Dissertation Titles and Synopses

Human Factors: Aerospace Medicine and the Origins of Manned Space Flight in the United States

by Maura Phillips Mackowski, PhD, *Arizona State University*, 2002, 447 pages

The period between 1934 and 1959 was one of maturation and evolution for aviation medicine. The United States Army's School of Aviation Medicine, the aviation medicine lab at Wright Field, and several German institutes played crucial roles in the growth of this field. World War II was pivotal because of advances in aircraft design and enormous increases in military flying personnel. Extreme altitudes and speeds of new aircraft created formidable challenges: oxygen deprivation, severe cold, flak, windblast, toxic exposures, and high-altitude bailout. It was also the germination period for manned space flight, demonstrated in America's postwar acquisition of German V-2 missiles (and their designers); rocket-powered aircraft and jets; and, under Project Paperclip, the world's leading aviation medicine researchers. This dissertation describes the actions of key aerospace medicine figures, their similarities to test pilots, the professionalization of the discipline of aerospace medicine, and the adjustments Americans and Germans made to work together. Details of the Mercury astronaut selection process are examined, suggesting a connection to earlier Air Force programs. Also outlined are the expectations of the military for its role in the manned space program.

The Association Between Lean Body Mass, Lactate Threshold, and the Decrement in VO_2max During Hypobaric Hypoxia in Well-Trained Cyclists

by Roberto Quintana, PhD, *The University of New Mexico*, 2002, 68 pages

The purpose of this study was to investigate determinants of maximum exercise capacity by examining the variance in the decrement in sea-level maximum oxygen consumption ($\text{SL-VO}_2\text{max}$) with hypobaric hypoxia (HH) in trained cyclists by multiple regression analysis. The hypo-/hyperbaric conditions consisted of 763, 568, and 486 Torr. The independent variables used in the multiple regression analysis included the change in arterial oxygen saturation with HH, hemoglobin concentration, $\text{SL-VO}_2\text{max}$ ventilation at VO_2max (VEmax), sea-level lactate threshold (SL-LT), lean body mass (LBM), leg volume, and gender. Male ($n = 14$) and female ($n =$

14) competitive cyclists completed 3 cycle ergometry VO_2max tests in a hypo-/hyperbaric chamber under randomized blind conditions. Oxygen consumption per unit time decreased significantly with HH for both genders; the average VO_2max decrement with HH was 8.6% per 100 mmHg. Results indicate that the decrement in VO_2max is dependent upon a number of factors, which change with respect to the population and altitude. Across all altitudes, the investigator suggests his data indicate that peripheral factors (LBM, leg volume, and SL-LT) together with pulmonary (VEmax) and central factors ($\text{SL-VO}_2\text{max}$), explain a significant portion of the variance in the decrement in VO_2max in trained cyclists acclimated to altitude.

High-Altitude Hypoxic Amnesia: Short-Term Memory Loss at High Altitudes

by William David Wiecking, PhD, *University of Hawaii*, 2002, 161 pages

This study evaluates the effects of exposure to altitudes of 3500 and 4200 m on short-term memory. After establishing relationships between the physiological signs of high-altitude exposure (acute mountain sickness scores and gross physiological changes such as hyperventilation and changes in blood pH) and the effect such exposure has on short-term memory loss, a further investigation was performed of the specific effects of high-altitude hypoxia on the short-term memory of test subjects at 2 observatories in Hawaii. The locations used were the Keck and UKIRT observatories on Mauna Kea (4200-m altitude) and the Atmospheric observatory on Mauna Loa (3500-m altitude). The investigator of this study reports that commuters to these altitudes suffer significant cognitive impairment as measured by changes in short-term memory. This impairment is most severe upon arrival at altitude, decreases for a short time, and then subsequently increases in severity. This temporary compensatory response is mirrored in changes in blood oxygen levels. There is evidence of long-term impact on cognitive function as well, though the scope of this study is too limited to make statistically significant conclusions on this matter. The investigator concludes that there exists an acute adaptive response during exposure to intermediate altitudes. The investigator also indicates that the tolerance to high-altitude hypoxic amnesia improved sequentially throughout the schedule of mountain work,

most notably with shift workers intermittently exposed to high altitude.

The Coldest Crucible: Arctic Exploration and American Culture, 1850–1910

by Michael Frederick Robinson, PhD, *The University of Wisconsin—Madison*, 2002, 279 pages

In the latter half of the 19th century, Arctic fever swept through the United States as dozens of explorers set sail on expeditions of discovery to find a sea route to Asia, to rescue missing explorers, and, ultimately, to stand at the North Pole. Most failed to accomplish their goals. Determining how explorers came to see Arctic exploration as meaningful work (so meaningful that they continued to risk their lives pursuing it) and what compelled middle-class Americans to follow their adventures with such avid interest demands that Arctic exploration be seen as an activity that unfolded in America as much as it did in the Arctic. This study considers Arctic exploration during the heyday of its popularity in America, from 1850 to 1910. Most works on the subject have followed explorers on their polar journeys, but the focus of this work is on their activities at home: how they built support for their expeditions before departure, promoted their claims upon their return, and crafted themselves as public figures according to the values of their day. A new portrait of these voyagers is created, one that removes them from the icy backdrop of the Arctic and sets them within important domestic debates about “manliness” and science. New light is thus shed on science at the turn of the 20th century.

Longitudinal Studies on the Epidemiology of Diarrheal Diseases in Peruvian Children

by William N. Checkley, PhD, *The Johns Hopkins University*, 2002, 154 pages

A 4-year field study was conducted in a Peruvian peri-urban community to determine the relationship between the epidemiology of diarrheal diseases and the physical anthropometry in a cohort of children less than 3 years of age. The investigator identified 1387 diarrheal episodes during the study period, yielding a mean diarrheal incidence of 3.2 disease episodes per child-year. Young children and especially infants frequently became ill with diarrhea during the first 3 years of life, but less than 2% of these episodes were 14 days or longer. Children in this study population had a high prevalence of stunting but a low prevalence of wasting. Significant determinants of diarrheal incidence were early age, nutritional status, and seasonality. Nutritional status, as measured by height-for-age, was significantly associated

with diarrheal incidence. Study results identified infants and children with poor nutritional status as a priority risk group for prevention efforts aimed at reducing the burden of acute childhood diarrhea. Additionally, multiple episodes of diarrhea led to stunted growth, especially in infants less than 6 months of age. The adverse effects of diarrhea on linear growth were increased with a greater prevalence of disease, indicating that both incidence and duration of illness determine the degree of linear growth retardation in a community. Improved water supply and sanitation played an important role in breaking the vicious cycle between diarrhea and malnutrition in poor communities of developing children. The author suggests that in light of new evidence linking early disease exposure to decreased cognitive abilities later in life, better control of diarrhea and improvements in linear growth early during childhood will undoubtedly result in significant social benefits in adulthood.

Assessing Malaria Risk from Space Using Radar Remote Sensing

by Shannon Ross Kaya, MA, *Carleton University (Canada)*, 2002, 144 pages

More than 80% of the 1 million-plus new cases of malaria reported each year are in sub-Saharan Africa. This paper discusses the potential use of remote sensing and Geographic Information System technologies as effective surveillance tools to monitor vector-borne diseases such as malaria in order to facilitate efficient control and mitigation activities. Background research includes a discussion of the malaria disease vector, a basic theory of remote sensing, and a review of the use of remote sensing for disease monitoring and mapping. A case study examines the use of multi-temporal RADAR-SAT-1 imagery for mapping malaria risk in coastal Kenya. The investigator suggests that this work demonstrates the potential of remote sensing for assessing disease presence and risk, being of particular interest to health officials and international development specialists.

Nutritional Impact of Resettlement of Internally Displaced People in Northern Iraq

by Pushpa Acharya, PhD, *University of Massachusetts Amherst*, 2002, 291 pages

A survey measuring the nutritional impact of resettlement of Internally Displaced Persons (IDPs) was conducted in Northern Iraq between July and November 2000. The sample consisted of 301 households in the collective town of Dyana, representing the IDPs, and 282 households in 10 villages of Rostey Valley, representing the resettled IDPs. The survey method consisted

of structured questionnaires, anthropometry, and measurement of hemoglobin levels of 1 child under the age 5 years, 1 man, and 1 woman per household. The prevalence of low height-for-age among the children from the resettled households was 30.6%; among those still in the collective town, the prevalence was 18.9% ($P < .01$). No significant differences existed in acute malnutrition and underweight rates among the children or in adult body mass indexes between the 2 populations. Anemia was present among 56.8% of the children in the collective town and among 46.8% of the children in the resettled villages ($P < .01$). The presence of anemia among both men (42.9%) and women (47.2%) was significantly higher among the IDPs in the collective town than among the men (22.5%) and women (28.0%) in the resettled villages ($P < .01$). Except for vegetables, all other types of food were available in higher quantities to the resettled households ($P < .05$). Availability of food energy, protein, iron, zinc, thiamin, and folic acid was significantly higher in the resettled villages, and availability of calcium, riboflavin, and vitamins C and A was significantly higher in the collective town ($P < .05$). The investigator concludes these results show that the resettled IDPs did not clearly have a superior nutritional status compared with those still considered IDPs.

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