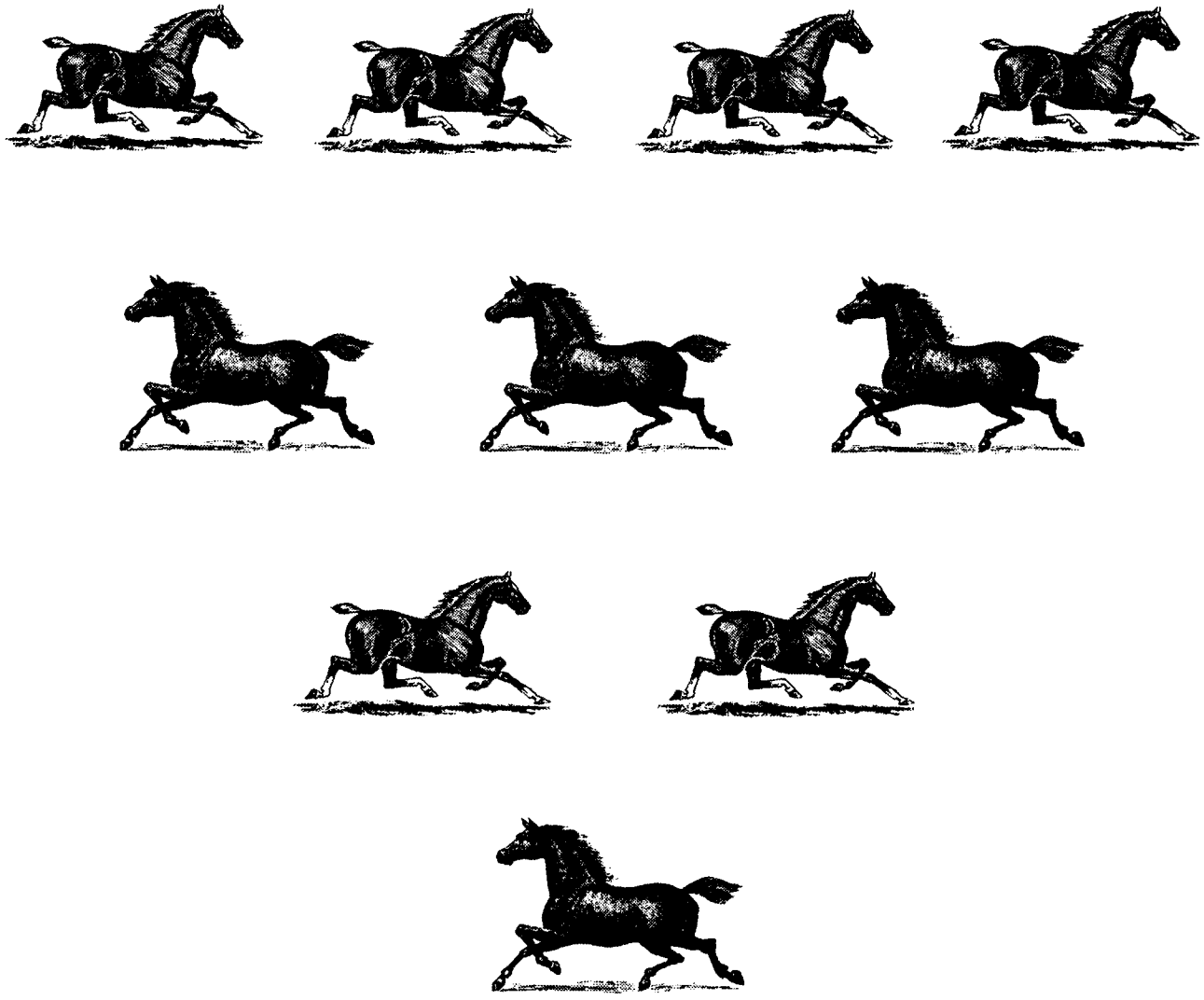
ANNOTATED BIBLIOGRAPHY

for

WILDLIFE CONTRACEPTION: METHODS, APPROACHES, & POLICY



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WILDLIFE CONTRACEPTION: METHODS, APPROACHES, & POLICY

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INTRODUCTION

In compiling an annotated bibliography we hope to provide a reference resource for wildlife management practitioners, researchers, decision makers, and interested stakeholders. This is essentially a working bibliography for two reasons: 1) it is not comprehensive, for reasons explained below; and 2) our efforts to update and maintain this database are ongoing. We provide this document as a starting point for those interested in the status of wildlife contraception techniques.

A promising contraceptive compound or technique generally follows a hierarchical path to evaluate its usefulness. Between the time the compound is identified and the day it is applied to a free-ranging population, the path looks something like this:

- Basic research on physiology, endocrinology, reproductive behavior, and population dynamics.
- Compound (or technique) identified and tested for physiological effects using histological techniques in a laboratory setting.
- Compound is tested *in vitro*--in living tissue outside the organism from which the material is derived--in a laboratory, to determine if it inhibits some step in the reproductive process.
- Compound is tested *in vivo*--in a living orgânism--and often in a laboratory "model" animal. A model animal is one that is easily obtained and generally approved for laboratory testing (e.g., laboratory strains of rat, mouse, or rabbit), but may not be the animal that will ultimately be targeted for contraception with the compound in question.
- Compound is tested in controlled laboratory setting (or in outdoor holding pens) on the intended target animal.
- Compound is tested in field conditions.
- Long-term field trials examine population response and determine if the compound effectively suppresses populations in the presence of ingress, egress, weather, or other biotic and abiotic factors.

Interspersed in this process are a variety of additional concerns which must be addressed.

- Does the compound have undesirable secondary effects? Can it be passed up the food chain and affect non-target species? Does it persist in the environment and enter the food chain through non-target species?
- How is the bait delivered to the target species--a self administered oral bait, or a human administered injectable vaccine? If in vaccine form, will the compound have to be microencapsulated for timed or controlled release? What is the appropriate dosage, and will it be delivered as a single or multiple dose? How many times per year, or how many years, must it be administered?
- Is enough known about the target population to model its response to contraception, and how much of the free-ranging population will need to be contracepted to suppress population growth?
- . Can a license be obtained from the appropriate regulating agency to test the compound on a free-ranging population? Is there a regulatory agency with clear jurisdiction over the proposed application of a fertility control action?

It's little wonder that many compounds which initially show promise as effective contraceptives never exit this gauntlet. The literature is replete with examples of compounds that are prematurely dropped from testing because funding dries up, career interests change or careers end, and promising compounds fall by the wayside.

A variety of motivations have driven contraceptive research. Zoos have had a long-standing problem with surplus individuals created by animals breeding in captivity, and have sought reversible techniques to curb reproductive output. Research veterinarians have sought contraceptives to control domestic or feral-domestic cat and dog populations. Researchers concerned with human reproduction continue to seek contraceptives to regulate human populations. These diverse research interests have sometimes worked synergistically to quickly advance our knowledge. But this is not always the case. For an alternative example, compounds occasionally produce side effects in animal models that would be unacceptable in humans, and so may be dropped from further research, even though the side effects might be acceptable in controlling short-lived animal species.

The references in this bibliography comprise the main body of literature on the topic of wildlife contraception. Be aware that the boundaries are diffuse and your particular area of research may lead you to papers which you think we should have included in the bibliography. The following types of references have been **excluded** from this bibliography: work which appeared only in the form of an abstract; theses and dissertations; unpublished manuscripts; grey literature in the form of reports submitted to funding agencies, or reports produced by a research branch of federal or state governments.

We, not the papers' authors, selected the keywords included with each reference. The keywords are intended to provide the user with some indication of the content of the paper, and to provide a means for cross-indexing the bibliography. At the broadest scale, papers were assessed to determine if experiments were carried out in free-range (FIELD) or controlled (CLINIC) conditions, and whether mammals (MAMMAL) or birds (AVES) were the study subjects. Where appropriate, keywords also indicate the compound or technique tested, the specific study animal, and whether males or females of the species were targeted. Be aware that we kept the categories broad. For example, DEER may refer to white-tailed, black-tailed, or mule deer; each abstract identifies specifically the species under study.

METHODS

We used several approaches to complete a comprehensive review of wildlife contraception. Using Wildlife Worldwide, we searched a CD-ROM database of over 320,000 citations. Wildlife Worldwide contains the equivalent of the U.S. Fish and Wildlife Service's publication *Wildlife Review*, with full coverage from 1971-present, and partial coverage from 1935-1970. We based each database search on the following list of keywords: chemosterilant, contraception, fertility control, human dimensions, immunocontraception, population control, risk analysis, sociology, virus, and virus-vectored. By inspecting the literature cited section of each reference uncovered in the database search, we located additional relevant citations.

In transcribing material from original sources we tried to maintain the intent of the authors' own writing. Material taken verbatim from the original source is indicated in quotes; we made no attempt to modernize language or standardize abbreviations within quoted material. Where editorial material had to be included for clarity, we indicated the insertion of our text with brackets. With few exceptions we did not attempt to assess the quality of the research or the validity of the results. For those seeking a critical assessment of the literature, a good review, comprehensive to approximately 1990, can be found in Bomford (1990).

Additions and Corrections

We encourage you to send us additions, updates, or corrections for significant literature. Send additions and corrections to: Wildlife Contraception Bibliography Update, Dept. Fisheries & Wildlife, Utah State University, Logan UT 84322-5210. A complete copy of any new literature would be most appreciated.

Don McIvor Robert Schmidt February 21, 1996