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PREFACE

This bibliography contains publications resulting from research supported by the Regulatory Physiology Discipline of the NASA Space Physiology and Countermeasures Program during the years 1980-1990. It is one of a series of four bibliographies being published in 1992 of the disciplines of the Space Physiology and Countermeasures Program. Others in this series include publications from the Musculoskeletal, Cardiopulmonary, and Neuroscience Disciplines. Portions of this compilation have been published previously as part of a series of bibliographies of space biomedical research. Previous editions in this series cover the years 1980-1982 (NASA CR-3587), 1982-1983 (NASA CR-3739), 1983-1984 (NASA CR-3860), 1984-1986 (NASA CR-4184), and 1987-1988 (NASA CR-187840).

This bibliography is divided into nine sections: Circadian Rhythms, Endocrinology, Fluid and Electrolyte Regulation, Hematology, Immunology, Metabolism and Nutrition, Temperature Regulation, General Regulatory Physiology, and General Physiology. The last section is included to provide the reader with additional, background material in space physiology research. NASA-funded investigators whose work resulted in these publications are identified by an asterisk. A principal investigator index, as well as a list of investigators and their affiliations, is also included in the bibliography.

As part of our continuing interaction with the scientific and professional community, we are pleased to present this bibliography in an effort to stimulate an exchange of information and ideas among scientists working in this discipline. I would like to thank April Commodore Roy and Audrey Robin Brown for their technical assistance in the production of this bibliography.

Janis H. Stoklosa, Ph.D.
Manager, Space Physiology and Countermeasures Program
The Regulatory Physiology Discipline is part of the Space Physiology and Countermeasures Program of the NASA Life Sciences Division. Space life sciences research was initiated in 1960 with the goal of enabling human survival in space. Now, in the late 20th century, the program is evolving to ensure human health and productivity on space missions: on the space shuttle in the 1990s, then on Space Station Freedom, and ultimately on the Moon and missions to Mars.

The goals of the Regulatory Physiology Discipline are to determine and understand the short- and long-term physiological adaptation(s) of humans to the space environment and to evaluate the efficacy of physiological and performance countermeasures. The Regulatory Physiology research program is comprised of several subdisciplines: Circadian Rhythms, Endocrinology, Fluid and Electrolyte Regulation, Hematology, Immunology, Metabolism and Nutrition, and Temperature Regulation.

The objective of the Circadian Rhythms subdiscipline is to describe and understand the effects of gravity and the spaceflight environment on biological rhythms of various physiological systems. This subdiscipline is concerned with determining the effects of the space environment and intermittent or variable gravity fields on sleep, sleep cycles, and the generation, expression, and entrainment of metabolic, endocrine, and/or behavioral circadian rhythms.

The objective of the Endocrinology subdiscipline is to understand the hormonal mechanisms that underlie the physiological responses to spaceflight. It is concerned with determining the effects of spaceflight on the endocrine system and the effects of these changes on other homeostatic systems (e.g., cardiovascular, nervous, immune, gastrointestinal, and energy metabolism). It also studies the hypothalamic-pituitary-adrenal and opioid system responses to normal spaceflight events.

The objective of the Fluid and Electrolyte Regulation subdiscipline is to describe and understand the effects of spaceflight on renal function, fluid distribution, and electrolyte regulation. It seeks to determine the time course and magnitude of fluid shifts and changes in fluid compartment volumes during acclimatization to hypogravity and during return to 1 g after flight. It also studies the fluid and electrolyte regulating mechanisms underlying the cardiovascular responses during spaceflight, as well as the effects of microgravity on renal function and stone formation.

The objective of the Hematology subdiscipline is to characterize the anemia that is present following spaceflight and to determine the causes and mechanisms involved in the loss of red blood cell mass. This subdiscipline focuses on the time course, magnitude, and mechanisms of changes in the erythropoietic system during spaceflight, and on whether the loss of red blood cell mass represents a normal microgravity-associated adaptive process or a transient response to changes brought about by various spaceflight-related stimuli.

The objective of the Immunology subdiscipline is to define and understand the changes in immunocompetency that occur in response to spaceflight. It is concerned with determining how spaceflight affects the humoral or cell-mediated immune functions, nonspecific immunity, or immune surveillance capabilities of space crews, and if these changes predispose crewmembers to unacceptable medical risks while on a mission or upon return to Earth.

The objective of the Metabolism and Nutrition subdiscipline is to understand and describe changes in metabolism that occur in spaceflight and define how and to what extent nutritional requirements may be altered. This subdiscipline seeks to determine if energy requirements, basal metabolic rate, metabolic efficiency, pharmacokinetics of drugs, or food consumption change during spaceflight.
The objective of the Temperature Regulation subdiscipline is to understand the effects of gravity and spaceflight on the regulation of body temperature and thermal comfort of the crew. Determining the compounded effects of microgravity and extravehicular activity and the effects of prescribed countermeasures on thermoregulation and heat exchange, and how changes in body temperature or its regulation correlate with metabolic rate and energy expenditure are the focus of this subdiscipline.

Janis H. Stoklosa, Ph.D.
Manager, Space Physiology and Countermeasures Program
CIRCADIAN RHYTHMS
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Gradual decay of circadian drinking organization following lesions of the suprachiasmatic nuclei in primates.

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Entrainment and masking of circadian drinking rhythms in primates: Influence of light intensity.
Physiology & Behavior 28: 205-211, 1982. (GWU 4642)

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Physiology & Behavior 31: 573-576, 1983. (GWU 6002)

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Three-dimensional structure of the mammalian suprachiasmatic nuclei: A comparative study of five species.
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Three dimensional structure of the suprachiasmatic nuclei in the diurnal squirrel monkey (Saimiri sciureus).

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The mammalian circadian system and the role of environmental illumination.

Moore-Ede*, M.C.
Physiology of the circadian timing system: Predictive versus reactive homeostasis.

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Homeostatic, entrainment and pacemaker effects of drugs that regulate the timing of sleep and wakefulness.

Moore-Ede*, M.C.; Song, P.; Harling, C.; Kass, D.A.; Sulzman*, F.M.; Fuller*, C.A.
Zero-g fluid shifts: Primate model of circadian adaptations (Abstract).

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The Clocks that Time Us: Physiology of the Circadian Timing System. Cambridge, MA: Harvard University, 448 p., 1982. (GWU 2776)

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Physiologist 25(6, Suppl.): S165-S166, 1982. (GWU 3825)
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Significance of light and social cues in the maintenance of temporal organization in man (Abstract).

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Plasma and pineal melatonin levels in female ferrets housed under long or short photoperiods.
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Lipoprotein binding in sucrose induced hypertriglyceridemia in the rat (Abstract).
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Total LDH activity and its isoenzyme patterns during bed rest with exercise training (Abstract).
*Physiologist* 25(4): 305, 1982. (GWU 3419)

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Insulin-induced hypoglycemia in conscious dogs. I. Dose-related pituitary and adrenal responses.

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Binding and degradation of very low density lipoproteins (VLDL) from diabetics by mouse peritoneal macrophages (Abstract).

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Lipoprotein binding in sucrose induced hypertriglyceridemia in the rat (Abstract).
*Clinical Research* 29(1): 56A, 1981. (GWU 3275)

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*Aviation, Space, and Environmental Medicine* 60(5): 482, 1989. (GWU 14351)

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Effect of confinement in small space flight size cages on insulin sensitivity of exercise-trained rats.
*Aviation, Space, and Environmental Medicine* 54(10): 919-922, 1983. (GWU 5185)

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*Clinical Research* 31: 94A, 1983. (GWU 4706)

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*Physiologist* 25(4): 304, 1982. (GWU 3416)

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The site of insulin resistance in normal rats induced by chronic fructose feeding (Abstract).
*Clinical Research* 29: 96A, 1981. (GWU 3274)
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Metabolism 38(10): 983-989, 1989. (GWU 13237)

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Dissociation of potassium and glucose uptake responses to hyperinsulinemia in critically ill patients (Abstract).  
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Effect of bedrest on leucine metabolic response to insulin in normal young men (Abstract).

Follicular phase ovarian hormone response to prolonged moderate exercise (Abstract).

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Enforced bedrest in man results in decreased action of insulin on glucose metabolism primarily in muscle (Abstract).

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The site of decreased glucose utilization in aging rats (Abstract).

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Effects of 7 days of microgravity on rat plasma hormone levels (Abstract).

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*Endocrinology* 110(2): 413-420, 1982. (GWU 4388)

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INDEX OF PRINCIPAL INVESTIGATORS
APPENDIX: List of Principal Investigators and Addresses
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Boston, MA 02114
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<td>A 10-year cumulative bibliography of publications resulting from research supported by the Regulatory Physiology discipline of the Space Physiology and Countermeasures Program of NASA's Life Sciences Division is provided. Primary subjects included in this bibliography are circadian rhythms, endocrinology, fluid and electrolyte regulation, hematology, immunology, metabolism and nutrition, temperature regulation, and general regulatory physiology. General physiology references are also included. Principal investigators whose research tasks resulted in publication are identified by asterisk. Publications are identified by a record number corresponding with their entry in the Life Sciences Bibliographic Database, maintained at The George Washington University.</td>
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