

DRUG APPROVAL RESEARCH ON 17 α -METHYLTESTOSTERONE

Chairperson: Rosalie A. Schnick, National Aquaculture NADA Coordinator,
Michigan State University

Industry Advisory Council Liaison: Mark Willows, Binford, North Dakota

Extension Liaison: Kevin Fitzsimmons, University of Arizona

Funding Request: \$54,615

Duration: 1 Year (September 1, 2009 - August 31, 2010)

Objectives:

Project #1: Official Transfer of 17 α -methyltestosterone (MT) Analytical Method for Feed

1. Develop study protocols to conduct the MT feed method transfer of the MT analytical feed method.
2. Submit method transfer study protocols to the Center for Veterinary Medicine (CVM) for concurrence.
3. Provide final study protocols to participating laboratories.
4. Prepare and ship medicated feed to participating laboratories.
5. Assay control and medicated feed samples according to the study protocols concurred with by CVM.
6. Complete report of analysis and submit along with raw data to the Upper Midwest Environmental Sciences Center (UMESC).
7. Compare and discuss the results of both the CANTEST, Ltd. (CANTEST) reference (expert) and transferred (naïve) analyses of the MT transfer study samples based on the MT analytical feed method developed by the University of Wisconsin-Madison (UW-Madison).
8. Determine whether any changes are needed to the MT analytical feed method developed UW-Madison based on the results of the MT feed transfer study.
9. Validate that the naïve analyst at CANTEST can analyze the MT feed samples according to the analytical feed method developed by UW-Madison.
10. Compile Final Study Report (FSR), archive raw data, and submit FSR to CVM through the UMESC MT investigational new animal drug (INAD) exemption.
11. Respond to CVM comments.
12. Gain acceptance from CVM for the MT feed method transfer study.

Proposed Budget for Project #1:

| Institution | Principal Investigator | Objec- tives | Year 1 | Total |
|---|-------------------------------|-------------------------|-----------------|-----------------|
| USGS, Upper Midwest Environmental Sciences Center | Mark P. Gaikowski | 1-12 | \$15,780 | \$15,780 |
| Reference Laboratory, CANTEST Ltd. | Nilmini Wijewickreme | 1-12 | \$12,100 | \$12,100 |
| Transferee Laboratory, CANTEST Ltd. | Nilmini Wijewickreme | 1-12 | \$5,400 | \$5,400 |
| Total | | | | \$33,280 |

Project #2: Repeat of the 17 α -methyltestosterone Target Animal Safety Study in Tilapia

1. Interact with CVM to determine whether the study design and protocol developed by Southern Illinois University at Carbondale (SIUC) will need to be modified.
2. Submit the revised study protocol to CVM for concurrence.
3. Conduct a target animal safety study using MT on tilapia according to the CVM concurred protocol that is based on the guidelines for a target animal safety study in feed under Good Laboratory Practices (GLP).
4. Write the FSR and submit to CVM through the Aquatic Animal Drug Approval Partnership Program (AADAP) MT INAD.
5. Respond to CVM comments.
6. Gain acceptance from CVM for the target animal safety study on MT in tilapia.

Proposed Budget for Project #2:

| Institution | Principal Investigator | Objectives | Year 1 | Total |
|--|-------------------------------|-------------------|-----------------|-----------------|
| USDA/ARS, Harry K. Dupree Stuttgart National Aquaculture Research Center | David L. Straus | 1-6 | \$21,335 | \$21,335 |
| | | | Total | \$21,335 |
| GRAND TOTAL FOR PROJECTS #1 and #2 | | | | \$54,615 |

TABLE OF CONTENTS

SUMMARY OVERVIEW (PARTICIPANTS, OBJECTIVES, AND PROPOSED BUDGETS)..... 1

JUSTIFICATION..... 4

RELATED CURRENT AND PREVIOUS WORK..... 4

ANTICIPATED BENEFITS..... 6

OBJECTIVES..... 6

PROCEDURES..... 7

FACILITIES..... 8

REFERENCES..... 9

PROJECT LEADERS..... 10

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS..... 11

BUDGETS

 BUDGET AND BUDGET EXPLANATION FOR EACH PARTICIPATING INSTITUTION..... 12

 USGS Upper Midwest Environmental Sciences Center (Gaikowski–Project #1, Objectives 1-12) 12

 CANTEST Ltd. (Reference Laboratory, Wijewickreme)–Project #1, Objectives 1-12)..... 15

 CANTEST Ltd. (Transferee Laboratory, Wijewickreme)–Project #1, Objectives 1-12)..... 17

 USDA/RS Harry K. Dupree Stuttgart National Aquaculture Research Center (Straus–Project #2, Objectives 1-6)..... 20

 Budget Summary for Each Participating Institution..... 22

SCHEDULE FOR COMPLETION OF OBJECTIVES..... 23

LIST OF PRINICIPAL INVESTIGATORS..... 24

CURRICULUM VITAE FOR PRINCIPAL INVESTIGATORS..... 25

JUSTIFICATION

The approval of 17 α -methyltestosterone (MT) medicated feed for use in tilapia to produce male fish would be of significant benefit to the industry. Tilapia is now the fifth most consumed seafood in the United States. Male fish grow faster than do their female counterparts, and by using all male fish, reproduction can be minimized or eliminated in grow-out systems, further benefiting growers. Approval of MT will allow all tilapia producers to have legal access to MT without an investigational new animal drug permit and will provide them with a legal means to yield increased biomass, thus resulting in more revenue for those producers. The production of male populations of tilapia is important to the U.S. tilapia industry if they are to remain competitive with foreign producers of tilapia. Additionally, approval by the Center for Veterinary Medicine (CVM) should help to alleviate fears from the public and erroneous claims by some environmental groups as to the safety of this technique. Approval of MT will provide advantages for those producers who currently do not have the space, time, or money to produce "super male brood stock" of tilapia through use of techniques such as producing genetically male populations of tilapia. MT is a major tool that could be used to manipulate the gender of a variety of cultured fish other than tilapia (e.g., hybrid striped bass, trout, percids, sunfish, and esocids). After the approval of MT for tilapia, supplemental New Animal Drug Applications (NADAs) could then be obtained for these species if specific data are generated on those species (e.g., target animal safety, effectiveness studies). The sustainability of yellow perch and sunfish aquaculture in the North Central Region are dependent on production of uni-sex fingerlings. These two species show considerable sexual dimorphic growth patterns, such that economic viability of culture operation for both species is compromised by slow growing individuals, females for sunfish and males for yellow perch. Eventual approval of MT is going to be a necessity for improving U.S. aquaculture of these species.

The remaining data requirements that are impeding approval of MT for an original NADA approval in tilapia have been identified. A NADA approval will be gained for the use of MT when CVM accepts (1) the remaining data currently being generated or to be generated to include data in the major categories of (a) Chemistry, Manufacturing, and Controls (CMC), (b) Environmental Safety, and (c) Target Animal Safety; (2) an update on Human Food Safety; (3) the minor categories of All Other Information, Freedom of Information Summary, and Labeling; and (4) the Administrative NADA package to be submitted by the sponsor after all these categories have been accepted by CVM.

In February and May 2008, the North Central Regional Aquaculture Center (NCRAC) and Western Regional Aquaculture Center (WRAC) Boards of Directors authorized funding for the only remaining and required studies that had not been funded: MT feed method transfer study and a repeat of the target animal safety study in tilapia. The National Coordinator for Aquaculture New Animal Drug Applications (National Aquaculture NADA Coordinator) and Kevin Fitzsimmons are working with both NCRAC and WRAC to accomplish this task.

NCRAC and WRAC sought a proposal from selected teams to carry out the work. These selected teams were based on a demonstrated record of expertise, access to facilities required for the project, and how they propose to address the objectives of the two separate projects. The proposal was reviewed and evaluated by experts.

RELATED CURRENT AND PREVIOUS WORK

Project #1: Official Transfer of 17 α -methyltestosterone (MT) Analytical Method for Feed

In a previous project that was funded by NCRAC, the University of Wisconsin-Madison (UW-Madison) developed an analytical method for MT to quantify MT in medicated fish feed. This method was accepted by CVM on December 2, 2005 (Marwah et al. 2005). This method development was required by CVM in a letter dated May 25, 2001 (CVM 2001). UW-Madison provided the analytical method and internal standard to the Food Safety Division, CANTEST Ltd. (CANTEST) in June 2006. CANTEST is the laboratory selected by the drug sponsor, Rangen, Inc., to analyze the feed for Good Laboratory Practices (GLP) compliance for target animal safety studies, Good Clinical Practices compliance for pivotal effectiveness studies to help gain NADA approval, and routine sampling after NADA approval to meet CVM requirements under the CMC Technical Section. In October 2006, CANTEST analyzed MT-

medicated feed samples according to the UW-Madison analytical method and began receiving samples for analyses. The analyses by CANTEST were conducted under ISO/IEC 17025 standard.

The MT analytical feed method must be officially transferred to meet the CVM requirements for the CMC Technical Section as part of the requirements for NADA approval (CVM 2001). CVM published a document regarding the development of study protocols for the method transfer study that the respective laboratories need to consult (CVM 2007). It is also recommended that laboratories conducting method transfer studies consult with and obtain specific guidance from the CVM Biotherapeutics Team (CVM 2008) prior to conducting a method transfer study. Two laboratories, at a minimum, are needed to perform a method transfer study, the reference (expert) laboratory that has demonstrated that it can analyze the method developed by UW-Madison plus a "transferred" (i.e., naïve) laboratory. CANTEST was selected by the sponsor (Rangen, Inc.) to perform the analyses of MT feed samples and CANTEST presently has on staff personnel that have demonstrated ability to perform the MT analytical method and are able to act as the expert laboratory. CANTEST also has a separate division within its company with analysts that have not performed the MT analytical method and are available to complete the naïve laboratory analysis using separate facilities and analytical instrumentation. A facility is also required to act as the Study Director who develops protocols and writes the Final Study Report and that facility is the U.S. Geological Survey's Upper Midwest Environmental Sciences Center (UMESC).

The analytical laboratory portion of the feed method transfer study is scheduled to start in January 2010. When these studies are completed and the data analyzed, reports will be completed by both the expert and naïve laboratories at CANTEST. Each report will summarize the results of the method familiarization sample assays and transfer study sample set, difficulties or challenges associated with the method, and deviations from the study protocol or method. Each report will be signed by the responsible individuals. These reports will be combined in a Final Study Report by UMESC that will compare and discuss the results of the CANTEST analyses of the transfer study sample set and summarize any proposed changes to the method that resulted from the transfer study. The Final Study Report will describe all sample preparation, shipment, and storage methods employed by the participating laboratories at CANTEST.

When this study is completed, coordinated, and analyzed, UMESC will submit the Final Study Report under its Investigational New Animal Drug (INAD) exemption to CVM for the agency's acceptance as complete.

Project #2: Repeat of the 17 α -methyltestosterone Target Animal Safety Study in Tilapia

An MT target animal safety (TAS) study in tilapia was conducted with NCRAC funds at Southern Illinois University-Carbondale (SIUC) in early summer 2007 using a study protocol that had concurrence from CVM. During the in-life phase of the study (completed through the necropsy stage), CVM conducted an audit for GLP compliance and noted several noncompliant GLP items. On August 17, 2007, CVM deemed that the study was not acceptable and needed to be repeated. The Principal Investigator for that project is no longer at SIUC and currently there is no one at SIUC who desires to or will repeat the study.

In February 2008, the U.S. Department of Agriculture, Agricultural Research Service's Harry K. Dupree Stuttgart National Aquaculture Research Center (SNARC) offered to conduct a new MT TAS study in tilapia. The staff at SNARC has been involved in drug approvals with GLP studies on residue analysis and target animal safety and is extensively trained in quality assurance procedures. The study will mainly be funded by SNARC base funds to cover salaries during the study and preparing the Final Study Report, aquaria, and other laboratory supplies (i.e., ~\$40,000); however, SNARC required financial support for histopathology consumables, feed analysis of the MT study material, and service expenses from a quality assurance (QA) unit.

When this study is completed, SNARC will submit the Final Study Report through the INAD owned by the Aquatic Animal Drug Approval Partnership Program (AADAP) for transmission to CVM for the agency's acceptance as complete.

ANTICIPATED BENEFITS

Implementation of these two studies will allow separate CANTEST laboratories to conduct the official Feed Method Transfer Study and SNARC to conduct a repeat of the Target Animal Safety Study on Tilapia, two essential requirements to gain approval of MT for tilapia production. Approval of MT will ensure that U.S. tilapia farmers have legal access to the most efficient method currently available for the production of predominantly male fish for stocking into grow-out units.

OBJECTIVES

Project #1: Official Transfer of 17 α -methyltestosterone (MT) Analytical Method for Feed

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2. Submit method transfer study protocols to CVM for concurrence.
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Project #2: Repeat of the 17 α -methyltestosterone Target Animal Safety Study in Tilapia

1. Interact with CVM to determine whether the study design and protocol developed by SIUC will need to be modified.
2. Submit the revised study protocol to CVM for concurrence.
3. Conduct a target animal safety study using MT on tilapia according to the CVM concurred protocol that is based on the guidelines for a target animal safety study in feed under GLP.
4. Write the FSR and submit to CVM through the AADAP MT INAD.
5. Respond to CVM comments.
6. Gain acceptance from CVM for the target animal safety study on MT in tilapia.

PROCEDURES

Project #1: Official Transfer of 17 α -methyltestosterone (MT) Analytical Method for Feed

Section 512(b) of the Federal Food, Drug and Cosmetic Act (the act) (21 U.S.C. §360b) establishes the requirements for a new animal drug approval. As part of the NADA submission, analytical procedures capable of determining the active component(s) of the new animal drug within a reasonable degree of accuracy and of assuring the identity of such components must be developed. This includes a description of practicable methods of analysis (assay methods) that have adequate sensitivity to determine the amount of the new animal drug in the final dosage form. In the case of MT, the medicated feed is the final dosage form used to treat the animal. Because the MT-medicated feed is prepared by the incorporation of a new animal drug and marketed as the final drug dosage for aquaculture use, it is thus defined as a Type C medicated feed by CVM. Thus, as part of the NADA review process for a Type C medicated feed, CVM requires assay methods to quantify the amount of the new animal drug in the Type C medicated feed.

As part of the validation of the Type C medicated feed assay, CVM requires that a method transfer study be conducted to confirm the reproducibility of the drug assay in laboratories other than the developing laboratory (CVM 2007). Many testing laboratories, including state feed laboratories and contract laboratories, use Type C medicated feed assay methods to determine whether the drug in a medicated feed is within the assay limits. Because many different laboratories use medicated feed assays, it is important that the assay methods are reproducible. A method transfer study demonstrates the transferability of the feed assay method among different laboratories by comparing the results each laboratory obtains when using the method to analyze a specific set of feed samples (CVM 2007).

The Type C method transfer is typically divided into two phases. Phase 1 is typically a method familiarization phase in which participating laboratories assay control and fortified feed samples to ensure the participating laboratory has the understanding, expertise, and equipment needed to perform the assay. This phase was previously completed by UW-Madison and CANTEST. Phase 2 consists of the analysis of a duplicate set of samples of the Type C medicated feed by the reference and transferee laboratories (CANTEST has both expert and naïve personnel available to process samples using separate laboratories and separate analytical instrumentation).

UMESC, in collaboration with CANTEST, will develop an analytical method transfer protocol to specify the characteristics the reference and participating laboratories will investigate including specifications for standard curve preparation, the number of samples to assay (including replicates), as well as criteria to accept data or require re-analysis. UMESC will submit the analytical method transfer study protocol to CVM for review and to obtain concurrence. Once the protocol has been accepted, separate CANTEST laboratories will assay the following feed samples provided by Rangen, Inc.:

- Five replicate control feed samples.
- Five replicates of control feed at each of the following fortifications: 0.5 \times the lowest dose, 1 \times the dose (if a dose range is specified, include 1 \times the lower and upper dose range), and 1.5 \times the highest dose.
- Ten replicates of medicated feed (five replicate samples of two feed batches). Feed samples will be collected from at least two medicated feed batches (227 kg; 500 lb minimum) prepared using processes presently used by Rangen, Inc. The feed nominal MT concentration will be within 0.5–1.5 \times the proposed label. Control feed will be obtained from the same mixing equipment and will be prepared before preparation of the medicated diets.

Feed samples will be processed according to procedures described in Marwah et al. (2005). Briefly, the MT concentration feed samples will be determined using a high performance liquid chromatography-mass spectrometric analysis (LC-MS) using 3 β -methoxy-17 β -hydroxyandrost-5-en-7-one as an internal standard. Feed samples will be extracted with methanol. The MT and the internal standard will be partitioned between 80% methanol and hexane and the methanol layer evaporated, purified by solid phase extraction, then subjected to chromatography on a C18 column using a water:acetonitrile gradient.

Both the reference and transferee CANTEST laboratories will compile the raw analytical data and provide their summary analytical reports to UMESC. UMESC and the two CANTEST laboratories will review the

raw data and summary analytical reports to determine whether any modifications to the analytical method are required. UMESC will archive the raw study data and prepare the final study report to describe all sample preparation, shipment, and storage by the reference and participating laboratories based on the analytical reports prepared by both CANTEST laboratories. The final study report will be submitted to CVM to complete the Type C method data requirements through the UMESC INAD exemption. UMESC will coordinate any required responses to CVM review comments.

Project #2: Repeat of the 17 α -methyltestosterone Target Animal Safety Study in Tilapia

The study will include four exposure groups (0 \times , 1 \times , 3 \times , and 5 \times), wherein test fish will receive treated feed that contains sufficient MT so that exposures are the respective multiples of the highest proposed treatment dose of 9 mg MT/kg fish body weight/day. After an acclimation period, fish will receive treated or control feed for 28 consecutive days before histological examination of tissues from selected fish. Each exposure group will consist of four test tanks containing 50 fish/tank ($N = 4$). Test tanks will be assigned an exposure group using a completely randomized design. Post-exposure fish samples will be collected and the study terminated after the last exposure day. Nominal water temperature should be 28.0°C (82.4°F) with an allowable range from 26.0°C (78.8°F) to 30.0°C (86.0°F).

Twenty stand-alone 20.0-L (5.3 gal) aquaria will be used as the test tanks. Each test tank will contain 18.0 L (4.8 gal) of filtered (75 M canister filter) water (volume will be marked appropriately on each tank). Each test tank will have a titanium heater to maintain water temperature. The water will be recirculated within each test tank with a typical external filter system, and water from each tank will not mix with any other tank. Tanks will be siphoned daily to remove debris. No more than 20% (approximately 3.6 L; 1.0 gal) of the tank volume will be removed and replaced daily.

Daily mortality, temperature, dissolved oxygen, and behavior data will be collected during the study. Background fish health data will also be collected from 20 fish sampled prior to study initiation. Fish will be too small for bacterial plating; therefore, fish health data will consist of an external check for parasites and 10 of the 20 fish selected for fish health will be randomly chosen for histology.

One day after the last exposure day, 20 fish from each test tank will be randomly chosen for gross external necropsy. Ten of these fish will be selected for histology. Fish will be euthanized by spinal severance. The size of fish is anticipated to be too small to perform an internal necropsy; therefore, whole fish will be preserved for histological examination (i.e., gill, liver, anterior kidney, posterior kidney, brain, heart, muscle with skin attached, spleen, stomach, pyloric intestine, and rectal intestine tissue).

FACILITIES

U. S. Geological Survey, Upper Midwest Environmental Sciences Center (UMESC)

UMESC has a proven expertise in the evaluation of drugs for use in fish culture. UMESC scientists have submitted numerous reports summarizing their research to CVM. These reports have led to the approval of several drugs to control diseases of fish and their eggs. The assigned investigator has led numerous regulated studies which were accepted by CVM and his body of work includes successfully completing several animal safety, effectiveness, residue depletion and environmental safety studies. UMESC's state-of-the-art research facility includes numerous laboratories (isolation, wet, and analytical laboratories) equipped with technology detect drug or chemical residues in fish tissue and to conduct fish culture and fish disease assessments.

Food Safety Division, CANTEST Ltd. (CANTEST)

CANTEST is a full service analytical laboratory offering a range of testing services related to food safety, environmental chemistry, ecotoxicology, and biopharmaceutical science. The Food Safety Division of CANTEST provides residue testing services to a number of clients in industry including produce growers, fish and beef producers, animal feed manufacturers, health product companies, and rendering plant operations. These testing services are completed in a variety of matrices including dairy, eggs, honey and syrups, meat, fruits and vegetables, fish, animal feeds, and processed foods. The residue testing services

include analyses for: agricultural chemicals (pesticides—over 250 individual compounds, herbicides, fungicides, and chlorinated organics), veterinary drugs (antibiotics, growth promoting hormones, and sulfonamides), trace heavy metals (lead, mercury, arsenic, and other elements), and microbiologicals (pathogenic bacteria, mycotoxins). CANTEST is one of only three laboratories providing residue testing services for the Canadian Food Inspection Agency's (CFIA) Canada National Residue Monitoring Program (NCRMP). CANTEST has been providing this service to the CFIA for more than a decade and holds accreditation from the Standards Council of Canada (SCC) (Laboratory Number 117) for specific tests.

Agriculture Research Service, Harry K. Dupree Stuttgart National Aquaculture Research Center (SNARC)

Research facilities at SNARC include an 18,000-ft² research laboratory completed in 1992. About 60% of the floor space is devoted to research activities in fish disease, therapeutic registration, nutrition/feeds development, and water quality management/production systems. A laboratory is set aside specifically for FDA studies; this laboratory is supplied with temperature-controlled well water.

Other buildings include a 3,700-ft² wet laboratory equipped with numerous aquaria, tanks, and troughs capable of being supplied with several temperatures of well and pond water. This building houses a fish disease research laboratory (572 ft²) with troughs and aquaria; it is served by an adjacent laboratory equipped with hoods and other equipment essential for fish disease research. An 8,000-ft² tank farm is equipped with 4-ft diameter fiberglass holding tanks. Each unit is supplied with well water or filtered pond water, aeration, and electrical power for research equipment. The tank farm has a complete catfish and tilapia hatching and rearing facility.

SNARC has a full analytical laboratory, toxicology/water quality laboratory with established methodology for various enzyme and water quality assays, parasitology laboratory, and microbiology/histology laboratory with expertise to evaluate histological specimens.

REFERENCES

- Center for Veterinary Medicine (CVM). 2001. CVM letter to Linda Lemmon, Rangen Aquaculture Center, Hagerman, Idaho. May 25, 2001. 5 pp. The Word file for the CVM letter is available upon request to Rosalie (Roz) Schnick.
- Center for Veterinary Medicine (CVM). 2007. CVM Guidance for Industry #136: Protocols for the conduct of method transfer studies for Type C medicated feed assay methods. Final Guidance. April 26, 2007. 18 pp. <http://www.fda.gov/cvm/Guidance/guide136.htm>
- Center for Veterinary Medicine (CVM). 2008. U.S. Food and Drug Administration, Center for Veterinary Medicine, Office of New Animal Drug Evaluation, Division of Manufacturing Technologies, Biotherapeutics Team (HFV-144), Rockville, Maryland.
- Marwah, A., P. Marwah, P., and H. Lardy. 2005. Development and validation of a high performance liquid chromatography assay for 17 α -methyltestosterone in fish feed. *Journal of Chromatography B: Biomedical Sciences and Applications* (824):107-115.

PROJECT LEADERS

| <u>State/Province</u> | <u>Name/Institution</u> | <u>Area of Specialization</u> |
|-------------------------|---|---|
| Arkansas | David L. Straus/Harry K. Dupree Stuttgart National Aquaculture Research Center | Aquatic Toxicologist |
| British Columbia | Nilmini Wijewickreme/Food Safety Division, CANTEST Ltd. | Pesticide and Drug Residue Determination |
| Wisconsin | Mark Gaikowski/Upper Midwest Environmental Sciences Center | Aquaculture Drug Research |

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS

Food Safety Division, CANTEST Ltd.

Nilmini Wijewickreme

USDA/ARS, Harry K. Dupree Stuttgart National Aquaculture Research Center

David L. Straus

USGS, Upper Midwest Environmental Sciences Center

Mark P. Gaikowski

BUDGET

| | | | | | | | | | | | | | | | |
|--|--|--|--|---|--|---|--|---|--|--|--|----------|--|--|--|
| ORGANIZATION AND ADDRESS USGS Upper Midwest Environmental Sciences Center, 2630 Fanta Reed Road, La Crosse, Wisconsin 54603 | | | | USDA AWARD NO. | | | | Year 1: Objectives 1-12 | | | | | | | |
| PROJECT DIRECTOR(S) Mark Gaikowski | | | | Duration Proposed Months: <u>12</u> | | Duration Proposed Months: _____ | | Non-Federal Proposed Cost-Sharing/ Matching Funds (If required) | | Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different) | | | | | |
| | | | | Funds Requested by Proposer | | Funds Approved by CSREES (If different) | | | | | | | | | |
| A. Salaries and Wages | | | | CSREES FUNDED WORK MONTHS | | | | | | | | | | | |
| 1. No. of Senior Personnel | | | | Calendar | | Academic | | Summer | | | | | | | |
| a. <u>1</u> (Co)-PD(s) | | | | 1.0 | | | | | | \$3,610 | | | | | |
| b. <u>1</u> Senior Associates | | | | 1.0 | | | | | | \$4,210 | | | | | |
| 2. No. of Other Personnel (Non-Faculty) | | | | | | | | | | | | | | | |
| a. ___ Research Associates-Postdoctorates . . . | | | | | | | | | | | | | | | |
| b. <u>1</u> Other Professionals | | | | 1.0 | | | | | | \$2,375 | | | | | |
| c. ___ Paraprofessionals..... | | | | | | | | | | | | | | | |
| d. ___ Graduate Students | | | | | | | | | | | | | | | |
| e. ___ Prebaccalaureate Students..... | | | | | | | | | | | | | | | |
| f. ___ Secretarial-Clerical..... | | | | | | | | | | | | | | | |
| g. ___ Technical, Shop and Other | | | | | | | | | | | | | | | |
| Total Salaries and Wages → | | | | | | | | | | \$10,195 | | | | | |
| B. Fringe Benefits (If charged as Direct Costs) | | | | | | | | | | \$2,127 | | | | | |
| C. Total Salaries, Wages, and Fringe Benefits (A plus B) → | | | | | | | | | | \$12,322 | | | | | |
| D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.) | | | | | | | | | | | | | | | |
| E. Materials and Supplies | | | | | | | | | | \$ 250 | | | | | |
| F. Travel | | | | | | | | | | \$ 2,780 | | | | | |
| G. Publication Costs/Page Charges | | | | | | | | | | | | | | | |
| H. Computer (ADPE) Costs | | | | | | | | | | | | | | | |
| I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.) | | | | | | | | | | | | | | | |
| J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.) | | | | | | | | | | \$ 428 | | | | | |
| K. Total Direct Costs (C through I) → | | | | | | | | | | \$15,780 | | | | | |
| L. F&A/Indirect Costs. (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.) | | | | | | | | | | | | | | | |
| M. Total Direct and F&A/Indirect Costs (J plus K) → | | | | | | | | | | \$15,780 | | | | | |
| N. Other..... → | | | | | | | | | | | | | | | |
| O. Total Amount of This Request → | | | | | | | | | | \$15,780 | | | | | |
| P. Carryover -- (If Applicable) | | | | Federal Funds: \$ | | | | Non-Federal funds: \$ | | | | Total \$ | | | |
| Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O) | | | | | | | | | | | | | | | |
| Cash (both Applicant and Third Party) | | | | | | | | | | → | | | | | |
| Non-Cash Contributions (both Applicant and Third Party) | | | | | | | | | | → | | | | | |
| NAME AND TITLE (Type or print) | | | | SIGNATURE (required for revised budget only) | | | | | | DATE | | | | | |
| Project Director | | | | | | | | | | | | | | | |
| Authorized Organizational Representative | | | | | | | | | | | | | | | |
| Signature (for optional use) | | | | | | | | | | | | | | | |

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the reviewing the collection of information.

BUDGET EXPLANATION FOR UPPER MIDWEST ENVIRONMENTAL SCIENCES CENTER

(Gaikowski)

- A. **Salaries and Wages.** 75% of a Research Physiologist for one month; 100% of a General Biologist for one month; and 35% of a Quality Assurance Officer for one month.
- B. **Fringe Benefits.** The Fringe Benefit rate for the Research Physiologist is 19.4%; the Fringe Benefit rate for the General Biologist and the Quality Assurance Officer is 21.7%.
- C. **Materials and Supplies.** General office supplies (binders, paper, etc.) to prepare final report.
- D. **Travel.** Transportation, meals, and lodging expenses for the Senior Associate to travel to CANTEST to validate that the naïve analyst received training and conducted the analysis according to the approved method.
- E. **All Other Direct Costs.** Costs to ship feed samples between labs.



United States Department of the Interior
U.S. GEOLOGICAL SURVEY
Biological Resources Division
Upper Midwest Environmental Sciences Center
2630 Fanta Reed Road
La Crosse, Wisconsin 54603

May 29, 2009

Dr. Ted R. Batterson, Director
North Central Regional Aquaculture Center
Michigan State University
13 Natural Resources Building
East Lansing, MI 48842

Dear Dr. Batterson

Subject: Drug approval research on 17 α -methyltestosterone

As the Authorized Organizational Representative (AOR) I would like to inform you USGS Upper Midwest Environmental Sciences Center (UMESC) wishes to participate in the above referenced project with Michigan State University. Mr. Mark P. Gaikowski will serve as the Principal Investigator of this project and he has access to all of the necessary equipment, laboratory, and office space to successfully undertake this project. I also approve the budget as submitted for Mr. Gaikowski's involvement in this project. Upon issuance of approval to the North Central Regional Aquaculture Center for this project, UMESC will enter into a formal reimbursable agreement with your institution.

Thank you for considering this request. Should you have additional questions or comments regarding this request, please contact Mr. Gaikowski of my staff at (608) 781-6284 or mgaikowski@usgs.gov.

Sincerely,

Michael D. Jawson
UMESC Center Director

BUDGET

| | | | | | | | | | | | | | |
|--|--|--|--|---|--|---|--|---|--|--|--|-------------|--|
| ORGANIZATION AND ADDRESS Food Safety Division, CANTEST Ltd., 4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 | | | | USDA AWARD NO. | | | | Year 1: Objectives 1-12 | | | | | |
| PROJECT DIRECTOR(S) Nilmini Wijewickreme | | | | Duration Proposed Months: <u>12</u> | | Duration Proposed Months: _____ | | Non-Federal Proposed Cost-Sharing/ Matching Funds (If required) | | Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different) | | | |
| | | | | Funds Requested by Proposer | | Funds Approved by CSREES (If different) | | | | | | | |
| A. Salaries and Wages | | | | CSREES FUNDED WORK MONTHS | | | | | | | | | |
| 1. No. of Senior Personnel | | | | Calendar | | Academic | | Summer | | | | | |
| a. ___ (Co)-PD(s) | | | | | | | | | | | | | |
| b. ___ Senior Associates | | | | | | | | | | | | | |
| 2. No. of Other Personnel (Non-Faculty) | | | | | | | | | | | | | |
| a. ___ Research Associates-Postdoctorates . . . | | | | | | | | | | | | | |
| b. ___ Other Professionals | | | | | | | | | | | | | |
| c. ___ Paraprofessionals..... | | | | | | | | | | | | | |
| d. ___ Graduate Students | | | | | | | | | | | | | |
| e. ___ Prebaccalaureate Students..... | | | | | | | | | | | | | |
| f. ___ Secretarial-Clerical..... | | | | | | | | | | | | | |
| g. ___ Technical, Shop and Other | | | | | | | | | | | | | |
| Total Salaries and Wages → | | | | | | | | | | | | | |
| B. Fringe Benefits (If charged as Direct Costs) | | | | | | | | | | | | | |
| C. Total Salaries, Wages, and Fringe Benefits (A plus B) → | | | | | | | | | | | | | |
| D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.) | | | | | | | | | | | | | |
| E. Materials and Supplies | | | | | | | | | | | | | |
| F. Travel | | | | | | | | | | | | | |
| G. Publication Costs/Page Charges | | | | | | | | | | | | | |
| H. Computer (ADPE) Costs | | | | | | | | | | | | | |
| I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.) | | | | | | | | | | | | | |
| J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.) | | | | | | \$12,100 | | | | | | | |
| K. Total Direct Costs (C through I) → | | | | | | | | | | | | | |
| L. F&A/Indirect Costs. (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.) | | | | | | | | | | | | | |
| M. Total Direct and F&A/Indirect Costs (J plus K) → | | | | | | | | | | | | | |
| N. Other..... → | | | | | | | | | | | | | |
| O. Total Amount of This Request → | | | | | | \$ 12,100 | | | | | | | |
| P. Carryover -- (If Applicable) | | | | Federal Funds: \$ | | Non-Federal funds: \$ | | Total \$ | | | | | |
| Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O) | | | | | | | | | | | | | |
| Cash (both Applicant and Third Party) | | | | | | | | | | | | | |
| Non-Cash Contributions (both Applicant and Third Party) | | | | | | | | | | | | | |
| NAME AND TITLE (Type or print) | | | | SIGNATURE (required for revised budget only) | | | | | | | | DATE | |
| Project Director | | | | | | | | | | | | | |
| Authorized Organizational Representative | | | | | | | | | | | | | |
| Signature (for optional use) | | | | | | | | | | | | | |

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the reviewing the collection of information.

BUDGET EXPLANATION FOR CANTEST LTD. (REFERENCE LABORATORY)

(Wijewickreme)

- J. All Other Direct Costs.** Sample analysis (30 samples); samples for stabilizing liquid chromatographic-mass spectrometry (38 samples).

BUDGET

| | | | | | | | | | |
|---|--|--|--|---|--|---|--|-------------|--|
| ORGANIZATION AND ADDRESS Food Safety Division, CANTEST Ltd., 4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 PROJECT DIRECTOR(S) Nilmini Wijewickreme | | | | USDA AWARD NO. Year 1: Objectives 1-12 | | | | | |
| | | | | Duration Proposed Months: <u>12</u> | Duration Proposed Months: ____ | Non-Federal Proposed Cost-Sharing/ Matching Funds (If required) | Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different) | | |
| | | | | Funds Requested by Proposer | Funds Approved by CSREES (If different) | | | | |
| A. Salaries and Wages 1. No. of Senior Personnel | | | | CSREES FUNDED WORK MONTHS | | | | | |
| | | | | Calendar Academic Summer | | | | | |
| a. <u>1</u> (Co)-PD(s) | | | | 1.0 | | | \$3,089 | | |
| b. ____ Senior Associates | | | | | | | | | |
| 2. No. of Other Personnel (Non-Faculty) a. ____ Research Associates-Postdoctorates . . . b. ____ Other Professionals | | | | | | | | | |
| c. ____ Paraprofessionals..... | | | | | | | | | |
| d. ____ Graduate Students | | | | | | | | | |
| e. ____ Prebaccalaureate Students..... | | | | | | | | | |
| f. ____ Secretarial-Clerical..... | | | | | | | | | |
| g. ____ Technical, Shop and Other | | | | | | | | | |
| Total Salaries and Wages → | | | | | | | | | |
| B. Fringe Benefits (If charged as Direct Costs) | | | | | | \$ 911 | | | |
| C. Total Salaries, Wages, and Fringe Benefits (A plus B) → | | | | | | \$4,000 | | | |
| D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.) | | | | | | | | | |
| E. Materials and Supplies | | | | | | \$ 500 | | | |
| F. Travel | | | | | | | | | |
| G. Publication Costs/Page Charges | | | | | | | | | |
| H. Computer (ADPE) Costs | | | | | | | | | |
| I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.) | | | | | | | | | |
| J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.) | | | | | | \$ 900 | | | |
| K. Total Direct Costs (C through I) → | | | | | | \$5,400 | | | |
| L. F&A/Indirect Costs. (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.) | | | | | | | | | |
| M. Total Direct and F&A/Indirect Costs (J plus K) → | | | | | | \$5,400 | | | |
| N. Other → | | | | | | | | | |
| O. Total Amount of This Request → | | | | | | \$5,400 | | | |
| P. Carryover -- (If Applicable) | | | | Federal Funds: \$ | Non-Federal funds: \$ | Total \$ | | | |
| Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O) | | | | | | | | | |
| Cash (both Applicant and Third Party) → | | | | | | | | | |
| Non-Cash Contributions (both Applicant and Third Party) → | | | | | | | | | |
| NAME AND TITLE (Type or print) | | | | SIGNATURE (required for revised budget only) | | | | DATE | |
| Project Director | | | | | | | | | |
| Authorized Organizational Representative | | | | | | | | | |
| Signature (for optional use) | | | | | | | | | |

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the reviewing the collection of information.

BUDGET EXPLANATION FOR CANTEST LTD. (TRANSFEREE LABORATORY)

(Wijewickreme)

- A. Salaries and Wages.** 100% of a chemist for one month.
- B. Fringe Benefits.** The fringe benefit rate is 29.5%.
- E. Materials and Supplies.** Laboratory supplies (reference standards 17 β -hydroxy-3 β -methoxyandrost-5-en-7-one, 17 α -methyltestosterone, and reagents).
- J. All Other Direct Costs.** Liquid chromatography-mass spectrometry with diode array instrument usage time (90 hours@ \$10/hour).

July 21, 2009

Dr. Ted R. Batterson, Director
North Central Regional Aquaculture Center
Michigan State University
13 Natural Resources Building
East Lansing, MI 48842

Dear Dr. Batterson

Subject: Drug approval research on 17 α -methyltestosterone

As the Authorized Organizational Representative (AOR) I would like to inform you CANTEST, Ltd. (CANTEST) wishes to participate in the above referenced project with Michigan State University. Dr. Nilmini Wijewickreme will serve as the Principal Investigator of this project and has access to all of the necessary equipment, laboratory, and office space to successfully undertake this project. I also approve the budget as submitted for Dr. Wijewickreme's involvement in this project. Upon issuance of approval to the North Central Regional Aquaculture Center for this project, CANTEST will enter into a formal contract with your institution.

Thank you for considering this request. Should you have additional questions or comments regarding this request, please contact Dr. Wijewickreme or my staff at (604) 639-2623 or anilmini@cantest.com.

Sincerely,



Rob R. Dhari
Director of Finance

BUDGET

| | | | | | | | | | | | | | |
|--|--|--|--|---|---------------------------------|---|--|--|--|--|--|-----------------|--|
| ORGANIZATION AND ADDRESS USDA/ARS, Harry K. Dupree Stuttgart National Aquaculture Research Center, PO Box 1050, Stuttgart, Arkansas 72160 | | | | USDA AWARD NO. | | | | Year 1: Objectives 1-6 | | | | | |
| PROJECT DIRECTOR(S) David Straus | | | | Duration Proposed Months: <u>12</u> | Duration Proposed Months: _____ | Non-Federal Proposed Cost-Sharing/ Matching Funds (If required) | | Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different) | | | | | |
| A. Salaries and Wages | | | | CSREES FUNDED WORK MONTHS | | | | | | | | | |
| 1. No. of Senior Personnel | | | | Calendar | Academic | Summer | | | | | | | |
| a. <u>2</u> (Co)-PD(s) | | | | | | | | | | | | | |
| b. ___ Senior Associates | | | | | | | | | | | | | |
| 2. No. of Other Personnel (Non-Faculty) | | | | | | | | | | | | | |
| a. ___ Research Associates-Postdoctorates . . . | | | | | | | | | | | | | |
| b. ___ Other Professionals | | | | | | | | | | | | | |
| c. ___ Paraprofessionals..... | | | | | | | | | | | | | |
| d. ___ Graduate Students | | | | | | | | | | | | | |
| e. ___ Prebaccalaureate Students..... | | | | | | | | | | | | | |
| f. ___ Secretarial-Clerical..... | | | | | | | | | | | | | |
| g. ___ Technical, Shop and Other | | | | | | | | | | | | | |
| Total Salaries and Wages → | | | | | | | | | | | | | |
| B. Fringe Benefits (If charged as Direct Costs) | | | | | | | | | | | | | |
| C. Total Salaries, Wages, and Fringe Benefits (A plus B) → | | | | | | | | | | | | | |
| D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.) | | | | | | | | | | | | | |
| E. Materials and Supplies | | | | | | | | \$3,500 | | | | | |
| F. Travel | | | | | | | | | | | | | |
| G. Publication Costs/Page Charges | | | | | | | | | | | | | |
| H. Computer (ADPE) Costs | | | | | | | | | | | | | |
| I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.) | | | | | | | | | | | | | |
| J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.) | | | | | | | | \$17,835 | | | | | |
| K. Total Direct Costs (C through I) → | | | | | | | | \$21,335 | | | | | |
| L. F&A/Indirect Costs. (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.) | | | | | | | | | | | | | |
| M. Total Direct and F&A/Indirect Costs (J plus K) → | | | | | | | | \$21,335 | | | | | |
| N. Other..... → | | | | | | | | | | | | | |
| O. Total Amount of This Request → | | | | | | | | \$21,335 | | | | | |
| P. Carryover -- (If Applicable) | | | | Federal Funds: \$ | | | | Non-Federal funds: \$ | | | | Total \$ | |
| Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O) | | | | | | | | | | | | | |
| Cash (both Applicant and Third Party) | | | | | | | | | | | | | |
| Non-Cash Contributions (both Applicant and Third Party) | | | | | | | | | | | | | |
| NAME AND TITLE (Type or print) | | | | SIGNATURE (required for revised budget only) | | | | DATE | | | | | |
| Project Director | | | | | | | | | | | | | |
| Authorized Organizational Representative | | | | | | | | | | | | | |
| Signature (for optional use) | | | | | | | | | | | | | |

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the reviewing the collection of information.

**BUDGET EXPLANATION FOR HARRY K. DUPREE SUTTGART NATIONAL AQUACULTURE
RESEARCH CENTER**

(Straus)

- E. Materials and Supplies.** Histopathology consumables (specimen containers, labels, reagents, adhesives, mounts, tissue marking dyes, etc.).
- J. All Other Direct Costs.** Feed analysis and quality assurance.

BUDGET SUMMARY FOR EACH PARTICIPATING INSTITUTION

| | UMESC | CANTEST (Reference) | CANTEST (Transferee) | SNARC | TOTALS |
|---|-----------------|--------------------------------|---------------------------------|-----------------|-----------------|
| Salaries and Wages | \$10,195 | | \$3,089 | | \$13,284 |
| Fringe Benefits | \$2,127 | | \$ 911 | | \$3,038 |
| Total Salaries, Wages, and Fringe Benefits | \$12,322 | | \$4,000 | | \$16,322 |
| Nonexpendable Equipment | | | | | |
| Materials and Supplies | \$ 250 | | \$ 500 | \$3,500 | \$4,250 |
| Travel | \$2,780 | | | | \$2,780 |
| All Other Direct Costs | \$ 428 | \$12,100 | \$ 900 | \$17,835 | \$31,263 |
| TOTAL PROJECT COSTS | \$15,780 | \$12,100 | \$5,400 | \$21,335 | \$54,615 |

SCHEDULE FOR COMPLETION OF OBJECTIVES

Project #1: Official transfer of 17 α -methyltestosterone (MT) analytical method for feed

| Objective | Projected Completion Date | Responsible Institution |
|---|---------------------------|-------------------------|
| 1. Develop study protocols to conduct the MT feed method transfer of the MT analytical feed method based on CVM Guideline for Industry #136, the CVM letter of May 25, 2001 to Rangen, Inc., and consultation with CVM's Biotherapeutics Team (CVM 2001a, 2007, 2008a; Marwah et al. 2005). | June 2009 | UMESC & CANTEST |
| 2. Submit method transfer study protocols to CVM for concurrence. | June 2009 | UMESC |
| 3. Provide final study protocols to participating laboratories. | September 2009 | UMESC |
| 4. Prepare and ship medicated feed to participating laboratories. | November 2009 | Rangen, Inc. |
| 5. Assay control and medicated feed samples according to the study protocols concurred with by CVM. | January 2010 | CANTEST |
| 6. Complete report of analysis and submit along with raw data to UMESC. | March 2010 | CANTEST |
| 7. Compare and discuss the results of both CANTEST reference and transferee analyses of the MT transfer study samples. | April 2010 | UMESC |
| 8. Determine whether any changes are needed to the MT analytical feed method (Marwah et al. 2005) based on the results of the MT feed transfer study. | April 2010 | UMESC |
| 9. Validate that the naïve analyst at CANTEST can analyze the MT feed samples according to the analytical feed method (Marwah 2005). | April 2010 | UMESC |
| 10. Compile final study report (FSR), archive raw data, and submit FSR to CVM through the UMESC MT INAD (CVM 2001c). | May 31, 2010 | UMESC |
| 11. Respond to CVM comments. | August, 2010 | UMESC & CANTEST |
| 12. Gain acceptance from CVM for the MT feed method transfer study. | September 2010 | UMESC & CANTEST |

Project #2: Repeat of the 17 α -methyltestosterone Target Animal Safety Study in Tilapia

| Objective | Projected Completion Date | Responsible Institution |
|--|---------------------------|-------------------------|
| 1. Interact with CVM to determine whether the study design and protocol developed by SIUC will need to be modified (CVM 1989, 2001b, 2008b). | May 2009 | SNARC |
| 2. Submit the revised study protocol to CVM for concurrence (CVM 1989, 2001B, 2008b). | August 2009 | SNARC |
| 3. Conduct a target animal safety study using MT on tilapia according to the CVM concurred protocol that is based on the guidelines for a target animal safety study in feed under GLP (CVM 1989, 2001b, 2008b). | September 2009 | SNARC |
| 4. Write the Final Study Report and submit to CVM through the AADAP MT INAD (CVM 2001c). | May 2010 | SNARC |
| 5. Respond to CVM comments. | November 2010 | SNARC |
| 6. Gain acceptance from CVM for the target animal safety study on MT in tilapia. | December 2010 | SNARC |

LIST OF PRINCIPAL INVESTIGATORS

Mark P. Gaikowski, USGS Upper Midwest Environmental Sciences Center

David L. Straus, USDA/ARS Harry K. Dupree Stuttgart National Aquaculture Research Center

Nilmini Wijewickreme, CANTEST Ltd.

VITA

Mark Gaikowski
Branch of Aquatic Ecosystem Health
USGS Upper Midwest Environmental Sciences Center
2630 Fanta Reed Road
La Crosse, WI 54603

Phone: (608) 781-6284
FAX: (608) 783-6066
E-mail: mgaikowski@usgs.gov

EDUCATION

B.S. University of South Dakota, 1991, Biology
M.A. University of South Dakota, 1994, Biology

POSITIONS

Research Physiologist (1993-present), USGS, UMESC

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society
Phi Sigma Biological Honor Society

SELECTED PUBLICATIONS

- Gaikowski, M.P., W.J. Larson, and W.H. Gingerich. 2008. Survival of cool and warm freshwater fish following chloramine-T exposure. *Aquaculture* 275:20-25.
- Meinertz, J.R., S.L. Greseth, M.P. Gaikowski, and L.J. Schmidt. 2008. Chronic toxicity of hydrogen peroxide to *Daphnia magna* in a continuous exposure, flow-through test system. *Science of the Total Environment* 392:225-232.
- Ronan, P.J., M.P. Gaikowski, S.J. Hamilton, K.J. Buhl, and C.H. Summers. 2007. Ammonia causes decreased brain monoamines in fathead minnows (*Pimephales promelas*). *Brain Research* 1147:184-191.
- Rach, J.J., S.D. Redman, D. Bast, and M.P. Gaikowski. 2005. Efficacy of hydrogen peroxide versus formalin treatments to mortality associated with saprolegniasis on lake trout eggs. *North American Journal of Aquaculture* 67:148-154.
- Barnes, M.E. and M.P. Gaikowski. 2004. Use of hydrogen peroxide during incubation of landlocked fall chinook salmon eggs in vertical-flow incubators. *North American Journal of Aquaculture*. 66:29-34.
- Gaikowski, M.P., J.C. Wolf, S.M. Schleis, and W.H. Gingerich. 2003. Safety of oxytetracycline (Terramycin, TM-100F) administered in feed to hybrid striped bass, walleye, and yellow perch. *Journal of Aquatic Animal Health* 15:274-286.

VITA

David L. Straus
Harry K. Dupree – Stuttgart National Aquaculture Research Center
U.S. Dept. of Agriculture, Agricultural Research Service
P.O. Box 1050
Stuttgart, AR 72160

Phone: (870) 673-4483
E-mail: Dave.Straus@ara.usda.gov

EDUCATION

B.S. Georgetown College, 1982, Biology/Chemistry
M.S. Mississippi State University, 1988, Wildlife Ecology (Aquaculture)
Ph.D. Mississippi State University, 1994, Animal Physiology (Environmental Toxicology)

EMPLOYMENT

Aquatic Toxicologist (1997-present), Harry K. Dupree - Stuttgart National Aquaculture Research Center, USDA/ARS/SPA
Computer Specialist/Site Inspector (1996-1997; temporary), Dynamic Mechanical Systems, Inc., Hamilton, Ohio
Aquatic Toxicologist (Industry Post-Doc) (1994-1996), New Zealand Forest Research Institute, Environmental Research Group, Rotorua, New Zealand
Graduate Research Assistant (1990-1994), Center for Environmental Health Sciences, Mississippi State University
Fisheries Research Assistant (1988-1990), Delta Research and Extension Center, Stoneville, Mississippi
Graduate Research Assistant (1986-1988), Department of Wildlife and Fisheries, Mississippi State University
Chemist (1983-1986), The Andrew Jergens Co., Cincinnati, Ohio

SELECTED PUBLICATIONS

Straus, D.L. 2008. Copper sulfate toxicity to channel catfish fry: yolk sac versus swim-up fry. *North American Journal of Aquaculture* 70(3):323-327.

Straus, D.L. 2006. Species sensitivity to copper: acute toxicity to channel catfish, *Ictalurus punctatus*, and sunshine bass, *Morone chrysops* × *M. saxatilis*. *Journal of Applied Aquaculture* 18(1):88-99.

VITA

Nilmini Wijewickreme
Food Safety Division
CANTEST Ltd.
4606 Canada Way
Burnaby, BC, V5G 1K5

Phone: (604) 639-2623
FAX: (604) 731-2386
E-mail: anilmini@cantest.com

EDUCATION

B.S. University of Peradeniva, Sri Lanka, 1986, Agriculture (Honors)
M.S. University of British Columbia, 1990, Food Science
Ph.D. University of British Columbia, 1996, Food Science

POSITIONS

Director (2007-present) and Manager (1999-2006), Food Safety, CANTEST Ltd.
Research Scientist/Post Doctoral Research Fellow (1996-1999), Food Science, University of British Columbia

PROFESSIONAL MEMBERSHIPS:

Association of Oil Chemists Society
Association of Official Analytical Chemists
American Chemical Society
Canadian Institute of Food Science and Technology
British Columbia Food Technologist Association
Institute of Food Science and Technology
Western Canada Functional Foods and Nutraceuticals Network

SELECTED PUBLICATIONS

- Penney, L., C. Bergeron, B.D. Coates, and A.N. Wijewickreme. 2005. Simultaneous determination of residues of Dipyrone and its metabolites in milk, bovine muscle, and porcine muscle by liquid chromatography/mass spectroscopy. *Journal of the Association of Official Analytical Chemists International* 88(2):496-504.
- Penney, L., A. Smith, B.D. Coates, and A.N. Wijewickreme. 2005. Determination of chloramphenicol residues in milk, eggs, and tissues by liquid chromatography/mass spectroscopy. *Journal of the Association of Official Analytical Chemists International* 88(2):645-653.
- Wong, P.Y.Y., A.N. Wijewickreme, and D.D. Kitts. 2005. The effect of fat content and ascorbic acid infusion on microbial and physicochemical qualities of irradiated ground beef patties. *Food Chemistry* 89:93-102.
- Wijewickreme, A.N., C. Hu, and D.C. Kitts. 2000. Antioxidant properties of North American ginseng extract. *Molecular and Cellular Biochemistry* 203(1):1-10.