Dissertation Titles and Synopses

Plasma Volume Shifts During Exercise: Role of Exercise Mode and Training Status on Hydrostatic and Oncotic Forces

by Jonathan H. Anning, PhD, *The University of Toledo*, 2001, 91 pages

Running and cycling were performed to assess the influence of mode and training status on plasma volume (PV). Intravascular hydrostatic and oncotic forces were examined in 6 trained and 6 untrained men during submaximal running and cycling. All subjects had lower peak VO_2 and peak HR responses during cycling compared with treadmill exercise. Heart rate, blood pressure, and venous blood samples were obtained with the subject in the supine and resting posture before exercise. Additional hemodynamic recordings and blood samples were collected at 5, 10, 20, and 40 minutes in both modes of exercise. Submaximal exercise sessions were executed in a randomized fashion and separated by at least 72 hours for each subject. During the exercise session, a decrease in PV was observed the first 10 minutes of exercise for both modes of exercise. PV loss was significantly greater during cycling than when running at 20 and 40 minutes of exercise. The primary contributors (identified via multiple regression) included HR, serum osmolality, potassium, and total protein. In conclusion, the specified posture in this study indicated that protein may be important in PV retention during running when preceded by training.

The Immunological Responses to Exercise of Varying Intensities in Normoxic and Hypoxic Environments

by Mark David Blegen, PhD, *Kent State University*, 2001, 229 pages

The purpose of this study was to determine the effects of varying intensities of exercise in normoxic and hypoxic environments on selected immune, hormonal, metabolic, and thermoregulatory responses. Subjects performed maximal tests on a cycle ergometer in both normoxic and hypoxic ($\text{PiO}_2 = 14.65\%$) environments to determine $\text{VO}_{2\text{max}}$. Subjects performed 4 randomly assigned 1-hour exercise sessions on a cycle ergometer (2 each in normoxic and hypoxic environments). The intensities for the exercise sessions were predetermined as 40% and 60% of their normoxic $\text{VO}_{2\text{max}}$ for the nor-

moxic exercise sessions, and 40% and 60% of their hypoxic $\text{VO}_{2\text{max}}$ for the hypoxic exercise sessions. Blood samples were collected pre-exercise, postexercise, 15 minutes postexercise, 2 hours postexercise, and 24 hours postexercise for analysis of numerous immune, hormonal, and metabolic variables. In addition, VO_2 , rectal temperature, skin temperatures, and heart rate were collected throughout each trial. During prolonged exercise at 40% and 60% of the subjects' respective $\text{VO}_{2\text{max}}$ values, hypoxia did not appear to alter the response of selected immune system or hormonal parameters. However, there appeared to be a differential response between normoxia and hypoxia with respect to rectal temperature, possibly influenced by relative exercise intensity.

Relationship Between Exhaled and Inhaled Nitric Oxide and Exercise-Induced Hypoxemia

by Andrew William Sheel, PhD, *The University of British Columbia*, 2000, 143 pages

The consensus in the literature is that exercise-induced hypoxemia (EIH) occurs secondary to ventilation-perfusion inequalities and diffusion limitations resulting from elevated pulmonary pressures. This causes the development of interstitial pulmonary edema, or decreased pulmonary transit time in the pulmonary vasculature. Endogenously produced pulmonary nitric oxide (NO) has been hypothesized to have several physiological functions, including ventilation-perfusion matching and maintenance of low pulmonary vascular resistance. Respiratory-derived NO is detectable in exhaled gases. Inhaled NO, a selective pulmonary vasodilator, is used in the treatment of diseases characterized by pulmonary hypertension and hypoxemia. Short-term inhalation of NO causes selective pulmonary vasodilation without any systemic effects. Given that athletes with EIH are thought to have altered pulmonary hemodynamics during exercise, the relationship between endogenously produced and exogenously delivered NO and EIH was examined in 2 separate studies. It was hypothesized that subjects with EIH would have a decreased production rate of NO compared with subjects who maintained normal oxyhemoglobin saturation (SaO_2) and that SaO_2 would be correlated with NO. A group of highly trained male cyclists ($n = 18$), some of whom develop EIH, performed a maximal cycle test. No significant differences in exhaled NO were observed between those with

and those without EIH. It can be concluded that NO present in exhaled air is not related to the etiology of EIH. In a subsequent study of highly trained male cyclists ($n = 7$) with EIH, results indicated that inhalation of NO during normoxic or hypoxic conditions did not significantly affect gas exchange, cardiorespiratory variables, or power output. These findings suggest that, during exercise, pulmonary capillary blood volume reaches a maximal morphological limit and further dilation is not possible.

Genetic Variation and Adaptation in the Quechua, a High-Altitude Native Population

by James L. Rupert, PhD, *The University of British Columbia*, 2000, 128 pages

Human adaptation to high altitude involves many physiological and anatomical characteristics designed to facilitate the uptake, transport, and utilization of oxygen, thereby compensating for the diminished oxygen availability inherent to high altitude. Although many of these characteristics may be acclimatory or developmental in nature, there is evidence that some are influenced by the genetic background of the population. The studies presented in this thesis are designed to examine the influence of genotype by comparing the frequencies of variants in a number of candidate genes between the Quechua, a high-altitude population indigenous to the Andean altiplano, and 2 low-altitude populations: Na-Dene from the west coast of Canada and Caucasians of western European descent. Genes were chosen because they had previously characterized polymorphisms with phenotypes that a priori were judged to be of potential benefit at altitude (eg, erythropoietin and hypoxia inducible factor 1- α). Given the theoretical requirements of high-altitude populations and the phenotypes associated with these alleles of these genes, predictions were made as to which alleles should have been selected for, and therefore currently be overrepresented, in the Quechua. As expected, given the diverse origins of the populations examined, there were significant differences in haplotype structure and allele frequencies. Although some of these differences may have resulted from the random divergence of separated populations over time, others may reflect an adaptive change in the Quechua. Successful expansion into a demanding environment will often be reflected in the genetic makeup of a population. Previous studies investigating the role of genetics in high-altitude adaptation have concentrated on the heritability of complex traits. However, the focus in this thesis is on the frequencies of variants in individual genes in an altitude-adapted population.

The Influence of Depressed Mood on Behavioral, Cognitive, and Affective Responses to Cold Pressor Pain

by Scott G. Willoughby, PhD, *The University of Southern Mississippi*, 1999, 114 pages

This study investigated the relationship between depression and pain by examining the influence of induced depressed mood on multiple responses to cold pressor pain. Participants consisted of 75 college students (21 men, 54 women). The study excluded from participation individuals reporting medical conditions affecting the hands or arms, history of frostbite, current use of antidepressant medication, significant depressive symptoms, and use of analgesic medications during the 24 hours before participation in the experiment. Participants were randomly assigned to receive depressed, neutral, or elated mood induction using the Velten Mood Induction Procedure. This resulted in 3 mood conditions with 25 participants in each condition. Mood induction was followed by participation in the cold pressor task, during which pain threshold, tolerance time, and unpleasantness ratings were obtained. Modified versions of the McGill Pain Questionnaire (MPQ) and the Pain Catastrophizing Scale (PCS) were administered immediately after the cold pressor task. Results indicated that the depressed mood group had significantly lower cold pressor tolerance times and higher PCS scores than the neutral group. No other differences were found among the groups on any of the dependent measures. These results support previous findings that depressed mood state is associated with alterations in only certain pain responses. More specifically, the results suggest that although depressed mood may not be associated with increased pain sensitivity or intensity, it may affect behavioral response and cognitive response to pain. This study failed to support previous findings suggesting that elated mood state is associated with significant differences in pain response.

Nitrogen Elimination and Venous Gas Embolism as Related to the Pathophysiology of Decompression Sickness: Effects of Age, Blood Lipids, and Negative Pressure Breathing

by Timothy Brian Curry, PhD, *State University of New York at Buffalo*, 2001, 194 pages

It is known that decompression sickness (DCS) is caused by the formation of gas bubbles in the body that result from decompressing too rapidly. However, much is still unknown about how the bubbles cause the disease and what predisposes individuals to the disease. This research examines how age and acute fat intake may

affect 2 major processes involved in decompression sickness: inert gas transport and venous gas embolism (VGE). The effect of negative pressure breathing on nitrogen elimination was also studied. Measurements of nitrogen elimination were performed while subjects re-breathed a nitrogen-free gas while cardiovascular measurements were made. The rate of nitrogen elimination was not found to be significantly different among various age groups or changed by a fatty meal but was greater during negative pressure breathing. Venous gas embolism was measured in subjects using ultrasonic bubble detection after simulated dives in a hyperbaric chamber. A fatty meal was not found to influence VGE. Thus, it does not appear that dietary fat increases the risk of VGE or influences the rate of nitrogen elimination. The effect of age on nitrogen elimination was statistically insignificant, perhaps because the subject population was healthy and free from the cardiovascular disease that accompanies aging. Age does appear to increase the amount of VGE formation after diving and to decrease the length of hyperbaric exposure needed to generate VGE. The use of negative pressure breathing for the purpose of accelerating nitrogen elimination warrants further study to elucidate the mechanisms by which it exerts its effects.

Traumatic Brain Injury Self-report: Identifying the Relationship Between Personality Style and Risk-Taking Behavior

by Phyllis Annette Walters-Kemp, PhD, *University of Northern Colorado*, 2001, 102 pages

This study examined the relationship between personality and risk-taking behavior in 145 male college students. Subjects were administered the Jackson Personality Inventory (JPI) and the Life Activities Questionnaire (LAQ). Results of a regression analysis indicate that the JPI Traditional Values scale explained approximately 14% of the variance, the Risk-Taking scale of the JPI explained an additional 3%, and the Innovation scale of the JPI explained a final 2% of the variance in risk taking as measured by the LAQ. Subjects were then divided into 2 groups based on their self-report of brain injury. Independent samples *t* tests were conducted to determine the difference between the group who reported a brain injury and the group who did not report a brain injury on the 15 JPI personality scales. Results revealed no significant personality scale differences between the 2 groups. The difference between mean scores obtained by the 2 groups on the LAQ revealed that the group who reported a brain injury scored significantly higher on the LAQ than did the group who did not self-

report a brain injury ($P = .019$). The subjects with a brain injury reported taking more risks than did the subjects not reporting a brain injury, especially in the areas of alcohol consumption and participation in high-risk sports such as mountain climbing and skiing. Future empirical research is needed to study and reduce the incidence of brain injury in individuals who take risks.

The Risk Handling Behaviour of White Water Kayakers

by Sally Lynne Rigoni, MSc, *University of Northern British Columbia*, 2001, 159 pages

This thesis examines the risk-handling behavior of white-water kayakers, a group of people alleged to experience few injuries because of their ability to effectively handle the risks of the sport. A qualitative ethnographic approach was used to capture the character of the kayakers' naturally occurring behavior. Findings suggest that developing programs that focus on the anticipated benefits of developing effective risk-handling behaviors may be a more effective means of engaging people in the learning process than programs that focus exclusively on the negative aspects of risk activities. The study drew on several bodies of literature: health promotion, adventure recreation, risk decision making, and experiential learning. The findings suggest guidelines for program development and demonstrate the ability of interdisciplinary collaboration to provide fresh insights for promoting health and preventing disease and injury.

Wilderness Therapy: A Qualitative Study of Clinicians' Perspectives

by Noel Casimir Chatroux, MSW, *California State University, Long Beach*, 2001, 84 pages

The perspectives of clinicians working in the field of wilderness therapy were explored in this study. The sample consisted of 13 clinicians holding positions ranging from program administrator to field counselor in a wilderness therapy program, all but 2 of them having earned an advanced degree. The researcher conducted phone interviews with the subjects, following an interview guide designed by the researcher. Subjects' perspectives on the effects of wilderness therapy on their clients were addressed, as was the interaction of these effects with length of intervention and ethnicity of both clients and clinicians. Clinicians' perspectives on what length of intervention would be appropriate were thought to depend on several factors, including treatment goals, program characteristics, client types, and willingness and ability of clients' families to change. Clients of all ethnicities

were perceived as being similarly able to benefit from a wilderness therapy intervention, with program modifications being necessary only for ethnically homogeneous groups.

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