University of Missouri South African Education Program
2006 Award
Final Report

Use of South African Native Plant Extract to Alleviate Heat Stress Induced Subfertility

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South African Collaboration Update

Our research hypothesis is that phenotypic effects of heat stress and associated patterns of gene expression may be alleviated by treatment with extracts of herbs anecdotally attributed to ameliorate hyperthermia in South African natives. We initially identified eleven genes of particular interest because of their roles in reproductive pathways or hyperthermic response from among 225 significantly differentially expressed genes in testis tissue between male mice that were highly fertile or lowly fertile after heat stress.

The specific objectives are to: 1) identify herbs associated ameliorating effects of hyperthermia from collections at the University of Western Cape, 2) conduct animal experiments at the University of Missouri to determine if treatment with herbal extracts reduces the phenotypic effects of heat stress on fertility in mice, and 3) determine the effects of treatment with herbal extracts on expression of genes associated with heat stress induced subfertility in mice.

The first objective of this research project has been accomplished. Dr. Kristi Cammack, a postdoctoral research fellow, traveled to South Africa to study botanical collections to identify plants that have potential for relieving symptoms of heat stress. She worked closely with her primary collaborator, Dr. David Fisher, a faculty member of the Medical Biosciences Department, and also with Dr. Jeremy Klaasen, a faculty member of the International Centre for Indigenous Phytotherapy Studies. Dr. Fisher is an expert in male reproductive physiology and is also a member of the Programme of Herbal
Sciences research team. Dr. Klaasen is an expert in plant taxonomy and plant extract technologies. Four plants were subsequently identified based on clinical and anecdotal evidence of immune or anti-oxidant properties in each of the specimens. The four plants selected for the trial are *Sutherlandia frutescens*, *Artemisia afra*, *Tulbaghia violacea*, and *Helichrysum*. All specimens are found in South Africa, and tend to be geographically limited to the African continent. Each of the four specimens was already available in Dr. Klaasen’s lab. However, Dr. Cammack accompanied Dr. Klaasen to two botanical nurseries to become more familiar with plant/herb taxonomy and production.

Proposed route of administration is via the feed. Previous research utilizing these specimens used other administration routes; therefore, plant extraction techniques and feed concentrations were further investigated. Plant material may be incorporated into the feed in one of two forms: raw or concentrate. Though the form to be used is still being debated, Dr. Cammack was trained in the methanol extraction method by Dr. Klaasen in order to be adequately prepared to use a concentrate. Due to the lack of information on effective dosage on these plants, Dr. James Syce, a faculty member of the International Centre for Indigenous Phytotherapy Studies, was consulted because of his expertise in pharmaceuticals and pharmacokinetics. Effective dosages of each of the specimens will be estimated at the University of Missouri according to Dr. Syce’s recommendations.

Dr. Cammack also met with Dr. George Van der Horst of the Medical Biosciences Department and Dr. Quinton Johnson, Director of the South African Herbal Science and Medicine Institute. Dr. Van der Horst is an expert in reproductive physiology, and Dr. Johnson is an internationally renowned expert in South African
phytomedicines and phytotherapies. Dr. Johnson is also involved in ongoing collaborative research with the University of Missouri. To become further acquainted with herbal medicine and therapies, Dr. Cammack attended an introductory lecture and discussion led by Dr. Johnson. She also visited with other faculty members and graduate students regarding their ongoing research and research interests. She additionally presented a summary of her PhD and ongoing post-doctoral research to faculty and staff of the Medical Biosciences and International Centre for Indigenous Phytotherapy Studies departments.

The next phase of this project is to conduct the animal experiments at the University of Missouri. The plant specimens have been properly dried, and are ready to be shipped to Columbia, MO. Upon delivery of the plant material, we will determine the effective dosage of each specimen. We anticipate that the animal trial will begin in late May, and the gene expression analysis will be conducted during the summer. Additionally, we have identified an undergraduate intern who will be assisting us with this project throughout the summer.