

UNCLASSIFIED

83

1. Title: Antipersonnel Chemical Immobilizers: Sedatives 27 April 1994

2. Type Effort. S & T

3. Proposed by: Edgewood Research, Development & Engineering Center

4. Capability Sought and Uses to Which it Could be Put: The objective is to develop non-lethal chemical materials having minimal side effects for immobilizing adversaries in various military and law enforcement scenarios. Potential military applications include meeting U.S. objectives in peacekeeping missions; crowd control; embassy protection; and counterterrorism. Law enforcement application include use by local, state and national law enforcement agencies, for example FBI and Alcohol Tobacco Firearms (ATF) in hostage and barricade situations; crowd control; close proximity encounters, such as domestic disturbances, bar fights and stopped motorists; to halt fleeing suspects; and prison riots.

5. Technical Description.

a. Technical Objectives: Develop chemical immobilizers with improved performance characteristics, such as safety, onset time and duration of action over existing potential candidates. Develop family of materials with performance characteristics best suited to various, specific scenarios.

b. Technical Approach.

(1) The overall development of a non-lethal chemical immobilizer is a multi-phase, multi-year process including the following steps:

Phase 1 - Develop candidate material, including design and synthesis; characterize chemical and physical properties; demonstrate effectiveness by preclinical toxicology tests.

Phase 2 - Expanded Preclinical Toxicological Tests, such as carcinogenicity, mutagenicity, teratogenicity, environmental fate, and subchronic effects, for Surgeon General, FDA and any required other agency approval.

Phase 3 - Develop delivery systems to include dissemination of candidate material for specific scenarios and hardware development.

Phase 4 - Clinical Trials for effectiveness and safety.

This proposal applies only to Phase 1.

(2) Technical Approach for Phase 1. Conduct Structure Activity Relationship (SAR) studies to determine a basic pharmacophore and to design and synthesize new alpha2-adrenergic agonists that cause immobilization by profound sedation. Emphasis will be on synthesis of quicker and shorter acting and safer materials than those that currently exist; starting point for synthesis will be on newly designed compounds based on previous molecular modeling and SAR studies conducted at ERDEC. Once target compounds are synthesized they will be tested by in vitro assays to indicate potential sedative activity and blood pressure effects, by use of platelet aggregation

UNCLASSIFIED

ONR-NLW.084  
Antipersonnel Chemical Immobilizers: Sedatives  
Other

# UNCLASSIFIED

and isolated guinea pig ileum tests. Based on in vitro results, the most interesting compounds will be further tested for sedative and blood pressure effects in the mini-pig. Previous studies have shown this animal to be the best model for this class of chemicals. The leading candidate(s) from these in vivo tests will be selected for tests in additional species and for inhalation studies to demonstrate effectiveness and safety by this route of entry. Thus, improved candidate non-lethal chemicals for follow-on Phase 2, 3 and 4 studies are the expected results.

6. Risk and Limitations: Alpha2-adrenergic agonists that cause profound sedation without the untoward side effect of respiratory depression exist. However, these materials also affect cardiovascular function, particularly blood pressure. Also, previously tested materials have onset times for physiological effect that are too slow and effects that last too long for their envisioned use. Thus, compounds with improved performance characteristics in these three areas are needed. Based on previous studies it should be possible to achieve these goals, but there is no guarantee of success. Operational limitations include the potential use in mixed populations of the very young, the elderly, those in poor health and those who may react adversely to a specific chemical. The search for new compounds will consider factors to minimize these risks. A properly functioning protective mask worn by trained personnel will serve as an effective countermeasure. Also, antidotes for this general class exist, however, precise knowledge of specific chemicals would be needed to employ effectively as countermeasures.

7/8. Project Plan/Cost by Fiscal Year. This plan is designed to provide data for the proposed ERDEC tech demo (ACTD) effort, entitled "Demonstration of Chemical Immobilizers" and, especially to provide data for next generation chemical immobilizers to improve or expand the capability.

<u>Task</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>
Structure Activity Relationship Study: Design, Synthesis, in vitro and in vivo screen	400	400	
In vivo evaluation	<u>175</u>	<u>300</u>	
Total	575	700	

9. ERDEC POC: C. Parker Ferguson  
Technical Director, U.S. Army Edgewood Research, Development  
& Engineering  
Center  
ATTN: SGBRD-RTC  
Phone: DSN 584-1901  
Commercial: 410-671-1901  
Fax: 410-671-3218

# UNCLASSIFIED