Day 1. Theme Presentations: African Perspective

No. 001 Oral

Strategic Vision for Remote Sensing Center for Health Applications at the Federal University of Technology Owerri Nigeria

Professor Celestine O.E. Onwuliri
Vice Chancellor,
Federal University of Technology Owerri, Nigeria.

Abstract

Parasitic diseases constitute grave public health problems and obstacle to socio-economic development in endemic communities in the world and particularly in tropical Africa. Six of these diseases namely; Malaria, Trypanosomiasis, Onchocerciasis, Lymphatic Filariasis, Schistosomiasis and Leishmaniasis have been tagged "major tropical diseases" by the World Health Organization. The control, prevention and eradication of these diseases are only possible through effective surveillance. However, surveillance using conventional methods in some instances is cumbersome, time consuming, expensive and impracticable over huge areas with wide ranges of ecological conditions. The need therefore to use remote sensing and other techniques like geographical information system (GIS) and global positioning system (GPS) for parasitic disease surveillance and eventual prevention and control becomes expedient. Remote sensing is used to provide the imagery and spectral characteristics of environmental factors that determine the population of vectors of these diseases. GIS will provide computerized capture, storage, management, analysis, retrieval and display of spatial and descriptive data that are geographically referenced to a common coordinate system. The GPS technology provides the geographical coordinates of features on the earth's surface using a constellation of satellites orbiting the earth. Other complimentary techniques at various stages of development include: human and robotic teams and telemedicine. The potential use of these techniques in disease control and other health applications in Africa is examined from the Nigerian perspective.

Theme Presentation: Neuroplasticity
No. 002 Oral

Brain Neuroplasticity for Color Processing in Space: A functional Transcranial Doppler Spectroscopy Study

Philip C. Njemanze MD

Non-invasive Neurocybernetic Flow Laboratory, Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria

Background**:** We demonstrate for the first time functional neuroplasticity for color processing by cortical long-term potentiation (CLTP) and subcortical long-term depression (SLTD) using a new noninvasive ultrasound technique called functional transcranial Doppler spectroscopy (*f*TCDS).
Methods: Functional transcranial Doppler spectroscopy (*f*TCDS) measures cerebral mean flow velocity (MFV) in major intracranial vessels during cognitive processing. *f*TCDS was used to monitor MFV in the right (RMCA) and left (LMCA) middle cerebral arteries bilaterally in 8 men, during color stimulation in different head down positions, before, at 6h and 24h of HDR, and after HDR (Pre-, 6H-, 24H-, and Post-HDR, respectively).
Results: There was brain hypoperfusion and left lateralization during HDR, and Post-HDR compared to Pre-HDR. At Pre-HDR, in the right hemisphere, there was wavelength-differencing comprising wavelength-encoding (Yellow vs Blue contrast) in the subcortical region and energy-encoding (Blue vs Yellow) in the cortical region. In the left hemisphere, there was energy-encoding and luminance effect (White vs Black) responsiveness in the subcortical region. During HDR, in the right hemisphere but not left , there was CLTP at C-peaks and SLTD at S-peaks, wavelength-differencing was absent, but wavelength-encoding was used as cues. There were double luminance effect detectors leading to sensory conflicts. Post-HDR in RMCA but not left showed reversed wavelength-differencing in both hemispheres, dual luminance effect detectors, CLTP and SLTD lasting over 25 hours in RMCA but not left.
Conclusion**:** *f*TCDS may be useful for the study of neuroplasticity for simultaneous color contrast and color constancy in microgravity. Sensory conflicts may explain light flashes in Space.

No. 003 Oral

Neuronal Plasticity and Functional Recovery Following Stroke

Gwendolyn Kartje
Professor of Neurology,
Department of Neurology, Loyola University Chicago, USA.

Our laboratory is investigating how to enhance functional recovery after brain and spinal cord injury, focusing on stroke as a major cause of adult disability. We have shown that the protein Nogo-A, found in the brain and spinal cord, inhibits the growth of new neuronal connections. This protein can be neutralized by targeted immunotherapy thereby resulting in new neuronal connections, ie neuronal plasticity, and functional recovery following stroke. This immunotherapy is now being tested in Europe in a clinical trial for acute spinal cord injury. If successful, this therapy could be quickly translated into a new therapy for stroke patients. We are currently testing the time window after stroke that immunotherapy will result in recovery, which is important for patients with chronic brain damage. We are also testing recovery of function in the aged rodent, in order to better model the conditions of neural repair in the human population.

No. 004 Oral

Study of the Vestibular Centers in the Brainstem of Thick-Toed Geckos (Pachydactylus turneri Gray, 1864) after 16-Day Spaceflight

Kharlamova A.S., Makarov A.N., Saveliev S.V.
Institute of Human Morphology, ul.Tsurupi-3, 117418, Moscow, Russia,
Email: grossu@rambler.ru

Within the Russian/American flight experiment on board «Foton-M2» studies upon the influence of the flight conditions on the Thick-Toed Gecko organs and tissues including the CNS were conducted. It was the first time when the Thick-Toed Gecko was used in experiments. Altogether 20 animals were used in the 16-day experiment: 5 in flight, basal, synchronous and laboratory control groups. They were euthanized 32 hours after flight by sodium pentobarbital injected into abdominal cavity and decapitated. All organs and tissues including brain needed for histological studies were fixed in 10% formaldehyde, they were embedded in paraffin and 10 mcm sections were prepared. They were stained according to Mallory and Nissl's method and with hematoxylin-eosin. There are results of the vestibular nucleus studies in the flight experimental and synchronous control groups. While analyzing gecko brain whole mounts an emphasis was put on the study of the rhombencephalon vestibular nucleus state since in zero-gravity it was logical to expect changes primarily in the centers responsible for perception of linear acceleration. Histological study of vestibular nucleus and the quantification in geckos' brains in the flight and synchronous control groups did not find out any significant changes after 16-day spaceflight. Apparently the zero changes in the flight group gecko brains are connected to the fugacity of the experiment. 16 days of spaceflight are not enough for activation of any significant CNS alterations at least on histological level.

No. 005 Oral

STUDY OF THE EXOCRINE AND ENDOCRINE PANCREAS OF THE THICK-TOED GECKOS (Pachydactylus turneri Gray, 1864) AFTER 16-DAY SPACEFLIGHT

Krivova Y.S., Barabanov V.M., Saveliev S.V.
Institute of Human Morphology, ul.Tsurupi-3, 117418, Moscow, Russia,
Email: homulkina@rambler.ru

Effect of 16-day spaceflight on the structure of different organs and tissues of Thick-toed Geckos were studied in "Foton-M2"experiment. Fifteen animals were used for investigation of the pancreas: 5 - in flight, 5 - in synchronous and 5 - in basal control groups. Animals were euthanized by sodium pentobarbital injected into abdominal cavity: For both histological and immunohistochemical studies pancreases were fixed in 10% formaldehyde, embedded in paraffin and 10μ-thick sections were prepared. Some sections were stained according to Mallory's technique. Immunoperoxidase reaction using polyclonal antibodies to insulin and glucagons were applied for identification of β- and α-cells. Histological analysis shows that there were no significant changes in the structure of the pancreas due to the influence of space factors. Pancreatic exocrine and endocrine cells of the flight group were similar with those of synchronous and basal groups. Immunohistochemical study has revealed variations in the number of α- and β-cells in the pancreas between animals. Two geckos of flight group have decreased quantity of glucagon-containing cells. Spherical to ovoid β-cells and polygonal α-cells were present in the pancreases of basal group whereas these cells seemed to be deformed and had irregular shape in the pancreases of flight and basal group. Our study has revealed no effect of 16-day spaceflight on the histological structure of the pancreases of geckos. We found some differences in the number and shape of endocrine cells between groups using immunohistochemisty. These differences could be related to the influence of space flight factors. Still we can not be certain in this respect due to small number of animals.

No. 006 Oral

AFRICAN REPTILE PACHYDACTYLUS TURNERI GRAY, 1864 AS A MODEL OBJECT FOR THE STUDY OF MINERAL METABOLISM IN MICROGRAVITY.

V. Nikitin[1], V. Gulimova[1], V. Asadchikov[2], A. Buzmakov[2], S. Saveliev[1]

[1] *Institute of Human Morphology, ul. Tsurupi-3, 117418, Moscow, Russia, e-mail: neekeeteen@hotmail.com*

[2] *Shubnikov Institute of Crystallography, Moscow, 119333, Leninsky prospect-59, Russia, e-mail: buzmakov@gmail.com*

For about 15 years our laboratory was involved in studies of amphibians and mammals subjected to spaceflight. In the frames of Foton-M program it was decided to include reptiles to give additional dimension to comparative studies. The gecko lizards were chosen because of their ability to attach themselves to surfaces by special structures on the fingers. The problem was that many species of geckos were previously tested by parabolic flights and were found to release their hold under influence of zero gravity (adaptation in case object of attachment starts to fall). We continued this line of tests by dropping experiments and parabolic flights onboard airplanes. It was found that Pachydactylus turnery does not detach at zero gravity. This species was included in Foton-M2 experiment and successfully survived the space journey. It was impossible to use video recording equipment during this flight, so assumption that the animals remain attached to the walls of container and practice their usual locomotory activity in space remained unconfirmed. Internal structure of the skeleton was studied by microtomographic method and chemical composition – by X-ray spectroscopy. No significant changes were found in the structure and mineral composition of the bones in flight animals compared to the control. It looks like the geckos are not subjected to bone degradation and in future it is important to find the reason why this happens.

No. 007 Poster/Oral

Olfactory organs of thick-toed geckos after 16-day spaceflight.

V.I. Gulimova, V.B. Nikitin, V.M. Barabanov, S.V. Saveliev

Institute of Human Morphology, Moscow, Russia, gulimova@yandex.ru

Thick-toed gecko is an attractive model for orbital investigations because possibly they can avoid floatation due to numerous setae on their toes, allowing them to remain attached to any surfaces. Study of their olfactory structures is relevant, because olfaction plays a very important role in social and reproductive behavior of these animals. 32 hours after a 16-day spaceflight 5 adult geckos were examined using traditional histology and immunohistochemistry comparatively with synchronous control group. The latter spent the same time in similar container without light, water and food (as flight animals) at the temperature corresponding to that onboard "Foton-M2" satellite. Histology did not reveal any differences between the flight and control groups on the serial sections of snout. Immunostaining by antibodies against S-100 protein showed highest immunopositivity in the cilia of vomeronasal respiratory epithelium, vomeronasal duct, nasopharyngeal surface and in some knobs of vomeronasal organ's (VO) receptor part. Schwann cells and some other structures were less positive. Variability in the extent of cilia staining and zonal distribution of stained knobs was revealed. There were no qualitative differences in immunopositivity between the flight and control groups. But the reaction in respiratory epithelium of VO in flight animals was weaker and more fragmentary than in control. Immunoreactive knobs after spaceflight were rarer. They did not form continuous zones and were spread differently in receptor part of VO.

No. 008 Oral

Possible Functional Consequences of Microgravity-Dependant Myosin II Downregulation in Neurons

Steven L Jones, Andrea Ketschek, Ginaluca Gallo

Drexel University Philadelphia, USA.

Background: Neurons make appropriate connections during development and regeneration by the exertion of axonal traction forces. These forces involve myosin II (MII)-dependant processes such as actomyosin-based contractility and cellular adhesion. MII expression is downregulated in some cell types in microgravity. Microgravity-dependent changes in axonal MII levels may lead to defects in extension and guidance. The effects of microgravity-dependent MII alterations on axons may be elucidated by first examining such alterations in ground- and cell-culture-based studies.

Methods: Dissociated chick DRG at E7 and E14 were cultured. Blebbistatin was used to inhibit MII, and MIIA-GFP plasmids to overexpress MII.

Results: MII levels in distal axons were downregulated between E7 and E14. To investigate whether this downregulation has functional consequences, we determined axon responses in MII-dependent assays. MII inhibition reduced the rate of axon extension of E7 but not E14. MII-dependant retraction studies showed that E14 retract at half the rate of E7 under MII-inhibited conditions. MII-dependant border-crossing studies showed that E7 axons cross borders with less frequency than E14, but both E7 and E14 increased crossing frequency under MII-inhibited conditions. In order to test whether MII downregulation underlie the differences in axon extension and guidance, we overexpressed MIIA in E14, which resulted in significantly larger growth cones.

Conclusion: Developmental decrease in MII levels has functional consequences on axon extension and guidance. MII overexpression is being used to determine if decreases in MII expression at E14 also contribute to the observed changes in axon extension and guidance.

Theme Presentation: Space Agriculture
No. 009 Oral

The Economic Potential of Cassava to Support an Immigrant African Population on Mars

Felix Nweke
Michigan State University
East Lansing, Michigan U.S. A.

Abstract

The paper takes the approach that cassava, which can support an immigrant African population on Mars will be produced in Africa and exported to Mars. The paper is based on information from the COSCA studies, which were carried out from 1989 to 1997, in 2001 and in 2005 under the aegis of the IITA in six African countries where roughly 70 percent of the total cassava in Africa is produced.

Cassava's wide ecological adaptation in Africa, its significant yield response to genetic improvement research and its wide application as feed and raw material in food and non-food industries point to its economic potential to support immigrant African population on Mars.

In Africa, investment in R and D is urgently needed to mechanize cassava production, harvesting, and processing in order to reduce cost and make cassava competitive with grains in food, feed and non-food industries. But in Africa, the necessary investments are not forthcoming because international donors and African political leaders view cassava as an inferior crop. This situation calls for a new paradigm for an effective organization and financing of cassava R and D. One option is a private research arrangement by a consortium of food and beverage industries, which stand to gain most from low-cost cassava products because cassava is a major source of their raw materials.

No. 010 Oral

Conceptual Study of Space Agriculture for Support of Life on Mars

Masamichi Yamashita (Institute of Space and Astronautical Sciences /JAXA, Japan)

Supplying food is a primary issue in manned Mars exploration. A conceptual design is developed for space agriculture, which is driven by the biologically regenerative function. Choice of farming plant species should be based on nutritional requirements, and the best use of limited resource available on Mars. From Asian background, we selected rice, soybean, sweet potato, and green-yellow vegetables, but still like to survey other combination.

In order to supplement fatty acids and certain vitamins, animal origin foods are required in diet. Among many candidate animals to breed, insects are of great interest since they have a number of advantages over mammals. We propose several insect species, such as the silkworm, *Bombyx mori*, the drugstore beetle, *Stegobium paniceum*, and the termite, *Macrotermes subhyalinus.* These insects do not compete with human in terms of food resources, but convert inedible biomass or waste into an edible form.

One problem associated to the human domination over ecological system is sodium and potassium. Sodium is one of elements necessary for human because of its physiological reason. Plants in general do not grow under high salinity, and consequently sodium needs to be separated at human waste composting for farming plants. One solution is to use plant species tolerant against salinity. Ice plant, *Mesembryanthemum crystallinum*, native to southern Africa, is capable to accumulate sodium salt in its bladder cells, up to 30 % of its dry weight. Marine algae are another candidate tolerant against wide range of salinity, and capable to harvest potassium selectively into their body.

Day 2: Physics of Space-Time

No. 011 Oral

ON NATURE'S 'BLUE PRINT'

Amagh Nduka

Department of Mathematics and Physics, Federal University of Technology, Owerri, Nigeria.

Abstract
We discuss 'Nature's Blue Print' (quantitative discussion only); and apply it to explain and proffer solutions for the Global fright called 'Nature Disasters' – Earthquakes, hurricanes, tornadoes, typhoon and Global Warming.

No. 012 Oral

Temperature as a Scaling Parameter in the Projective Geometry of 4-dimensional Space-time

Alex Animalu

Professor of Mathematics,
University of Nigeria, Nsukka.

It is well-known that one requires n+1-coordinates to characterize the projective geometry of n-dimensional space. This means that temperature (T) could be treated as the fifth coordinate of the projective geometry of 4-dimensional space-time, i.e., each point of the 4-dimensional projective space would have the following five (aT, ct, x,y,z)-coordinates, where a and c are constants, T is temperature and t time. Temperature can then be interpreted as a scaling parameter in the sense that, in such a projective space, aT:ct:x:y:z =aT':ct':x':y':z' under a scale transformation from the primed to the unprimed coordinates, if the scaling parameter is interpreted as the 1/T. The consequences of this paradigm for understanding of global warming in the universe will be discussed.

No. 013 Oral

Planetary Migrations and the Recolonization of Mars

P. O. Adetiloye
Future World Center Project
University of Agriculture
Abeokuta.
poadetiloye@yahoo.com

Summary

This paper is divided into two parts. Part one examines the nature of planetary migrations. The challenges of human travel to Mars and challenges of possible colonization of Mars by humans are explored from the above perspective. Robust evidences are provided in support of my theory that humankind migrated to the warm planet Earth from the aged and extremely cold Martian planet when all energy sources, (renewable and non-renewable) became unsustainable for life at about 3 million years ago. The idea of Mars re-colonization is therefore unjustifiable because of its sub-optimal climate for life including humans. Human expeditions aimed at short duration habitation of Mars can however, be justified from astro-archaeological perspective. Such visits could provide useful astro-archaeological data on the past root of the human race and their extant technologies on Mars.

The second part explores the ideal architectures for re-colonization of the hostile and biological dead Martian climate.

No. 014 Oral

FUNCTIONAL MAGNETIC RESONANCE IMAGING: A MATHEMATICAL ANALYSIS OF BLOOD FLOW AT SUCTION POINTS

Awojoyogbe O. B.

Department of Physics, Federal University of Technology, Minna, Niger-State, Nigeria

Background
Changes in the oxygenation level of the blood occur as a consequence of neuronal activity and so the magnitude of change in signal intensity on magnetic resonance imaging (MRI) can be used as an indirect measure of excitatory input to neurons which is generally related closely to the cell firing rate.

Method
In this study, based on the solutions of the Bloch NMR flow equations using the perturbation theory, we have analyzed the asymptotic suction profile and described the physical quantities that affect the flow system. We study the flow properties of the time independent Bloch NMR flow equations which describe the dynamics of fluid flow under the influence of rF magnetic field subject to the resonance condition at Larmor frequency.

Result
We have constructed the analytic solution of the Bloch NMR flow equations for the analysis of suction points in a blood flow model. The analysis is valid for strong and weak suction points. The solution of the underline equation for the velocity profile at strong suction points is a continuation of the solution at weak suction points. This is very important, because, sometimes it may be very difficult to obtain the solution for velocity profile at strong suction points but it can be easy to obtain it for weak suction points.

Conclusion

The method may be applicable to functional Magnetic Resonance Imaging (fMRI) a technique for determining which parts of the brain are activated by mental processing.

Theme: Telemedicine, Remote Sensing, and Climate Change

No. 015 Oral

Telemedicine: A Pilot Project for the Federal Ministry of Health

Joachim F.C. Placidus

NATIONAL SPACE RESEARCH AND DEVELOPMENT AGENCY

FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY
Obasanjo Space Centre, Airport Road, Abuja. P.M. B. 437, Garki, Abuja

BACKGROUND:
The National Space Research and Development Agency (NASRDA) a parastatal of the Federal Ministry of Science and Technology in Nigeria was established in May, 1999 to implement the National Space Programme. The Agency on 15th December, 2004, went into collaboration with China for the design and launch of a hybrid geostationary 40 transponders communication satellite (NIGCOMSAT-1), which was launched into the orbit on 14th May, 2007 and has been commissioned for commercial operations after the successful In-Orbit-Test (lOT).
METHODS:
In order to deploy the services to show-case the capabilities of the Nigerian Communication Satellite, NASRDA initiated a Pilot Project on Telemedicine in collaboration with the Federal Ministry of Health. The project is currently networking 2 University Teaching Hospitals, 6 Federal Medical Centres and one fully equipped Mobile Clinic to provide real time health delivery.
The fixed and mobile hospitals are equipped with VSAT equipment, video equipment and telemedicine equipment for real time Tele-diagnosis and Tele-consulting.
There is a Network Operation Centre HUB for the project and is installed at the Nigerian Communication Satellite (NIGCOMSAT-l) ground control station for management of bandwidth among the nine service locations.
RESULTS:
The Nigeria telemedicine project would create opportunity for but not limited to the following services: Specialist referral services, patient consultations, remote patient monitoring, medical education, consumer medical health and information.
CONCULSION:
The National Space Research and Development Agency (NASRDA) would be excited to show-case Space Technology as a means to Medicine and its application through the Nigerian Communication Satellite (NIGCOMSAT-1).

No. 016 Oral

The Impact of Climate Change and the Nigerian Environment and on the Epidemiology of Malaria

Prof. B.E.B. Nwoke
Professor of Public Health Parasitology & Entomology
Department of Animal & Environmental Biology
Faculty of Science
Imo State University Owerri
Nigeria.
E-mail: bebndie@yahoo.com
Tele: + *(234)* 8033 2739 15

ABSTRACT

Malaria, transmitted by female mosquitoes of the genus *Anopheles* in Nigeria, still remains the most important of the tropical parasitic diseases. It exacts heavy toll of illness and death, especially among children, as well as retards economic development in endemic areas. These mosquito vectors breed in different types of aquatic habitats [temporary and or permanent]. As a result, any modifications or degradation of these habitats either by human behaviour or economic development are bound to affect the mosquito bionomics as well as the disease transmission and epidemiology. Some of these activities combine with the Nigerian tropical environment and abundant breeding sites to perpetuate the high prevalence and distribution of malaria. The life cycle of malaria parasite, *Plasmodium,* is particularly sensitive to temperature and humidity. These, among several factors are important limiting factors in malaria transmission and distribution. And with the climate change scenario and consequent climatic and seasonal variation across the globe, attempts have been made to understand the effect of climate change on malaria prevalence. These are discussed in the context of their impact on the disease epidemiology in Nigeria, with examples drawn from Africa.

No. 017 Oral

APPLICATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM TECHNOLOGIES TO "ROLL-BACK" MALARIA CONTROL PROGRAM

Njemanze PC, Chukwu A, Akagha O, Nwachukwu N, Ukanacho O, Mbaegbu C, **Dozie INS, **Nwoke BEB, *Chukwuocha UM, *Abanobi OC, *Lemchi J, *Akujor C, **Jiburum B, *Onwuliri C

Institute of Space Medicine and Terrestrial Science, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria; *Federal University of Technology, Owerri; **Imo State University, Owerri.

Background: About 350–500 million clinical malaria episodes occur annually. More than 1 million Africans die from malaria each year, and most are children under 5 years of age. Remote sensing (RS) and geographic information system (GIS) technologies could be applied to study the risk of malaria epidemic.
Methods: The patient population included 4,647 children under 5 years of age, seen at health centers in 10 different local government areas of Imo State. Maps of old Imo State were converted to digital form using ARC/INFO GIS software, and the resulting coverages included hydrology, towns, and villages. Remote sensing images from Advanced Very High Resolution Radiometer (AVHRR) data set were used to obtain color-coded monthly normalized-difference vegetation index or NDVI. The man-made small house-hold ponds and community ponds (called Iyiala or 'land streams') were located by direct visual inspection, in towns and villages.
Results: The least NDVI values occurred in the months of January-February each year, and highest values in the months of April and May. The highest number of malaria cases occurred in Jan-Mar each year, and least in the wet months of Apr-May and dry months of Sep-Dec.
Conclusion: The prevalence of malaria was spatially related to availability of household and community ponds during the farming season. The eradication strategy of malaria should include provision of reticulated water source in urban and rural areas to eliminate breeding sites for ***Anopheles*** mosquito as well as use of RS/GIS for planning prophylactic campaigns.

No. 018 Oral

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM AND SATELLITE REMOTE SENSING TECHNOLOGIES TO WATER-BORNE INFECTION IN IMO STATE, NIGERIA

** Dozie INS, Ugo S, Akagha O, Ofoegbu C, Ekeocha E, Orjinta U, Ako A, *Onwuliri C, *Chukwuocha UM, **Okoro I, ***Osunkwo UA, ****Nnodimele E, Njemanze PC.

**Imo State University, Owerri; Institute of Space Medicine and Terrestrial Sciences, Chidicon Medical Center, Owerri, Nigeria; *Federal University of Technology, Owerri, ***National Institute for Pharmaceutical Research & Development, Idu, Abuja, NIGERIA, ****Imo State Environmental Agency, Owerri. Nigeria.

INTRODUCTION**:** There are an estimated 1 billion cases of water-borne diarrheal cases per year, accounting for 4-6 million deaths per year, and over 50% of deaths of children in Sub-Saharan Africa. The problem is spatially related to lack of potable water. We applied risk analysis (RA) and geographic information system technologies (GIS) to evaluate health impact of water source.
METHODS: The study populations comprised 2.3 million people of age 0-85 years in 18 LGA of Imo State. Diarrheal disease incidence rate (DDIR) were calculated from the annual disease surveillance reports from the health centers. Maps of Imo State, Nigeria were converted into digital form using ARC/INFO GIS software, and the resulting coverages included geology, hydrology, towns and villages.
RESULTS: A total of 11,537 diarrheal cases were reported. Thirty-nine water sources were evaluated. A computer modeling approach called probabilistic layer analysis (PLA) spatially displayed the water source at layers of geology, hydrology, population, environmental pollution, and electricity according to color-coded five-point ranking. The water sources were categorized in into A, B, and C based on the cumulative scores <10 for A, 10-19 for B, and >19 for C. T-test showed significant differences in diarrheal disease incidence between categories A, B, and C with mean ± SEM values of I.6 ± 0.3, 6.3±0.4, and 15.6±2.2, and between B and C ($p<0.01$).
CONCLUSION**:** The PLA enabled estimation of the probability of the risk of diarrheal diseases occurring at each layer and solutions to eliminate these risks.

No. 017 Oral

THE APPLICATION OF REMOTE SENSING IN IDENTIFYING ENVIRONMENTAL FACTORS ASSOCIATED WITH MALARIA RISK IN NIGERIA: A POTENTIAL USE AND NEED OF THE NIGERIASAT 1 AND 2.

CHUKWUOCHA U.M.[1], DOZIE I.N.S.[2], NWOKE B.E.B.[3], ONWULIRI C.O.E.[4],

1. .Department of public Health Technology, Federal University of Technology, Owerri, Nigeria.
2. Department of Microbiology, Imo State University, Owerri, Nigeria.
3. Department of Animal and Environmental Biology, Imo State University, Owerri,Nigeria.
4. Department of Biotechnology, Federal University of Technology, Owerri, Nigeria.

Malaria remains one of the most serious health problems in Nigeria with 97% of the population are at endemic risk, especially in children below the age of 5 and pregnant women. The transmission of malaria occurs in the entire country. The transmission is year round in a small part of the south of the country with peaks in the month of September. In the remaining parts of the country, transmission is 3-10 months, from February to December. The female anopheline mosquito transmits malaria and breeds in area of shallow surface water that are suitable for mosquito and parasite development.
These environmental factors can be detected with satellite imagery which provide high spatial and temporal coverage of most of the earth's surface. The combined use of remote sensing and geographical information system (GIS) provides a strong tool for monitoring environmental conditions that are conducive to malaria and mapping the disease risk to human population. The NigeriaSAT1 and NigeriaSAT2 satellites, having 32meters and 5 meters resolutions respectively would provide better methods for vector-borne disease surveillance. The potential application of remote sensing in identifying environmental factors associated with malaria risk in Nigeria using the Nigeriasat 1 and 2 is summarized and the steps involved in applying the method are elucidated.

No. 020 Oral

Myelo-meningocele: a multi-disciplinary problem.

Ibe, M.O.N.MD
Consultant Neurosurgeon, SnowWhyte Hospital Owerri.

Background: Myelo-meningocele is part of congenital afflictions of humans in the spinal column. They arise from failure of the neural tube to fuse properly during early embryonal growth. This failure has been attributed to various factors like drugs, environment, and genetics etc. The sequalae are multiple and therefore require multiple disciplines.
Materials: From 1975 to date, the author repaired 20 midline lumbar/lumbo-sacral myelo-meningoceles in Jamaica and Nigeria. There were 9 female and 11 males. Ages at operation ranged from 1 day to 8 months. The operations were carried out under routine general anesthesia. All had urine and feacal incontinence, severe para-paresis to paraplegia. Skeletal deformities were present followed up for between 3 months to 4 years. Eleven cases never returned after first visit in the out-patients department.
Result: There were no deaths within the period of hospitalization, usually about 14 days. Those followed up so far have not made much improvement, though they were able to sit up without support. Three were able to move by sitting and shifting on their buttocks on the floor.
Conclusion: We must continue to help these patients, but under the umbrella of specialized rehabilitation centers with the different specialists working together to make these patients attend a meaningful life and be useful to themselves and the society at large.

No. 21 Oral

Possible Anxiolytic and Neuprotective Potentials of Aqueous Extract of Garcinia Kola (Heckel) on Methamphetamine-induced Neurotoxicity in Mice.

By

Gabriel Oze, Iheanyi Okoro, Austin Obi, and Polycarp Nwoha,
Institute of Neuroscience and Biomedical Research, College of Medicine and Health Sciences, Imo State University, Owerri, Nigeria.

Abstract

The possible anxiolytic and neuroprotective potentials of aqueous extract of garcinia Kola (Heckel) (Gultifereae) were studied in 30 mice of mixod sexes. The animals were randomly assigned to 3 experimental groups of 10 mice each. Group I received normal saline (NS) for 2, and then 6 weeks, and served as the negative control. Groups II and III received 100 and 200mgkg^{-1} aqueous extract of Garcinia Kola (AEGK) orally for the same period. Group I* received the NS plus 10mgkg^{-1} methamphetamine (MAM) (i.m.) to induce neurotoxicity on the 6th week. It served as the positive control. Groups II* and III* obtained 100 and 200mgkg^{-1} MAM in addition to the AEGK. Using elevated plus maze (EPM), behavioural parameters of the number of entries, duration, head-dips, stretching, grooming, rearing, freezing, and percentage open arm avoidance were determined for both the open and closed arms (OA and CA) of EPM. 80% of the mice in group I* died. 50% died in group II*, and non in the other groups. There were significant reduction ($p<0.05$) in the OA entries and head-dips at 100 & 200mgkg^{-1} by the 2nd and 6th weeks. The grooming and rearing increased in a similar pattern. There was a non-significant ($p.>0.05$) decreases in the freezing behaviour. The percentage OA avoidance increased non-significantly ($p>0.05$) in the MAM treated mice by the 6th week at 200mgkg^{-1}, but decreased by the 2nd week at 100mgkg^{-1}. The changes in the CA activities were non-significant, except for stretching behaviour which increased significantly ($p<0.05$) at both dose levels. However, the CA entries rose significantly ($p<0.05$) in the presence of MAM by the 6th week at 200mgkg^{-1} with transient alteration in CA duration. The outcome suggests possible neuroproective, anxiolytic and mood-stabilizing potentials in mice. The results also agreed with some of the reasons for the wide spread consumption of the nut, especially in local settings.

No. 22 Poster

GENDER DIFFERENCES IN CEREBRAL BLOOD FLOW VELOCITY RESPONSE TO FACIAL PROCESSING IN SIMULATED MICROGRAVITY

Constance Peters, Ekeoma Ekeocha, Praise Ijezie, Chinwe Ofoegbu, Mercy Onwunali, Patricia Alakwe, Philip C. Njemanze

Institute of Space Medicine & Terrestrial Science, Chidicon Medical Center, Owerri, Nigeria.

INTRODUCTION**:** Facial expression just like language is crucial for communication among individuals.
METHODS: Transcranial Doppler (TCD) ultrasonography was used to monitor mean blood flow velocity in both middle cerebral arteries during processing of facial images before (Pre-HDR), during (6H-HDR and 24H-HDR) and after (Post-HDR) at -6 degrees for 24 hours of head-down bed rest (HDR) in 16 (8 men and 8 women). Laterality index was assessed as side-to-side differences during each stimulus relative to baseline.
RESULTS**:** For men, in Pre-HDR, both object and faces were differentially right lateralized ($p<0.001$), but were left lateralized in women. In men, at 6H-HDR, both object and faces were left lateralized ($p<0.05$), but right lateralized in women ($p<0.001$). At 24H-HDR, both genders were left lateralized ($p<0.05$). In Post-HDR, both genders remained left lateralized for all tasks ($p<0.05$).
CONCLUSION
The present study demonstrated that HDR alters cerebral lateralization for object and facial stimuli, with men right lateralized and women left lateralized at Pre-HDR, but both left lateralized at 24H-HDR.

No. 23 Poster

Transcranial Doppler Spectroscopy: A Method for Functional Brain Imaging on Mars

Adanna Ako, Praise Ijezie, Chikodi Ihugba, Philip C. Njemanze.

Non-invasive Neurocybernetic Flow Laboratory, Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria

Objective**:** To introduce a portable non-invasive cost-effective instrumentation for evaluation of color processing on Mars.
Methods: Functional transcranial Doppler spectroscopy (*f*TCDS) is a non-invasive, ultrasound technique that measures cerebral mean flow velocity (MFV) in major intracranial vessels during cognitive processing. *f*TCDS was used to monitor mean blood flow velocity (MFV) in the right (RMCA) and left (LMCA) middle cerebral arteries (MCAs) and other cerebral arteries bilaterally in real or simulated microgravity. The derived MFV were analyzed using Fast Fourier transformation. The derived spectral density peaks were plotted and the regions with highest cluster of similar frequencies were designated as peaks. Three peaks were found at the first, second and third harmonics.
Results: The first peak was designated the fundamental peak (F-peak), and denoted summations of reflections and re-reflections coming from the peripheral arterial tree mainly from the finger tips, at about 125 cm from the measurement site in the main stem of the MCAs. The second was designated the cortical peak (C-peak), and emanated from the ends of the temporo-occipital junction, at about 28 cm. The third peak was designated the subcortical peak and emanated from the ends of lenticulo-striate arteries. The peaks accentuated with stimulation at C-peak, and was called cortical long-term potentiation (CLTP), but attenuated at the S-peak, and was called subcortical long-term depression (SLTD).
Conclusion: *f*TCDS may be useful for the study of brain neuroplasticity microgravity. It could be applied in the clinical setting for stroke patients.

No. 24 Poster

Plaque formation Dynamics in the Right and Left Internal Carotid Arteries Determined by levels of Low Density Lipoprotein Cholesterol and Age:
Criteria for Crew Selection on Mission to Mars

Chika Ugwo, Queen Onyeneke, Adaeze Chukwu, Constance Peters, Adanna Ako, *Uche A. Osunkwo, Philip C. Njemanze.

St. Andrew's Laboratory for Biochemistry and Microbiology, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria; * National Institute for Pharmaceutical Research & Development, Idu, Abuja, NIGERIA

Background: Stroke is the leading cause of death and disability. Carotid artery disease is a known determinant of stroke. Crew selection must take into account the predisposition to stroke.
Methods: The study population included 100 patients of age 52±13 years, 50 men and 50 women. All were examined using color flow Doppler and B-mode ultrasound of both carotid systems. The percent internal carotid stenosis of the right (%RICAST) and left (%LICAST) were measured. The low density lipoprotein (LDL) cholesterol was measured using the Friedewald method. A 3D-surface quadratic curve fit was used to examine the relationship between percent carotid stenosis, LDL level and age.
Results**:** For the %RICAST, there is a J-shaped relationship with LDL cholesterol levels. From about 200 mg/dL, the %RICAST rises dramatically with increasing levels of LDL cholesterol. On the other hand, %RICAST rose with age. For the %LICAST, there was an inverted U-shaped curve relationship between %LICAST and LDL cholesterol levels. In the younger patients, less than 50 years of age, %LICAST rose steadily with LDL cholesterol levels, and peaked between 250-350 mg/dL. Thereafter, there was a decline with higher levels of LDL cholesterol. However, in the older patients, greater than 50 years, %LICAST peaked at levels of 200-250 mg/dL. Thereafter, there was a precipitous drop with rising LDL cholesterol levels.
Discussion**:** The J-shaped relationship in the RICA, but an inverted U-shaped curve in the LICA, eludes to a role for anatomical asymmetry in plaque formation mechanisms in both carotid systems. The findings are relevant to crew selection criteria for Mission to Mars.

No. 25 Poster

Influence of Aging on Protective Effects of High Density Lipoprotein Cholesterol on Carotid Atherosclerosis: Towards a Martian Crew Protective Profile

Ugwo C, Ako A, Ijezie P, *Okere C, *Nwoha P, *Okoro I, Njemanze PC.

St. Andrew's Laboratory for Biochemistry and Microbiology, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria; *INBR Imo State University, Owerri.
philip.njemanze@chidicon.com

Background: The levels of serum lipids may affect the degree of carotid stenosis. We showed earlier that the rising levels high density lipoprotein cholesterol (HDL) reduced the percent carotid stenosis in the right but not left internal carotid artery. Age may influence the effects of cholesterol on carotid stenosis.
Methods: The study population included 100 patients of age 52±13 years, 50 men and 50 women. All were examined using Color Flow Doppler and B-mode ultrasound of both carotid systems. The percent internal carotid stenosis of the right (%RICAST) and left (%LICAST) were measured. The high density lipoprotein (HDL) cholesterol was measured by the Friedewald method.
Results**:** The %RICAST, in patients less than 50 years of age, rising HDL cholesterol levels was accompanied by decline in the %RICAST. However, in patients older than 50 years of age, rising HDL cholesterol levels was accompanied by increasing degree of %RICAST. The %LICAST, in patients less than 60 years of age, the rising HDL cholesterol level was accompanied by decrease in %LICAST. However, in patients older than 60 years of age, the rising levels of HDL cholesterol was accompanied by increase in %LICAST.
Discussion: The results may suggest that HDL was not protective against atherosclerotic carotid plaque in the elderly as was in younger patients. Aging has been known to have significant influence on arterial geometric nonuniformity. With aging, arterial stiffening and endothelial surface changes occur. In the young, smoothly tapering vessels provide a steady pressure-flow relationship.

No. 26 Poster

Artificial Intelligent Transcranial Doppler Probe Adapted for Cerebral Blood Flow Velocity Measurement on the Mission to Mars (United States Patent 6,547,737)

Adanna Ako, Praise Ijezie, Chinwe Ofoegbu, Philip C. Njemanze

Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria

Objective: The present invention relates to a means for mounting transcranial Doppler probe on the head of a patient and automatically insonating the major cerebral arteries using artificial intelligence (AI-TCD probe) fuzzy neural network software.
Methods**:** The system comprising: two 2 MHz probes placed in the bi-temporal probe hanger, a cylindrical probe housing having a coil, said probe cylindrical base placed within the cylindrical probe housing, a spring system affixed to provide perpendicular pressure on the probe cylindrical base, a system of roller balls to facilitate probe angulation, a locking system to affix the cylindrical probe housing to the frame of the bi-temporal probe hanger, a system software program and microprocessor for controlling the probe position, and a removable handle attached to the said probe cylindrical base. The system 'leans' probe angulation after initial manual manipulations and then performs cerebral vessel insonation using electromotive force independent of operator.
Results**:** The insonation with AI TCD probe is expected to cut down clinical examination time to a third, for most patients. It would eliminate at least 30% of technically inadequate studies. The use of fuzzy neural network applications makes for easy and economic use of computer memory and creation of large clinical study database that would be applicable in almost all instances.
Conclusion: The artificial intelligent transcranial Doppler probe may be used in the Mission to Mars.

No. 27 Poster

GENDER RELATED ASYMMETRY OF MIDDLE CEREBRAL ARTERY MEAN FLOW VELOCITY DURING TASKS OF GENERAL INTELLIGENCE

Nwachukwu N, Ofoegbu C, , Oluigbo F, Orjinta U, *Osim E, **Ekwerike A, **Nzeh DC, Njemanze PC.

Noninvasive Neurocybernetic Flow Lab, Chidicon Medical Center, Owerri, Nigeria; University of Calabar, Calabar, Nigeria; **INBR Imo State University, Owerri, Nigeria.

INTRODUCTION: The present study evaluated middle cerebral artery mean flow velocity (MFV) during processing of Raven Progressive Matricies (RPM).
METHODS**:** Transcranial Doppler (TCD) ultrasonography was used to monitor MFV in both middle cerebral arteries during processing of RPM task. Subjects included 15 women and 9 men); all were right handed. Laterality index (LI) was assessed as side-to-side differences (LI=(LIR–LIL)/(LIR+LIL)) during each stimulus relative to baseline (LI'=LIparadigm– LIbaseline).
RESULTS**:** MANOVA comprising 2 levels of ANSWER (Wrong, Correct) and two levels of GENDER (Male and Female) in 2X2 design was used. The LI value was the independent variable. There was a main effect of GENDER $F(1,1148)=26.4$, $p<0.0001$, MSe=88. There was no main effect of ANSWER ($p>0.05$). There was a GENDER x ANSWER interaction $F(1,1148) = 3.8$, $p<0.05$, MSe=12.6. For Correct answer men were right lateralized, while women were left lateralized.
CONCLUSION: For RPM tasks of general intelligence, women used a left hemisphere strategy, while men used a right hemisphere strategy.

No. 28 Poster

TRANSCRANIAL DOPPLER SPECTROSCOPY DEMONSTRATION OF GENDER DIFFERENCES DURING FACIAL PROCESSING: IMPLICATION FOR THE MISSION TO MARS

Ibechukwu G, Ikeh P, Ako A, Orjinta U, Ekeocha E, Njemanze PC.

Institute of Space Medicine and Terrestrial Sciences,
Chidicon Medical Center, Owerri, Nigeria. philip.njemanze@chidicon.com

INTRODUCTION: Transcranial Doppler spectroscopy could be used to demonstrate cortical and subcortical processing stages of facial processing in men and women.
METHODS**:** The study populations comprised 16 right-handed participants, 8 men age-matched to 8 women. TCD was performed to obtain right and left middle cerebral artery, mean flow velocity (MFV) during presentation of object and facial paradigms. Fast Fourier transform was applied to 48 data point for each stimulus. The spectral density estimates were plotted and the peaks: fundamental (F-peak), cortical (C-peak) and subcortical (S-peak) were identified.
RESULTS: An ANOVA showed a main effect of GENDER, $p< 0.0001$. There was a main effect of STIMULATION, $p<0.0001$. There was a main effect of ARTERY, $p<0.01$. There was a STIMULATION x ARTERY interaction, $p<0.01$. There was a GENDER x STIMULATION x ARTERY interaction, $p<0.00$. In men, in the RMCA at C-peaks, there was a category-specific face effect. However, at S-peak, there was only a marginal tendency for luminance effect. In men, in the LMCA at C-peaks, there was a facial processing strategy effect. However, at S-peaks, there was no main effect of STIMULATION. In women, in the RMCA at C-peaks, there was a luminance effect. Similarly, at the S-peaks, there was a marginal tendency for luminance effect. In women, in the LMCA at C-peaks, there was a category-specific face effect. However, at S-peaks there was no main effect of STIMULATION.
CONCLUSION**:** Men used a category-specific process-mapping system for right cognitive style, but women used same for the left. The left lateralization in microgravity may affect facial perception on Mission to Mars.

No. 29 Poster

ASYMMETRY OF CEREBRAL BLOOD FLOW VELOCITY RESPONSE TO COLOR PROCESSING AND HEMODYNAMIC CHANGES DURING -6 DEGREES 24-HOUR HEAD-DOWN BED REST IN MEN

Ukanacho PO, Ako A, Ijezie P, Orjinta U, Ugo S, Oluigbo F, Njemanze PC.

Institute of Space Medicine and Terrestrial Sciences,
Chidicon Medical Center, Owerri, Nigeria.

INTRODUCTION: Color is important for information processing in Space. Cerebral left lateralization in simulated microgravity may disrupt processing in the right hemisphere.
METHODS**:** The study population comprised 8 right-handed men. TCD was used to measure mean flow velocity (MFV) in the right (RMCA) and left (LMCA) middle cerebral arteries (MCAs) during dark, white and presentation of color STIMULATIONS (black white, blue, yellow, and red). Laterality index (LI) and pulsatility index (PI) were calculated. Heart rate (HR) was monitored. Data collection TIMES were at Pre-HDR, 6H-HDR, 24H-HDR, and Post-HDR respectively.
RESULTS**:** Subjects were right lateralized for colors at Pre-HDR, but left lateralized at 6H-, 24H- and Post-HDR. LI showed main effect of TIMES ($p < 0.0004$), but not STIMULATIONS ($p > 0.05$). MFV showed main effect of TIMES ($p < 0.0001$) and STIMULATIONS ($p < 0.0001$). There was a TIMES x STIMULATIONS x MCAs interaction ($p < 0.0001$). At Pre-HDR, MFV responses for blue vs yellow ($p = 0.05$), and white vs black ($p < 0.05$), were significant, but not during and after HDR. MFV, PI and HR decreased at 6H-HDR, 24H-HDR and Post-HDR ($p < 0.05$).
CONCLUSION**:** HDR altered color processing and opponent mechanisms for blue vs yellow, and white vs black axes of color space. HDR was associated with left lateralization, decreased pulsatility and heart rate.

No. 30 Poster

ASYMMETRIC NEUROPLASTICITY FOR MOTOR ACTIVITY IN SIMULATED MICROGRAVITY

Ngozi Nwachukwu, Praise Ijezie, Adanna Ako, Onyii Akagha, Ekeoma Ekeocha, Philip C. Njemanze

Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria
philip.njemanze@chidicon.com

Background**:** Dextricity and eye-hand coordination could be impaired during performance of crucial tasks in microgravity.
Objective**:** To study cerebral mean blood flow velocity response to finger movements in simulated microgravity using head-down tilt (HDT).
Methods: The study included right-handed 8 men and 6 women of same age 24±2 years. Motor tasks comprised movement of fingers in the right hand (RT), left hand (LT), both hands synchronously (BS), both hands asynchronously (BA), and no movement (NM). The fingers' movements involved repetitive opposing movement of the tip of the thumb to the tip of the other fingers sequentially, usually at a rate of 70-100 such movements per minute. The rate of movement of the motor task was monitored with a time metronome for 60 sec. Transcranial Doppler ultrasound technique was used to measure mean flow velocity (MFV) in the middle cerebral arteries during baseline and tasks, at TIMES (Pre-, 6H-, 24H-, and Post-HDT, respectively). The laterality index (LI) for each task was calculated as side-to-side difference in MFV, relative to baseline.
Results**:** At PRE-HDT, both genders, had contralateral or bilateral responses to right (RT) and left (LT) finger movements. At 24H-HDT, in both men and women, there was contralateral left hemisphere response to right finger movement. However, there was ipsilateral left hemisphere response to left finger movements in men.
Conclusions: Motor slowing in simulated microgravity was associated with asymmetric ipsilateral neuroplasticity involving the motor activity of the left fingers.

No. 31 Poster

INTESTINAL CYTOSKELETAL REARRANGEMENT IN GIARDIASIS AS A MODEL FOR NEUROGASTROINTESTINAL MOTILITY EFFECT OF SPACEFLIGHT

A HIGH FREQUENCY ULTRASOUND IMAGING STUDY

Oluigbo F, Njemanze J, Akagha O, Maduka O, Peters C, Chukwu A, **Dozie INS, *Onwuliri C, Njemanze PC.

Institute of Non-invasive Imaging for Parasitology, Chidicon Medical Center, Owerri, Nigeria; *Federal University of Technology, Owerri; **Imo State University, Owerri.

INTRODUCTION: Gastrointestinal motility may be decreased in early Space flight. The symptoms of space motion sickness - nausea and vomiting are similar to those seen in giardiasis. Exposure to G.lamblia trophozoites could induce localized condensation of F-actin and loss of peri-junctional alpha-actinin in human duodenal and colonic monolayers and could be visualized with B-mode ultrasound.
METHODS: B-mode ultrasound imaging using 7.5 MHz probe with water contrast of the abdomen was used to examine the duodenum and colon in 100 patients with giardiasis and 40 healthy subjects.
RESULTS: The walls of the duodenum and colon in giardiasis were thicker than in healthy subjects ($p<0.05$). Giardiasis was characterized by wall thickening and impaired colonic wall motion. In comparison, healthy subjects had normal intestinal wall thickness and colonic wall motion.
CONCLUSIONS: High frequency ultrasound imaging techniques called ultrasound duodenography and colonography, could be used to study cytoskeletal rearrangement of intestinal walls in giardiasis. The wall thickening and motion abnormality may provide clinical models for studies of the long-term effects of Space flight on gastrointestinal cytoskeleton.

No. 32 Poster

GENDER-RELATED ASYMMETRY OF CEREBRAL BLOOD FLOW VELOCITY IN THE RIGHT AND LEFT CAROTID SYSTEMS MAY BE ALTERED BY SPACE FLIGHT

Ekeoma Ekeocha, Stella Ugo, Adanna Ako, Praise Ijezie, Patience Ikeh,
Philip C. Njemanze

Non-invasive Neurocybernetic Flow Laboratory, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria
philip.njemanze@chidicon.com

Background: Gender-related asymmetry of cerebral blood flow velocity in the right and left carotid systems may be altered by blood flow lateralization during space flight. The latter may impair performance.
Objective: To study gender-related asymmetry of cerebral blood flow velocity by determining the supply-to-distribution index (SDI) or correlation coefficient between MFV in the internal carotid artery (ICA) and middle cerebral artery (MCA) territories, in the right (RICA/RMCA) and left (LICA/LMCA), respectively. The gender effect on SDI was compared to body mass index (BMI), waist-to-hip ratio (WHR), and age.
Methods: Transcranial Doppler ultrasound technique was used to measure cerebral mean flow velocity (MFV) in major intracranial vessels in 100 subjects (56 men age 49.6±12.3 and 44 women age 52.3±13.7). BMI and WHR were calculated. MFV was measured in the cerebral arteries including the right (RMCA) and left (LMCA) middle cerebral arteries, RICA and LICA. Multiple regression analysis was used to assess the relationship of the supply-to-distribution MFV in the RICA to RMCA, on one hand, and LICA to LMCA, on the other.
Results: Only gender showed a side bias, with men having a higher correlation on the right side between RICA/RMCA (beta = 0.83), but women on the left side between LICA/LMCA (beta = 0.80).
Conclusion: Men had a right bias for SDI, but women had a left bias. Space flight induced lateralization in cerebral blood flow velocity may alter gender-related asymmetry, and thus may affect functional performance in space.

No. 33 Poster

EFFECT OF CAROTID ARTERY DISEASE AND DIASTOLIC HYPERTENSION ON CEREBRAL PERFUSION: IMPLICATIONS FOR MARS MISSION

Patience Ikeh, Faith Oluigbo, Chika Ugwo, Praise Ijezie, Ngozi Nwachukwu, Philip C. Njemanze

Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria.
philip.njemanze@chidicon.com

Background: Maintaining cerebral perfusion is essential to human performance in Space. Blood pressure and carotid stenosis could predispose astronauts to stroke during the Mission to Mars.
Objective: To study the autoregulatory effects of carotid stenosis and blood pressure on middle cerebral artery mean flow velocity (MFV).
Methods**:** One hundred subjects including 56 men and 44 women of mean age 51±13 years were studied. Transcranial Doppler ultrasound was used to measure MFV in the right (RMCA) and left (LMCA) middle cerebral arteries. Carotid percent stenosis (%ICA) in the right (%RICA) and left (%LICA) were determined. Blood pressures including systolic (SBP) and diastolic (DBP) were monitored.
Result: Subjects had diastolic blood pressure of 91±15 mmHg; MFV in the RMCA was 51±16 cm/s, and in the LMCA was 54±19 cm/s; %RICA was 65±19% and %LICA 63±19%. For RMCA MFV, DBP between 60-80 mmHg, and %RICA between 40-60% showed a stable cerebral perfusion suggestive of intact autoregulation. Diminution of cerebral perfusion occurred at high percent stenosis greater than 60% and high diastolic blood pressure greater than 80 mmHg. For the LMCA MFV, at low %LICA, 0-40%, as well as at high levels of %LICA, 60-100%, MFV increased with rise in DBP suggestive of impaired autoregulation. However, there was stable autoregulation between %LICA 40-60% and DBP 60-80 mmHg.
Conclusions: The results suggest that diastolic blood pressure between 60-80 mmHg and carotid stenosis of 40-60% would maintain stable cerebral autoregulation. This must be taken into consideration during crew selection for the Mission to Mars.

No. 34 Poster

NEURAL NETWORK FOR MODELING ECOLOGICAL AND BIOLOGICAL SYSTEMS

Njemanze PC, Peters C, Ekeocha E, Akagha O, Ukanacho O, Nwachukwu N, Chukwuocha* UM, **Dozie INS, **Nwoke BEB; *Akujor C, *Onwuliri C.

Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training, Chidicon Medical Center, Owerri, Nigeria; **Imo State University, Owerri, *Federal University of Technology, Owerri.

Background: Simulation of ecological and biological systems using stochastic or deterministic model based on neural network architecture could be useful for disease
Methods: A neuron is the fundamental building block of an artificial neural network. The computer model represents these neurons as well as the whole network in structured data layers. Each layer or data set represents one or more neurons. The neurons are connected to each other and with the surroundings. The neuron has multiple inputs and a single output. The present invention comprises input neurons and three layers of neurons. Input neurons serves as interconnect function, relating external inputs to the network. A first layer of hidden neurons comprising neurons not connected to the surroundings. The second layer of hidden neurons receives inputs from the first. A third layer of neurons transfer their output to the output set. They are called output neurons. Each neuron applies a user-specified regression model to define what types of relationship "makes sense," that is, are interpretable in a meaningful manner. The hidden neurons apply a Simplex, quasi-Newton, Hook-Jeeves pattern moves procedures to reduce the likelihood of local minima.
Results**:** Ecological system modeling of a vector-borne disease – Onchocerciasis was possible using the present approach. Physical factors such as temperature, humidity, light, gaseous content that are altered by climate changes was shown to affect the black fly population.
Conclusion: The system could be applied to assess the impact of climate change on vector-borne diseases including Onchocerciasis, Filariasis and Malaria.

No. 35 Poster

PHYSIOLOGIC G-SUIT MODULATOR FOR MONITORING CEREBRAL BLOOD FLOW VELOCITY IN HIGH PERFORMANCE AVIONICS AND SPACECRAFTS

Njemanze PC, Nwachukwu N, Ekeocha E, Orjinta U.

Institute of Space Medicine and Terrestrial Sciences, International Institutes of Advanced Research & Training,
Chidicon Medical Center, Owerri, philip.njemanze@chidicon.com

Background: Hypergravity conditions would arise in modern high performance avionics and spacecrafts. The physiologic consequences could impair immediate performance in Space.
Objective: It is desirable to develop a physiologic G-suit device that would monitor cerebral blood flow velocity changes, and would adjust G-suit pressurization to avoid drop in cerebral perfusion.
Methods**:** The suit incorporates a pressurization source for use with the G-suit for varying the degree of pressure generated within it during application. A controller microprocessor regulates the varying of the pressurization source during flight, based on the monitored changes in cerebral blood flow velocity in the middle cerebral arteries on both sides of the brain. The microprocessor integrates information received from force detectors responsive to the G-forces and operatively associated with the microcomputer of the avionic system, and generates a feedback signal that may adjust the pressurization source. The device also monitors of the 'state-of-being' of each astronaut and uses the information to determine the level of autonomy decision-making that could be assigned, given the physiologic state. The information is communicated to the Mission Control Manager to make decisions in real-time.
Results: The physiologic G-suit monitor would eliminate incidence of gravitational loss of consciousness (GLOC) and regulate the level of autonomy decision-making that could be assigned at every given point early in the Mission.
Conclusion: There is need to implement physiologic monitoring for astronauts on the Mission to Mars. This would forestall cognitive and physiologic impairments early in the mission.

No. 36 Poster

Gender-related Asymmetry of Cerebrovascular Hemodynamics in Depression: Implications for the Mission to Mars

Akagha O, Ijezie P, Ekeocha E, Orjinta U, Nwachukwu N, Peters C, Oluigbo F, Njemanze PC.

Institute of Space Medicine and Terrestrial Sciences,
Chidicon Medical Center, Owerri, Nigeria.

INTRODUCTION: The present study evaluates gender-related differences in cerebral hemodynamics in depression.
METHODS: Sixty patients with depression and cerebrovascular risk factors and 40 controls without depression were studied. Cerebral mean flow velocity (MFV) in the internal carotid arteries (RICA, LICA), anterior cerebral artery (RACA, LACA), middle cerebral arteries (RMCA, LMCA), posterior cerebral arteries (RPCA, LPCA) and basilar artery (BA) were measured using transcranial Doppler (TCD) ultrasonography. Carotid percent stenosis of the right (%RICA) and left (%LICA) extracranial internal carotid arteries were measured using color duplex ultrasound.
RESULTS: In men, depression was associated with greater %RICA (70.1%) and %LICA (68.3%) than in controls %RICA (55.3%) and %LICA (54.5%), respectively, $p < 0.01$, but not in women. In men, DSM-IV score correlated negatively with %LICA (*beta* = -0.353, $p < 0.05$), and RACA MFV (beta = -0.45, $p < 0.05$); but marginally negatively with LPCA MFV (beta = -0.357, $p = 0.06$). Also, DSM-IV correlated positively with RMCA MFV and LACA MFV, $p < 0.05$, but negatively with BA MFV (Fig. 1A). In women, DSM-IV score correlated negatively with %RICA (*beta* = -0.464, $p < 0.05$); but marginally positively with RACA MFV (*beta* = 0.87, $p = 0.06$). RPCA MFV (29 cm/s) was lower that in controls (37 cm/s), $p < 0.05$.
CONCLUSION: There was a gender-related inverse correlation of DSM-IV severity score with contralateral carotid intima media thickness. Depression in men was associated with RACA hypoperfusion and LACA hyperperfusion, but the converse in women. Blood flow lateralization in microgravity may increase the severity of depression.

No. 36 Poster

Detrimental effects of exposure to telephone masts on Wistar rats

Alatise Segun I and Nwoha Polycarp U

Department of Anatomy and Cell biology, Obafemi Awolowo University, Ile-Ife, Nigeria. Email: polycarpu@yahoo.com

Abstract
This study was carried out to assess the effects of long term exposure of animals to telephone masts. Thirteen Wistar rats, aged 25 days, and average weight 45gm obtained from the Animal Colony of the Obafemi Awolowo University Ile-Ife, Nigeria were used for the work. Seven (4 males and 3 females) were the experimental group, and six (4 males and 2 females) were the control. The experimental and control groups were housed separately in clean plastic cages and fed laboratory mouse chow. Water was provided freely. The experimental animals were kept in a house located midway between two telephone mast stations. Each mast base station is 29.6m from the house. The control animals were kept in a house in the University Research Farm and the nearest telephone mast to the farm is 5 kilometres away. The experimental and control animals remained in their respective houses until 70 days of age. Thereafter the colour of skin, behaviour, and fertility potential were studied. Four males from each group were allowed to mate eight newly obtained fertile females for three days (one male to two females). The results showed heavy pigmentation of the skin of the experimental rats. The white skin of the control rats remained unchanged. The eight females mated by the experimental animals did not get pregnant, while the eight females mated by the control rats were all pregnant and delivered life litters. Behaviour changes on the plus maze, open box, and light/dark box were noted. The conclusion from this preliminary work is that exposure to telephone masts is detrimental to life. The findings are alarming and need to be given urgent attention.

No. 38 Oral

Adult Malnutrition Affects Behaviour Of Mice

Nwoha Polycarp Umunna [1,4], Ayoka Abiodun [2], Ibeh Joseph [1], and Okoro Iheanyi [3,4]
[1]Department of Anatomy and Cell, Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Department of Physiological Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria
[3]Department of Anatomy and Neurobiology, Imo State University, Owerri, Nigeria
[4]Institute of Neuroscience and Biomedical Research, Owerri, Nigeria

Address Correspondence:
Dr. Polycarp Nwoha
Email: polycarpu@yahoo.com

The present work investigated the effects of varied levels of malnutrition on adult mice behaviour. Twenty adult male mice were divided into four groups: control mice were fed mouse chow ad libitum; protein-malnourished (PM) were fed diet containing 3% casein at libitum; severely undernourished (SU) were fed 25% of diet consumed by control; and mildly undernourished (MU) group fed 50% of diet consumed by the control. The mice were fed for 30 days following which they underwent behavioural assessment using the elevated plus-maze, open field, and light-dark box paradigms. Incidences of arm entries, head-dipping, line-crossing, transitions, rearing, and grooming by the mice were measured for 5 minutes. Data obtained were analyzed with one-way ANOVA and Student-Newman-Keuls post-hoc test. The significance level was kept at $P< 0.05$. Results showed a decrease in body weight in all groups by 2 weeks and increase in week 4. At the end of 30 days, the protein malnourished group had higher body weight followed by the slightly undernourished and then the severely undernourished groups. Among the groups, the protein-malnourished mice significantly had the lowest percent open arm entries, total entries and spent least time on open arms in the elevated plus-maze ($P < 0.05$). The severely undernourished group significantly made the highest head-dipping and spent the greatest time in open arms as well as recorded the highest percent open arm entries. Also, transition in the light/dark box was least in the protein malnourished mice compared to the control and the undernourished groups ($P < 0.05$). There was no significant variation in open-box activity amongst the groups. However, the slightly undernourished group significantly crossed more lines than the control and the protein malnourished groups in the line crossing index.
These findings suggest reduced activity of the protein malnourished group which may be due to inherent fear and anxiety. The high activity of the severely undernourished group could be hunger-related.