

Working outline
John & Greg

STRONG PILL

I. INTRODUCTION (Definition and use)

As used in this report "strong pill" encompasses interventions that might increase strength, speed, or endurance and slow the onset of fatigue. Continuous operations will require sustained physiological and psychological human effort. Physiological, nutritional, or pharmacological treatments that would increase endurance and decrease fatigue would be of considerable benefit to military performance in combat.

As noted by the military historian, General S.L.A. Marshall "In the measure that the man is shocked nervously and that fear comes uppermost, he becomes physically weak. His body is drained of muscular power and of mental coordination". Stress, both physical and mental, interacts with fatigue and tiredness. Thus fatigue can be expected to occur earlier and following less physical expenditure of energy in men who are stressed. The amount of physical load carried by a soldier, the amount of sleep loss or disruption, the time of day at which the physical or mental effort is required (i.e. the effects of biological rhythms or jet lag), the thermal load (ambient temperature, wearing of nuclear/chemical suits), the degree of dehydration and salt loss can all be expected to interact with and affect the endurance of the soldier.

Another factor to be considered in the design of a "strong pill" is the type of sustained performance required. Generals, artillery fire control officers, tankers, and infantry soldiers perform different types of tasks and one "magic bullet" will not suffice to improve relevant performance for these different jobs on the battlefield. Often a drug will improve one type of performance but simultaneously degrade a different performance. Drugs that might increase, for example, strength could have a side effect of disrupting judgement.

It is the purpose of this report to describe potential performance enhancers with

regard to their known beneficial and side effects and to suggest new areas of research based on recent data regarding exercise physiology that might produce new types of drugs that could be used as "strong pills". This report will also emphasize the potential benefits of using currently available knowledge with regard to nutrition, physical conditioning, training, preparedness, sleep and water discipline to maximize human endurance and minimize fatigue.

II. HISTORY

1. Amphetamines in WWII
2. Steroids in athletes
3. Vitamins
4. Other stimulant drugs

III. MECHANISMS OF ENDURANCE AND FATIGUE

1. Hormonal and biochemical responses to exercise
2. What is fatigue?
3. Oxygen debt
4. Adaptive biochemical changes in training
5. The importance of glucose homeostasis
6. Sources of energy for physical effort: short vs long duration exercise.
7. Interactions among biochemical/hormonal responses to exercise, stress, and other factors.

IV. PERFORMANCE ENHANCERS

A. DRUGS

1. Amphetamines
2. Steroids
3. Caffeine
4. Ox phos couplers
5. L- DOPA or other catecholamine agonists
6. Other drugs thought to enhance physical or mental performance.

B. NUTRITION (Prior to and during sustained performance)

1. Vitamins
2. Carbohydrate loading
3. Salt tablets
4. Water
5. High Protein

C. CONDITIONING (physical and/or mental)

1. Oxidative enzyme induction
2. Blood oxygen carrying capacity
 - a. Training at altitude
 - b. blood doping
3. Mental Techniques

V. PROBLEMS

A. DRUGS

1. Toxicity
2. Side effects
3. Drug Abuse

B. NUTRITION

C. CONDITIONING

D. OTHER

VI. RESOURCES

1. Sports medicine
2. Exercise physiologists (NATICK)