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Role of Veterinarians in Space Research & Exploration

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Abstract
Veterinarians are the best doctor in the world who can understand the sufferings and pains of animals. Besides, his basic duties, he is involved in the implementation of many plans, programmes and policies of Government. It might be very interesting and strange to hear that Vets are also involved in the Space Research and Exploration. It's true, Vets are involved in this field from the dawn of space Exploration. Vets can play a crucial role in the space studies. Vets will be the first person to be called to identify alien species, if so discovered in outer space. Veterinarians have been pioneers throughout their history, and one of the exciting frontiers where they are currently centre stage is space exploration. Veterinarians have played a key role in the NASA programme from the Mercury missions to the collaboration with Russia on Kosmos to Spacelab. Indeed, it is an interesting and appealing untraditional field of study for the Vets, who can solve many challenges that to come in the future Space Research and Exploration.

Keywords: Veterinarian, space, research, exploration, NASA

Introduction
Veterinarians are mainly involved with society, animal welfare, animal and public health. They bring relief to animal's suffering through proper diagnosis and treatment of diseases. They are also involved in disaster management like flood, earthquake, etc. through rescue and rehabilitation. With the passage of time and advancement in space exploration the importance of Veterinarians are being felt. Veterinarians are playing a significant role in the space expedition since the dawn of space programme. Dealing with lab animals for scientific experiments, is being handled by the vets. First animal to be sent into space was none other than the dog named Laika.

Importance of Space Research and exploration
It has tremendous impact on mankind. It promotes Science Education, Environmental Research**,** Eliminate Earth Over Population (Colonisation of heavenaly bodies)**,** exploitation of Natural Resources**,** to put ourselves into Perspective (Daniel Hohler, 2009) [2], univeral co-operation and lots and lots of importance lies with space research and exploration, countering the criticism of the few.

Research conducted by Vets and use of animal in space studies
NASA animal research practices have started since the days of Able and Baker (Mark Betancourt, 2011) [3]. An experiment to study the effect of microgravity on amphibian development was conducted aboard Spacelab in 1992, by using a frog (Mark Betancourt, 2011) [3]. Besides, mice, many animals are used like dog, monkey, lizards, etc.

Requirement of Vets in space exploration or space Research
It is not composulary that vets will only take part in space expedition but can perform many ground duty experiments and managemental tasks that are required for the scientific research in space explorations for the well-being of mandkind.
Veterinarians as astronauts can work with other researchers to study what happens to human beings and animals in space where there is no gravity (Zero-G). Vets can perform experiments on Earth as well as on space shuttle missions in order to observe the long term health effects of space travel and a zero-gravity environment on human beings by experimenting first with

animals. This kind of research will improve lifestyles of astronauts during subsequent space Animals. This kind of research will improve lifestyles of astronauts during subsequent space missions and will continue to provide new information for future human life in space. Vets can build different laboratory animal's houses that is suited to a space shuttle aboard. They are also involved in behavioural studies of this space laboratory animals.

In the dawn of space exploration, animals were sent into space prior to human beings because scientists did not know if humans would survive a trip beyond the Earth's atmosphere. First, they decided to learn if animals could survive a space mission. In 1948, a monkey named Albert flew inside a V2 rocket. In 1957, Russian scientists sent a dog named Laika into orbit. Both of these flights proved that humans could survive weightlessness and the effects of high gravitational forces experienced during their takeoff and landing.

Veterinarians are responsible for the health of all the animals whether on the ground or in space. Veterinarians are consulted to ensure that the animals selected are appropriate for the commited space experiments. They also provide guidelines and instructions for the proper care of the animals during the space voyages. They are also involved in monitoring the nutritional nequirements of research animals, planning and conducting experiments, collecting data, interpreting results of their research, and reporting their findings to the space organisations. Veterinarians in space shuttle missions can assist their fellow crew members to keep the space mission going smoothly.

So, activities that a Vet can do

In defending a nation, vets indirectly contributes a lot by providing dog squad who can detect and defuse bombs, mines and also narcotics. Likewise, Vets can also contribute a lot in space exploration directly and indirectly by involving himself or herself in the great expeditions to come as also had played in the past. In brief, Vets do activities like

i. Care and management of Lab animals (mostly mice)
ii. To conduct Scientific experiment
iii. To prepare animal modules
iv. drug testing, effect of gravity, sending of animals to unknown planets prior to human beings, etc.
v. As an astronaut
vi. As a space explorer
vii. As a microbioligst
viii. As a bio-medical engineer
ix. As an Animal Scientist
x. Characterisation and documentation of extra-territorial life
xi. In search of extra-territorial life and to study and communicate with them.

Veterinarian in space Research & expolaration

We are much well acquinted with late Kalpana Chawla, Sunita William, Rakesh Sharma, Neil Armstrong who had immensely contributed to mankind by their involvement in Space research and exploration. They are the few and many more are also involved in the Space Research. Besides, these great personalities, i would like to speak a little about those vets who are working in this space research and explorations, in particular.

Very few Vets are involved in space Research and Exploration. Some are working in famous space research stations like NASA. Some Indian vets are also working in space research & exploration with ISRO. To mention a few, renowned Vets involved with this profession being Dr. Alex Dunlap and Richard M. Linnehan.

Dr. Alex Dunlap, D.V.M., M.D. (NASA website, Division of Space Life Sciences, 2012)

Alex Dunlap is the chief veterinarian for the National Aeronautics and Space Administration (NASA). In addition, Dr. Alex Dunlap is an MD, awarded from the University of Tennessee in 1996. He is also a Diplomat of the American College of Family Physicians. He worked in a mixed animal practice in Collierville, Tenn., for three years. After that he joined medical school and was selected to go into astronaut training during his senior year. He was a payload specialist in the astronaut corps from 19961998. In 2001, he became chief veterinarian for NASA. As chief veterinarian, Dr. Dunlap is responsible for all NASA policies related to animal health and welfare.

Dr. Richard M. Linnehan (Bs, Dvm. Mpa) (Biographical Data, 2016, NASA, Lyndon B. Johnson Space Center)

He was born on September 19, 1957, in Lowell, Massachusetts. He graduated from the University of New Hampshire in Durham, New Hampshire in 1980 with a Bachelor of Science degree in Animal Sciences with a minor in Microbiology. He received the degree of Doctor of Veterinary Medicine (DVM) from the Ohio State University College of Veterinary Medicine in 1985. He is a member of the International Association of Aquatic Animal Medicine; the Association of Space Explorers and the Explorers Club. In addition he is doing Professorships at the North Carolina State University College of Veterinary Medicine, National

Space and Biomedical Research Institute (NSBRI), User Panel member. Besides, Board Member of NASA Institutional Animal Care and Use Committee (IACUC).

Dr. Linnehan was selected by NASA in March 1992 and he joined the Johnson Space Center (JSC) in August 1992. There, he completed one year of Astronaut Candidate training, qualifying him for Space Shuttle flight assignments as a Mission Specialist. He was initially assigned to flight software verification in the Shuttle Avionics Integration Laboratory (SAIL) and he was subsequently assigned to the Astronaut Office Mission Development Branch, working on payload development and mission development flight support for future Space Shuttle missions. He first flew as a mission specialist in 1996 on STS-78, the Life Sciences and

Microgravity Spacelab (LMS) mission, fourth servicing mission to the Hubble Space Telescope. In 2008, he lead EVA crewmember on the STS-123/1JA mission to the International Space Station. He is engaged with collaborative, advanced biomedical research projects as well as K-12 Science, Technology, Engineering and Mathematics (STEM) educational initiatives in direct support of NASA/JSC and the Texas a&M University System. Presently, he is assigned to both the JSC Astronaut Office Exploration and Integration branches as well as The NASA Human Research Program (HRP). He continues to work on advanced initiatives in space suit design, physiological modelling and research. He is also directly supporting development of next generation space flight resistive exercise hardware and on orbit exercise methodologies, as well as radiation and nutritional countermeasures protocols, in preparation for future long duration manned exploration Orion Class space missions.

The Life Sciences and Microgravity Spacelab mission was flown aboard Space Shuttle Columbia. This mission was the first to combine both a full microgravity studies agenda and a comprehensive life sciences payload. It focused on the effects of microgravity on the central and peripheral nervous systems. Both the LMS and Neurolab missions served as models for future life sciences studies to be conducted on board the International Space Station (ISS).

Besides, the above mentioned Vets, there are many Vets or animal specialists that have been involved in the space programme, namely Rick Linnehan, Dr. Goodly, Dr. David Schabdach, John Fanton (worked with the US-Russian Kosmos programme), Joe Bielitzki (laboratory animal medicine), William Britz (inventor of a laboratory animal cages which is an instrumentation for the space programme) and Richard Simmonds who made early attempts to care for animals in space.

Conclusion

Veterinarians can enhance animal and public health and this knowledge of Vets and as astronauts can extend their mission durations, go to near Earth Asteroids, Mars and other heavenly bodies to study their living and non-living characteristics. There is a strong relationship between the fields of space biomedicine and veterinary medicine which can improve the techniques in the laboratory for space research. Veterinarians have a real potential for improving the quality of life for those who are involved in Space exploration. A veterinary research perspective can contribute to the space biomedicine and thereby can conduct a meanginful space research and exploration for the sustainable, growth and development of mankind and other living species to live in peace and harmony in this beautiful and wonderful Universe.

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