

24th International Gravitational Physiology Meeting
4-9 May, 2003, Santa Monica, California

FINAL PROGRAM

SUNDAY, MAY 4TH

15:00 – 17:00 Meeting check-in and Registration

19:00 Welcome Reception

MONDAY, MAY 5TH

CURRENT CONCEPTS IN GRAVITATIONAL PHYSIOLOGY

08:00 Overview of Study Design and Effects of long-Duration Bedrest with or without Resistance Exercise on Skeletal Muscle Size and Function

P.A. Tesch

08:30 Skeletal Muscle Protein Composition with 84 d of Bedrest and Exercise

T. Trappe

09:00 Effects of Long-Duration Bedrest and Resistance Exercise on Myonuclei and Satellite Cells

L.E. Thornell

09:30 MORNING BREAK

10:00 Human Single Muscle Fiber Function with 84-d Bedrest and Resistance Exercise

S. Trappe

10:30 Effects of Long-Term Bed Rest on Muscle Integrity and Cytoskeletal Proteins with and without Resistance Exercise

A. Chopard

11:00 Skeletal Muscle Marker Expression Following 84d of Bedrest with and without Exercise: Maintenance of NOS-1 Enzyme Activity and Protein

D. Blottner and B. Schoser

11:30 LUNCH

FREE PAPERS: MUSCULOSKELETAL

13:00 Irreversible Morphological Changes in Hindlimb Bones of Rats Following Chronic Unloading

Y. Ohira and F. Kawano

13:15 Effects of Long-Term Bed Rest on Muscle Integrity and Cytoskeletal Proteins With and Without Resistance Exercise

A. Chopard, N. Arrighi, A. Carnino, and J.-F. Marini

- 13:30 Role of the Gravity Factor on Mechanical Properties and Expression of Contractile Proteins in Rat Soleus Muscles
Y. Mounier, C. Bozzo, F. Picquet, L. Stevens, V. Montel, B. Bastide, and M. Falempin
- 13:45 Changes of Bone Characteristics under Simulation of Space Flight Condition as Deduced by EPR Spectroscopy
A.B. Brik, O.N. Atamanenko, and V.B. Atamanenko
- 14:00 High Calcium Intake does not Prevent Disuse-Induced Bone Loss
M. Heer, A. Boese, N. Baecker, and S.M. Smith
- 14:15 Effects of Artificial Support Stimulation on Soleus Single Fiber Characteristics in Men Exposed to 7-day “Dry” Immersion
K.S. Litvinova, T.L. Nemirovskaya, N.M. Gasnikova, I.B. Kozlovskaya, and B.S. Shenkman
- 14:30 Effects of Ca²⁺ Binding Agent on Contractile Characteristics of Single Skinned Soleus Fibers in Hindlimb Suspended Rats
K.S. Litvinova, T.L. Nemirovskaya, and B.S. Shenkman

14:45 AFTERNOON BREAK

FREE PAPERS: COUNTERMEASURES/APPLIED

- 15:00 Space Shuttle versus Space Station Missions: Cardiovascular Considerations
C.F. Sawin
- 15:15 Effects of Simultaneous Load of Centrifuge-Induced Artificial Gravity and Ergometer Exercise as the Countermeasures for Space Deconditioning on Human Cardiovascular Function
S. Iwase, Q. Fu, A. Kamiya, D. Michikami, T. Mano, E. Morimoto, and H. Takada
- 15:30 Development of a Vibration Based Countermeasure to Inhibit the Bone Erosion and Muscle Deterioration that Parallels Spaceflight
T. Kaplan, Y.-X. Qin, S. Judex, and C. Rubin
- 15:45 Is Intermittent Artificial Gravity an Ideal Multi-System Countermeasure?
L.-F. Zhang, and B. Sun
- 16:00 The Venous-Arteriolar Response is Preserved Following Long-Term Exposure to Microgravity
A. Gabrielsen and P. Norsk

FREE PAPERS: DEVELOPMENT

- 16:15 Positive Geotaxis in Infant Rat: Correcting an Historically Misinterpreted Phenomenon
J.R. Alberts and B. Motz
- 16:30 Effects of Hypergravity Rearing on Growth Hormone and Insulin-Like Growth Factor in Rats
L.A. Baer, J.H. Chowdhury, R.E. Grindeland, C.E. Wade, and A.E. Ronca
- 16:45 Gender Differences in the Effect of Hypergravity on the Rat Neonatal CNS
K. Nguon and E.M. Sajdel-Sulkowska

17:00 – 18:00 POSTER SESSION I

- 1 Correlated Resting CA^{2+} and CA^{2+} Entry Decreases Precede Slow-to-Fast Transition in Unloaded Rat Soleus Muscle Independently of Atrophy
F. Bodvael, J.-F. Desaphy, S. Pierno, A. De Luca, A. Liantonio, J.-F. Rolland, and D. Conte Camerino
- 2 Characteristics of Spindle Discharges of Rat Soleus Muscle after a Period of Hypodynamia-Hypokinesia
M. Falempin, L. De-Doncker, and F. Picquet
- 3 Expression of Myosin Heavy Chain Isoforms in Spindle From Rat Soleus Muscle in Conditions of Microgravity and Hypergravity
M. Falempin, L. De-Doncker, and F. Picquet
- 4 The Effects of 90-Day 2G Exposure on Muscle Myosin Heavy Chain Expression in Rat Soleus and Plantaris Muscles
J.C. Fuller, P.M. Fuller, C.E. Wade, L.A. Baer, and C.A. Fuller
- 5 Effects of Hindlimb Unloading on Cell Body Size and Oxidative Enzyme Activity of Soleus Motoneurons in Developing Rats
A. Ishihara, F. Kawano, X.-D. Wang, and Y. Ohira
- 6 Dynamics of Muscle Transverse Stiffness under Conditions of Dry Immersion in Combination with Artificial Stimulation of Foot Support Zones
D.V. Popov, O.L. Vinogradova, and I.B. Kozlovskaya
- 7 Myosin Phenotype and Sarcomeric Cytoskeletal Proteins in Stretched Soleus of Hindlimb Suspended Rats
B.S. Shenkman, T.L. Nemirovskaya, I.M. Vikhlyantsev, A.M. Muchina, and Z.A. Podlubnaya
- 8 Ultrastructural Adaptations of Peripheral Part of Rat Motor Units after Support Unloading, Hypergravity, Combination of the Both Factors, Endurance Exercises (RUN) and Later on Triton Space Flight
M.M. Umnova, I.B. Krasnov, T.P. Seene, and V.I. Mitashov
- 9 Load-Associated Growth of Soleus Muscle Fibers in Rats
X.D. Wang, F. Kawano, Y. Takeno, H.J. Song, A. Ishihara, and Y. Ohira
- 10 Effect of Inhibited L- Ca^{2+} Channels on Intermittent Tetanic Contraction in Unloading Soleus
F. Gao, Z.-B. Yu, J.-H. Cheng, and J.-P. Jin
- 11 Changes in Muscle Function after 28-Day Limb Suspension
T. Finni, A.M. Lai, J.A. Hodgson, V.R. Edgerton, and S. Sinha
- 12 Load- and Afferent-Input-Associated Responses of Neuromuscular System to Hindlimb Unloading in Rats
F. Kawano, A. Ishihara, J.L. Stevens, X.D. Wang, S. Ohshima, M. Horisaka, Y. Maeda, I. Nonaka, and Y. Ohira
- 13 The Dosed Hypoxia Preserve the Bones Biomechanical Properties
V.A. Berezovskiy, H.G. Chaka, and P.V. Laxin
- 14 Effects of Intermittent Standing on Femur of Hindlimb Unloaded Rats
X.-S. Cao, X.-Y. Wu, Y.-H. Wu, and L.-F. Zhang
- 15 The Bone Electrical Properties in Hypokinetic Rats
M.I. Levashov, V.A. Berezovskiy, S. Saphonov, and O. Levashov

- 16 Acclimatization to Hypergravity
J. Sykora, I. Lokcova, J. Dvorka, M.-B. Bachrack, and D. Strobl
- 17 Re-Adaptation to 1-G of Pregnant Rats Following Exposure to Spaceflight or Centrifugation
K.E. Johnson, J.R. Alberts, and A.E. Ronca

TUESDAY, MAY 6TH

EFFECTS OF GRAVITY ON PLANT PHYSIOLOGY

- 08:00 Gravisensing in Plants - Many Adaptive Possibilities
K.H. Hasenstein
- 08:30 Transcription Profiling the Early Gravitropic Response in Arabidopsis Using High-Density Oligonucleotide Probe Microarrays
N. Moseyko and L. Feldman
- 09:00 Effects of Extracellular ATP on Growth and Gravidresponsiveness in *Arabidopsis* Roots
W. Tang, I. Steinebrunner, Y. Su, and S.J. Roux

09:30 MORNING BREAK

- 10:00 Physiological Challenges to Seed Production during Spaceflight
M. Musgrave
- 10:30 Mapping the Way to Plant Gravitropic Response Genes
T. Lomax
- 11:00 Spirals in Space - Non-Random Orientation of Moss *Protonemata* in Microgravity (STS-87)
V. Kern

11:30 LUNCH

FREE PAPERS: PLANT PHYSIOLOGY

- 13:00 Rearrangements of the In *Brassica Rapa* Photosynthetic Apparatus in Microgravity
N.I. Adamchuk, E.L. Kordyum, and J.A. Guykema
- 13:15 Gravity Effects on the *Arabidopsis* Transcriptome
R. Hampp, M. Martzivanou, R.-M. Maier, E. Magel
- 13:30 Gravisensing - the Combined Result of Viscous Properties and Noise Amplification
K.H. Hasenstein, Z. Ma, and P. Scherp
- 13:45 Response of Haplopappus Cells in Callus Culture to Fast Clinorotation
D.O. Klymchuk
- 14:00 A Role of Cytoskeleton in Plant Cell Gravisensitivity
E.L. Kordyum
- 14:15 Investigation of the Rheology of the *Chara* Cytoplasm by Intracellular Magnetograviphoresis of Statoliths
O.A. Kuznetsov
- 14:30 Vibration Forces and Ultrastround Can Displace Organelles Inside Plant Gravidreceptor Cells
O.A. Kuznetsov
- 14:45 Geotaxis in Pea and Bean Seedlings
G.C. Vezzoli and A. Tse

15:00 Bioconvection in Cultures of the Calcifying Unicellular Alga *Pleurochrysis carterae*
D. Montufar-Solis, P.J. Duke, and M. Marsh

15:15 AFTERNOON BREAK

FREE PAPERS: CELLULAR/MOLECULAR

15:30 Microgravity and Bone Cell Mechanosensitivity - Fluid Shear Stress-Induced Nitric Oxide Production by Bone Cells is Rate Dependent

R.G. Bacabac, T.H. Smit, S. Dijcks, J.J.W.A. van Loon, and J. Klein-Nulend

15:45 Loss of Pleiotropic Response in Microgravity Accompanied by Changes in Nuclear Morphology

M. Hughes-Fulford, K. Rodenacker, and U. Jutting

16:00 Demonstrate on Line Cell Shape Changes due to Gravity

J.J.W.A. van Loon, M.C. van Laar, J.P. Korterik, F.B. Segerink, R.J. Wubbels, H.A.A. de Jong, and N.F. Van Hulst

16:15 Influence of Artificial Gravity Loading on Synaptosomal Uptake and Release of L-[¹⁴C]-Glutamate

T. Borisova, N. Krisanova, N. Himmelreich

FREE PAPERS: ENDOCRINOLOGY/IMMUNOLOGY

16:30 Changes of Urine Volume with Day and Responses of Hormones during 20 Days of Head Down Bed Rest

Y. Suzuki, H. Kobayashi, and A. Gunji

16:45 The Hematopoietic Stem Cell Therapy for Exploration of Deep Space

S. Ohi, A.-N. Roach, W. Fitzgerald, D.A. Riley, and S.R. Gonda

17:00 Energy Intake and Expenditure of Rats Hind Limb Suspended for 90-Days

C.E. Wade, L.A. Baer, P.M. Fuller, T.P. Stein, and C.A. Fuller

17:15 – 18:00 POSTER SESSION II

1 The Effects of Clinorotation on G1-Phase Events in Pea Root Meristematic Cells
O.A. Artemenko

2 Clinostation Influence on Microspectral Parameters of Fluorescence in Healthy and Virus Infected Apogee Wheat Variety Leaves

L.T. Mishchenko, O.I. Kitaev, I.A. Mishchenko, and G.S. Yanishevskaya

3 Dynamic of the WSMV Reproduction in the Apogee Wheat Variety under Simulated Microgravity Conditions

L.T. Mishchenko

4 Gravitropism of the Statolith-Free Internodal Cells of Chara

M.P. Staves and A. Faber

5 An Effect of Silicon on Biochemical Processes in Plants in Microgravity

N. Zaimenko and T. Cherevchenko

6 Gravicurvature Loss, Changes in Ultrastructure and Calcium Balance of Pea Root Statocytes Treated with Chlorpromazine

N.A. Belyavskaya

- 7 Ruthenium Red-Induced Gravicurvature Loss, Changes in Statocyte Ultrastructure and Calcium Balance of Pea Seedlings
N.A. Belyavskaya
- 8 Accumulation of the Nutrient Substances in the *Brassica Rapa* Embryos and Ovules at Early Stage of their Development under Altered Gravity
A.F. Popova and A.G. Kononko
- 9 Ultrastructural Subnucleolar Localization of Fibrillarin, One of the Most Important Proteins of Pre-rRNA Processing, is Changed in Altered Gravity
M.A. Sobol
- 10 Effects of Rotating Clinostat Simulated Weightlessness on the MAPK/ERK Signal Pathway in Osteoblastic ROS 17/2.8 Cells Induced by BMP-2
B. Wang, S. Zhang, and X.-Y. Wu
- 11 Gene Expression of Paxillin and Talin in Osteoblasts during Weightlessness Simulation using Clinostat
S. Zhang, B. Wang, Y.-H. Wu, and Y.-H. Li
- 12 Simulated Microgravity Inhibits Proprioceptive-Mediated Secretion of Bioassayable Growth Hormone
R.E. Grindeland, A.J. Bigbee, K.L. Gosselink, R.R. Roy, H. Zhong, L. Baer, T. Wang, M. Moran, and V.R. Edgerton
- 13 The Effects of Diet and/or Exposure to Acute Stress by Hindlimb Suspension on Estrous Cycling in Female Rats
J.C. Tou, R.E. Grindeland, and C.E. Wade
- 14 Expression of Components of Vascular Renin-Angiotensin System in Simulated Weightless Rats
J.-X. Bao, Q.-J. Meng, L.-F. Zhang, and L.-N. Zhang
- 15 Hypergravity-Induced Changes in Hematological and Lymphocyte Function Parameters in a Mouse Model
D.S. Gridley, G.M. Miller, G.A. Nelson, and M.J. Pecaut

WEDNESDAY, MAY 7TH

BIOSATELLITES: PAST, PRESENT AND FUTURE

- 08:00 Animals and Biosatellites in Space: A Historical Perspective
C.M. Tipton
- 08:30 The Bion Program and Medical Support of Humans in Space
E.A. Ilyin
- 09:00 The Main Results of Sensory-Motor Studies in Bion Flights and Their Applications for Human Space Flights
I.B. Kozlovskaya

09:30 MORNING BREAK

- 10:00 Effects of Head-Out Water Immersion on Eye-Head Coordination in Rhesus Monkeys
A.M. Badakva, N.V. Miller, and J.N. Eron
- 10:30 Molecular, Cellular and Integrated Muscle Physiology in Microgravity: Past, Present and Future - Neurophysiological Approaches
M. Falempin
- 11:00 Molecular, Cellular and Integrated Muscle Physiology in Microgravity: Past, Present and Future - Biomolecular Approach and Post-Translational Modifications
Y. Mounier

11:30 LUNCH

FREE PAPERS: BIOSATELLITE / TECHNICAL

- 13:00 The Mars Gravity Biosatellite: a New Platform for Partial Gravity Research
E.L. Brown, C.E. Carr, and P.D. Wooster
- 13:15 European SOYUZ Missions - Limitations to Biology Experimentation
J. Maroothynaden
- 13:30 Hicop: Human Interface Computer Program
F. Beckers, B. Verheyden, and A.E. Aubert
- 13:45 A Description of Very Large, Commercial R&D Facilities to be Built in Orbit during this Decade
G. Meyers
- 14:00 Intrauterine Pressure (IUP) Telemetry in Pregnant and Parturient Rats: Potential Applications for Spaceflight and Centrifugation Studies
A.E. Ronca, J.C. Villarreal, L.A. Baer, and C.E. Wade
- 14:15 Pulsed Phase Lock Loop Device for Monitoring Intracranial Pressure during Space Flight
T. Ueno, B. Macias, W.T. Yost, and A.R. Hargens
- 14:30 *In Vivo* Near-Infrared Spectroscopy in Human Bone and Skeletal Muscle
M. Klasing and J. Zange
- 14:45 Microgravity Effects in Belousov-Zhabotinskii (BZ) Reaction
J.R. Castilho Piqueira

15:00 AFTERNOON BREAK

15:15-17:15 BIOSATELLITE ROUND TABLE DISCUSSION

Round Table panel members:

Dr. Eugene A. Ilyin, Institute of Biomedical Problems, Moscow, Russia

Dr. Noriaki Ishioka, NASDA Headquarters, Tokyo, Japan

Dr. Terri Lomax, NASA Headquarters, Washington, D.C.

Dr. Ketheth Souza, NASA Ames Research Center, Moffett Field, CA

Dr. Charles M. Tipton, University of Arizona, Tucson, AZ

Dr. Michel Viso, ESA Headquarters, Paris, France

15:15 Biosatellites: Recapturing Missed Opportunities and Recommendations for the Future

C.M. Tipton

15:25 Free Flyers: A Research Platform to Augment the International Space Station

K.A. Souza and M. Skidmore

15:35 Bion/Foton Capabilities and Tentative Research Program

E.A. Ilyin

15:45 ROUND TABLE DISCUSSION – OPEN TO ALL PARTICIPANTS

18:00 BUSES DEPART FOUR POINTS SHERATON FOR GALA DINNER

19:00 GALA DINNER

THURSDAY, MAY 8TH

EFFECTS OF GRAVITY ON NEUROBIOLOGICAL SYSTEMS

08:00 Mechanisms of Postural Control in Quadrupeds

T. Deliagina

08:40 Changes in Neural Control of Movement Following Chronic Exposure to Reduced Gravity

V.R. Edgerton

09:20 MORNING BREAK

09:50 Support / Weight-Bearing Afferentation Withdrawal in the Motor System

I.B. Kozlovskaya

10:30 Multi-Parallel CNS Control Mechanisms in Bipedal Walking Japanese Monkeys,

M. fuscata

F. Mori

11:10 LUNCH

13:00 Motor Adaptation to Robotic Force Fields Applied during Locomotion

D. Reinkensmeyer

FREE PAPERS: NEUROBIOLOGICAL SYSTEMS

13:40 Effects of +Gz on Memory and Brain Heat Shock Protein 70 Expression in Rats

X.-Q. Sun, X.-S. Cao, and J.-S. Li

13:55 Mechanical Stimulation of Receptor Cells in Otoliths

A.V. Kondrachuk

14:10 The Model of the Effect of Strong Magnetic Fields on Orientation and Growth of Biological Structures

A.V. Kondrachuk

14:25 The Actions of Helio- and Geomagnetic Disturbance on Human Health and Professional Functioning Reliability on Development of Social Processes

A.I. Mikhailov, G.V. Shilov, P.M. Shalimov, Y.I. Gurfinkel, and V.L. Voeikov

14:40 AFTERNOON BREAK

FREE PAPERS: CARDIOVASCULAR

14:55 Calf Vein Cross Section Changes during Post 7d HDT Stand Test & LBNP in Tolerant & Non-Tolerant Subjects

P. Arbeille, L. Pascaud, F. Belin de Chantemele, M. Porcher, and J. Boulay

15:10 Flow Redistribution Between Legs and Brain during STS 93 Re-entry and Landing. (Case Report)

P. Arbeille, J. Meck, M. Porcher, E. Benavides, D.S. Martin, D.A. South, C. Ribeiro, and A. Westover

- 15:25 Portal Vein Flow Volume and Diameter Changes during Stand Test in Normal Subjects
P. Arbeille, J. Ayoub, S. Besnard, and L. Pascaud
- 15:40 Simulated Weightlessness Decreases Potassium Channel Function of Vascular Smooth Muscle Cells of Cerebral Arteries in Rats
Z.-J. Fu, H.-W. Cheng, L.-F. Zhang, and J. Ma
- 15:55 Effects of Hindlimb Unweighting on Arterial Contractile Responses in Mice
J. Ma, X.-L. Ren, and R.E. Purdy
- 16:10 Heart Rate Variability during Head Out of Water Immersion: a Simulation of Microgravity?
B. Verheyden, F. Beckers, and A.E. Aubert
- 16:25 Evolution of Heart Rate Variability before, during and after Space Flight
F. Beckers, B. Verheyden, and A.E. Aubert
- 16:40 Frequency Analysis of Cardiovascular Variability during Parabolic Flight
B. Verheyden, F. Beckers, and A.E. Aubert
- 16:55 Cardiovascular Reflexes in Anesthetized Post-Suspension Rat
V.O. Golubinskaya, O.S. Tarasova, A.S. Borovik, and O.L. Vinogradova

17:10 – 18:00 POSTER SESSION III

- 1 Microgravity Exposure May Modify the Control of Limb Endpoint Movement during Human Walking
G. Courtine, C. Papaxanthis, and T. Pozzo
- 2 Intermittent 2G Prevents the Structural Alterations in Nervous System of Tail-Suspended Rats
L.N. Dyachkova, I.B. Krasnov, T.D. Burtseva, I.V. Denisenkova, V.S. Yakushina, G.M. Piskunova, V.I. Loginov, and N.A. Chelnaya
- 3 The Role of the Hystaminergic Neurotransmitter System on Physiological Responses to Hypergravity
P.M. Fuller and C.A. Fuller
- 4 Changes of Coherences of the Electroencephalogram during an Acceleration of +2.5Gz and Related Performance of Pilot Candidates with Acceleration Training on a Human Centrifuge
D. Wirth, H. Welsch, M. Nehring, F. Noack, P. Lindner, P. Dettmar, and U. Buhss
- 5 Na⁺ Dependent Glutamate Efflux from Rat Brain Synaptosomes under Altered Gravitational Environment
T. Borisova, N. Krisanova, N. Himmelreich
- 6 Reaction of Rat Right Atrium Cardiomyocytes to Simulated Weightlessness
L.S. Pogodina, M.V. Shornikova, and Yu.S. Chentsov
- 7 Comparison of Heart Rate Response to + and -Gz Load Changes at Safe and Low Altitude Level during Real Flight
P. Doseel, J. Hanousek, J. Petricek, J. Cmiral, and L. Cettl
- 8 Structural Changes of Brain Vessels in the Rats Exposed to Prolonged Hypergravity
T.S. Gulevskaya, V.A. Morgunov, and I.B. Krasnov
- 9 Gravity and Cardiovascular Regulation: Combined Stimulation Paradigm
H. Hinghofer-Szalkay, I. Loder, K. Pilz, and A. Rössler

- 10 Responses of Rat Left Ventricle Cardiomyocytes to Simulated Weightlessness
T.V. Lipina, M.V. Shornikova, and Yu.S. Chentsov
- 11 Role of Baroreflex Control of Sinus Node in Orthostatic Intolerance after 4 Hours
Head Down Bed Rest
*G. Raimondi, J.M. Legramante, S. Sacco, S. Contini, M. Pallante, A. Vespa, and
C. Saltini*
- 12 Cardiovascular Responses to Head-Up Tilt Together with Lower Body Negative
Pressure Following Exposure to Head-Down Tilt (Simulated Push-Pull Effect)
Y.-J. Yao, X.-Q. Sun, C.-B. Yang, T.-S. Liu
- 13 Hypoxic Gaz Mixture Partially Compensate Negative Influences of Hypokinesia
I.G. Litkova and V.A. Berezovskiy
- 14 Cerebral Lateralization and Intelligence in Simulated Microgravity: A Functional
Transcranial Doppler Study
P.C. Njemanze

FRIDAY, MAY 7TH

08:45 Board buses at Four Points Sheraton for regional tour

09:00 – 18:00 REGIONAL TOUR