMENT**

*The reduction of visual acuity and in particular loss of depth perception would play a large role in this outcome. Wherever possible, unprocessed light is better, at least using present technology.*

**Bennett T, et al. Effect of Creatine on Performance of Militarily relevant Tasks and Soldier Health. Mil Med 2001; 166(11): 996-1002.**

#### **PURPOSE**

Determine the short-term effects of creatine supplementation on performance of military tasks, thermoregulation, and health risks.

#### **METHODS**

Male military personnel were randomly assigned to a creatine (N=8) or a placebo (N=8) supplementation group. Testing was conducted at baseline, after a six-day load phase (20g/day) and after 4 weeks of taking 6g/day. Measurements included body composition, liver/kidney function tests, core body temperature during a ten-mile march and five-mile run, and performance on physical tasks.

#### **RESULTS**

Serum and urine creatine increased significantly in the CR group. Body mass and the number of pull-ups performed increased significantly in the CR group but not the CON group by week 4. No significant difference between the CR and CON groups were found for other performance measures.

#### **CONCLUSION**

Creatine supplementation increases body mass and pull-up performance but did not cause acute health problems. Creatine did not increase core temperature compared with placebo under the environmental conditions of the study, and it is unlikely that creatine will enhance the overall readiness or performance of soldiers.

#### **COMMENT**

*Good study, other than the numbers were small. Creatine does not appear to be dangerous, but nor is it of significant benefit, so why bother? The concern about overheating probably arises associated with dehydration, use of ephedrine concomitantly, and other factors.*

**Gray G, et al. Prospective study of respiratory infections at the US Naval Academy. Mil Med 2001;166(9):759-763.**

Midshipmen at the US Naval Academy have recently suffered epidemics of upper respiratory tract infections. Seeking to determine the cause, in June 1998 we enrolled 1243 (99.5%) of 1249 new midshipmen (plebes) and followed them during their first 11 months of training. Eighty-five plebes sought medical attention for acute respiratory disease. Using culture, serologic studies, and polymerase chain reaction, considerable evidence for respiratory pathogen infection was found among the ill subjects: Chlamydia pneumoniae in 42 (52.6%), Mycoplasma pneumoniae in 19 (25.3%), influenza in 11 (14.2%) Streptococcus pneumoniae in six (7.3%) and adenovirus in one (1.2%). Additionally, 873 (81%) of the 1077 plebes who completed an end-of-year questionnaire complained of having one or more respiratory symptoms (>12 hours) during their first year of school. Of these, 132 (15%) reported that the symptoms significantly affected their performance. Study results suggest that respiratory infections were frequent, had a significant adverse impact on training and were often attributable to bacterial pathogens.

#### **COMMENT**

*Chlamydia and Mycoplasma are not bacteria. There did not seem to have been an epidemic during the year of the study. The most prominent pathogens seem a little skewed; influenza is very underrepresented; presumably, the common viral pathogens were to be found in the illnesses, which did not get to the medical centre. But not one case of Epstein Barr Virus?*

**Sicard B, et al. Risk propensity assessment in Military Special Operations. Mil Med 2001; 166(10): 871-874.**

Risk-taking, decision making and stress factors are strongly associated with military operations. The authors used the Bond and Lader mood and alertness scale and a new scale, Evaluation of risks (EVAR) to assess risk proneness in a maritime counter-terrorist exercise. EVAR items are distributed among five factors: self-control, danger seeking, energy, impulsiveness and invincibility. In the study, ten pilots were submitted to strenuous night flights with limited sleep deprivation. Compared with baseline data, pilots reported an increase in impulsiveness, whereas EVAR factors were consistent in a control group comprised of nine navy crew members. Correlations were observed between mood and alertness and risk factors. These results illustrate how EVAR can be used to evaluate change in risk proneness in individuals submitted to various stressors. But further studies are required to weigh stress factors and environmental conditions in risk propensity with a larger population of various age and personality traits.

#### **COMMENT**

*Early days. The idea is to evaluate personnel to see if they are too prone to risk taking and 'risk proneness' before setting out on a mission. The aviation community already embraces risk assessment. The military community needs to extend it to a far wider audience, including medical missions. This tool may prove valuable but much more work is needed.*

