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. Baeker, 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 Ca$^2+$ 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 Veno-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
<table>
<thead>
<tr>
<th>17:00 – 18:00 POSTER SESSION I</th>
</tr>
</thead>
</table>
| **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 Hypodynamic-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 Myosis 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 Unpacking 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. Seeve, 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  
| **11** Changes in Muscle Function after 28-Day Limb Suspension  
| **12** Load- and Afferent-Input-Associated Responses of Neuromuscular System to Hindlimb Unloading in Rats  
| **13** The Dosed Hypoxia Preserve the Bones Biomechanikal 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. Saphonnov, and O. Levashov* |
Acclimatization to Hypergravity
J. Sykora, I. Lokcova, J. Dvorka, M.-B. Bachrack, and D. Strobl

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 Graviresponsiveness 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
       Magnetogravipholeresis of Statoliths
       O.A. Kuznetsov
14:30 Vibration Forces and Ultrasound Can Displace Organelles Inside Plant
       Gravireceptor 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

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

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. Yanishevska*

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*
Ruthenium Red-Induced Gravicurvature Loss, Changes in Statocyte Ultrastructure and Calcium Balance of Pea Seedlings
N.A. Belyavskaya

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

Ultrastructural Subnucleolar Localization of Fibrillarin, One of the Most Important Proteins of Pre-rRNA Processing, is Changed in Altered Gravity
M.A. Sobol

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

Gene Expression of Paxillin and Talin in Osteoblasts during Weightlessness Simulation using Clinostat
S. Zhang, B. Wang, Y.-H. Wu, and Y.-H. Li

Simulated Microgravity Inhibits Proprioceptive-Mediated Secretion of Bioassayable Growth Hormone

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

Expression of Components of Vascular Renin-Angiotensin System in Simulated Weightless Rats

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. Maroethynaden
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 8**

**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, *Macaca 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*

*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*
Portal Vein Flow Volume and Diameter Changes during Stand Test in Normal Subjects
P. Arbeille, J. Ayoub, S. Besnard, and L. Pascaud

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

Effects of Hindlimb Unweighting on Arterial Contractile Responses in Mice
J. Ma, X.-L. Ren, and R.E. Purdy

Heart Rate Variability during Head Out of Water Immersion: a Simulation of Microgravity?
B. Verheyden, F. Beckers, and A.E. Aubert

Evolution of Heart Rate Variability before, during and after Space Flight
F. Beckers, B. Verheyden, and A.E. Aubert

Frequency Analysis of Cardiovascular Variability during Parabolic Flight
B. Verheyden, F. Beckers, and A.E. Aubert

Cardiovascular Reflexes in Anesthetized Post-Suspension Rat
V.O. Golubinskaya, O.S. Tarasova, A.S. Borovic, and O.L. Vinogradova

Microgravity Exposure May Modify the Control of Limb Endpoint Movement during Human Walking
G. Courtine, C. Papaxanthis, and T. Pozzo

Intermittent 2G Prevents the Structural Alterations in Nervous System of Tail-Suspended Rats

The Role of the Hystaminergic Neurotransmitter System on Physiological Responses to Hypergravity
P.M. Fuller and C.A. Fuller

Changes of Coherences of the Electroencephalogram during an Acceleration of +2.5Gz and Related Performace 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

Na⁺ Dependent Glutamate Efflux from Rat Brain Synaptosomes under Altered Gravitational Environment
T. Borisova, N. Krisanova, N. Himmelreich

Reaction of Rat Right Atrium Cardiomyocytes to Simulated Weightlessness
L.S. Pogodina, M.V. Shornikova, and Yu.S. Chentsov

Comparison of Heart Rate Response to + and -Gz Load Changes at Safe and Low Altitude Level during Real Flight
P. Dosel, J. Hanousek, J. Petricek, J. Cmiral, and L. Cettl

Structural Changes of Brain Vessels in the Rats Exposed to Prolonged Hypergravity
T.S. Gulevskaya, V.A. Morgunov, and I.B. Krasnov

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