



BULLETIN OF THE PET PRACTITIONERS ASSOCIATION OF MUMBAI.

(For Circulation amongst PPAM Members)

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IF NOT DELIVERED,
PLEASE RETURN TO

The Secretary, PPAM.
Shop No. 1, Bramhandev CHS,
Padmabai Thakkar Road,
Shivaji Park, Mahim,
Mumbai 400 016.

The World Veterinary Day is celebrated on the last Saturday of April every year. This day is celebrated to promote animal health and welfare. This day focused on the realisation that animals and human live interconnected lives, so their existence depends on each other. World Veterinary Day is observed globally to recognise the contributions of veterinarians in the field of healthcare and medical science. The welfare of animals is intrinsically related to the well-being of humans and the ecosystem.

Based on the Covid-19 situation and regulations in April 2021, PPAM has a plan for a two day event on 24th and 25th April 2021. World Veterinary Day field event on Saturday 24th April and One health Concept Seminar on Sunday 25th April 2021 in Mumbai (One Health Concept is Improving the health of people, animal, plants and Environment). If regulations and conditions permit then this programme will be conducted following all Covid-19 protocol.

Covid-19 has brought in forefront an unprecedented situation. This situation has convinced the world

Editorial

On One health Concept and World Veterinary Day PPAM members your suggestions welcome

that the world is interconnected and be it medical, veterinary, environmental or plant science we are all dependent on each other. We need to learn from each other and work in coordination.

We at PPAM need inputs from our PPAM members as to your ideas of celebrating the world veterinary day so that our society at large knows the importance and role of veterinarians. We at PPAM would also appreciate the members coming forward with suggestions or recommending speakers both human medical doctors and veterinarians who can enlighten the audience on the topic of one health concept and zoonotic diseases. You just have to email your suggestions/ideas to the editor



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PPAM bulletin vishwasraodr@hotmail.com. I am confident our PPAM will have scores of ideas regarding celebrating world veterinary day and one health concept. Over the years our best ideas have come from our PPAM members.

We invite PPAM members that are open and willing to contribute ideas and time for such PPAM activities. When we come together in this way, we have all the information and ideas necessary to make our best decisions. When we invite your ideas or feedback, we hear the ideas that can unlock new frontiers. Our goal is to generate as many different ideas as possible. There will be plenty of PPAM members participating in the ideation process. This will help us achieve the goal of

having lots of different ideas, and it helps all of us to stretch our thinking. The basic idea is we've got to get our thinking aligned somewhat and to feel that we are all working together even if our ideas may be different. This will also help to get our minds in a state of opening up, out of the general day-to-day reactive mode. On this day we would also appreciate veterinarians working in diverse fields.

"Coming together is a beginning, staying together is progress, and working together is success." – Henry Ford.

PPAM members your ideas and suggestions are eagerly awaited.

Feline viral diseases of importance in today's clinical setting

Dr. Ramani Jairam, M.V.Sc

Pluto Pet Clinic, Mumbai, India

(Lecture delivered at International E conference on An Integrated approach to Eliminate Canine and Feline Viral Disease in India organized by Madras Veterinary College, Chennai)

Infectious viral diseases are a major cause of morbidity and mortality in domestic cats. There are a plethora of viruses which can affect the feline population. Feline Rhinotracheitis, Feline calicivirus, Feline herpes viruses etc. are important viruses. With the advent of COVID 19 the focus has shifted firmly back onto zoonosis and viral infections. Exposure to viruses may occur through direct contact with an infected animal or through contact with the virus deposited into the environment by an infected animal. The routes of transmission include ingestion of contaminated food or water, inhalation or mucosal exposure to infectious aerosol droplets or fluids, in utero exposure and infection of virus by biting, puncture wounds or insects.

Three possible outcomes may develop once a cat has been exposed to a virus by an appropriate route:

- The cat does not become infected
- The cat becomes infected but no disease results
- The cat becomes infected and disease results

Feline infectious peritonitis (FIP):

FIP is associated with feline corona virus and was first described in 1963. Even now no proven drug regimen is available. The feline coronaviruses (FCoV) are only 2 members of an extensive family of single stranded, positive sense RNA viruses called Coronaviridae. Cats can be infected with FIPV and FECV viruses (both are closely related antigenically). The incidence of FIP peaks in young cats (6-24 months of age) and then to a lesser extent (degree) in elderly cats. Stress induced leaving a cattery and

entering a new home or undergoing general anaesthesia, neutering surgery and hospitalization probably explain the development of clinical signs of FIP several weeks after each of these events. Breeds like Siamese, Burmese and Persian seem to be over-represented.

The two major forms of FIP are the effusive or wet form and the non-effusive, granulomatous or dry form. In effusive FIP increased vascular permeability secondary to peri-vasculitis leads to the accumulation of protein rich fluid in peritoneal and pleural spaces. Extension of inflammatory process to other organs in the abdomen can produce signs of hepatic disease and less commonly exocrine or endocrine pancreatic insufficiency.

Clinical signs exhibited include anorexia, weight loss, listlessness and dehydration. The clinical signs in case of non-effusive FIP are often vague because of the discrete nature of the pyogranulomatous lesions. Undulating fever is the hallmark clinical sign of non-effusive FIP. With effusive FIP the level of fever fluctuates dramatically.

Treatment of FIP is palliative. Immunosuppressive doses of corticosteroids along with anti-biotics can be tried. Cyclosporine and Melphalan are other immunosuppressive drugs which can be tried.



Dr. Ramani Jairam

Vaccination programs can significantly decrease illness and death due to feline respiratory and enteric viruses. Proper management remains an important element of control for most of the feline viral diseases.

Feline immunodeficiency virus (FIV):

FIV is a lentivirus which can cause an acquired immune deficiency syndrome in cats (Feline AIDS)

FIV infections in kittens is uncommon. The clinical signs are diverse due to the immunosuppressive nature of the disease. Persistent generalised lymphadenopathy can occur briefly in cats. The acute phase begins 4 weeks after infection and lasts for up to 4 months. Lymphadenopathy, neutropenia, fever and diarrhoea are common clinical signs. The asymptomatic carrier stage during which clinical evidence of disease is absent, may last several months to years. The cats in the fourth stage of disease (ARC stage) usually exhibit signs of chronic respiratory, gastro-intestinal and skin disorders in addition to persistent lymphadenopathy. Another common finding in FIV infected cats are gingivitis, stomatitis and periodontitis. FIV infected cats may also be detected with *Otodectes cyanotis* and *Demodex cati* infections. Dermatophytosis is also noted sometimes in these cats.

Hematologic abnormalities exhibited include anaemic, neutropenia, myelosuppression and thrombocytopenia. Toxic neutrophils are noted. In infected cats the bone marrow may appear normal, hypoplastic or hyperplastic.

Diagnosis : Screening for FIV anti-bodies using an enzyme linked immunosorbent assay side kits can be performed. Most cats will produce antibodies to FIV within 60 days of

exposure. The sensitivities are similar between ELISA, IFA and Immunoblot. False positive cases can occur with ELISA. ELISA may give false positives (decreased specificity) due to operator error. This may specially occur on account of inadequate washing. False positive results increase when the tested cats are at a low risk for FIV. Presence of maternal derived antibodies in kittens upto 5 months of age can also result in false positive cases. Therefore the western blot can be used for confirmation

Cats can test FIV negative on account of any number of reasons. The main reasons being insufficient levels of antibodies (early in course of infection or a poor immune response) inadequate sensitivity of the assay and operator error.

Retesting must be undertaken after a period of 6-8 weeks when the results of the tests are Indeterminate. Virus isolation and detection of FIV DNA or RNA by PCR maybe useful in diagnosis. This will require good research facilities which are currently unavailable to the field veterinarians.

Prevention and control : Prevention of exposure to FIV infected cats is the only available method of control

References :

Stephen J Ettinger & Edward C. Feldman, Textbook of veterinary internal medicine Vol 1 Feline viral diseases Chapter 70 (Page 409-438)

Katrin Hartmann Clinic, Viruses 2012 / Volume 4 (11)/ Clinical aspects of Feline Retroviruses: A review

Susan Little , dvm360 , 2008 ,Testing kittens for FeLV and FIV (Proceedings)

Impact of Covid'19 on Animal, Agriculture and Veterinary Services

Tanvi. G. Shendye

*“As I walk, as I walk,
The universe is walking with me,
In beauty it walks before me,
In beauty it walks behind me,
In beauty it walks below me,
In beauty it walks above me,
Beauty is on every side.”*

-Traditional Navajo Prayer.

Nature, a complex interwork of the universe which binds all creatures great and small on this endless ground. With its root deep within the soil to its wings reaching high up the

endless universe. When we look at our lives outside our 4x4 concrete jungle will we realise that the differences between us are in fact so baseless and worth less and that we are not different yet one, bound by this complex interwork of universe- our nature!

Thanks to COVID'19 we realised this fact. A virus so tiny, invisible has brought the smartest creature on earth to its knees. Crippling economy, halting our day-to-day activities,



Tanvi. G. Shendye

closing schools, universities, forcing people to stay indoors. Who knew something so tiny, invisible would have such a great power, almost as great as GOD that would make mankind so helpless. Or maybe, it's the nature's way to make man understand that

"The nature doesn't need us, we need nature"

Every story has two sides, yes COVID19 has many cons one could notice but, like the saying goes, "grass is greener on the other side" There's a side to this tiny, powerful creature which has impacted us in a positive way. As this virus, whose origin is yet unknown, some theories suggest it was the bat (which is again controversial) forced human beings indoors, it has been fabulously soft on the nature. Pollution levels have been so low, the nature could finally breathe oxygen and not the toxins man has been releasing out. 40 to 50% drop in N₂ gas levels, Monkeys/Elephants and dogs reclaiming the streets of India, to deer being spotted on the subway in London, to cute peacocks walking in pride on the streets of South Mumbai, to penguins taking a stroll in Chicago zoo to nature reclaiming its lost pride and power by healing its ozone layer, animals have come home! With global pressure and schemes underway calling for ban on wildlife trades, with Wildlife poaching dipped, the nature is regenerating itself. COVID 19 is doing more good than harm.

With around majority of the economy dependent upon agriculture, India ranking 8th in the world, contributing \$1500 Billion to the economy this sector has been inevitable being impacted by covid. The farm economy has seen some bumps following the nationwide lockdown. Unavailability of migrant labourers, to wrong interpretations and misguidance. Yet the economy and the world is relying on the basic foundation of our society- The Agro sector and The Medical sector. Where everything, all businesses closed down except the ration shops, hospitals, milk shops are we really prepared to face the covid pandemic in efficient way?

With India lacking sufficient cold storages, this provides a bigger challenge in front of the agro sector and the government. Agro products are perishable and so there's a need to overcome this hurdle by providing some means and ways to ensure the production doesn't halt back. There has been relaxations provided to the farmers/agro industries to make sure that the lockdown doesn't affect them. With markets in Maharashtra working for certain days of the week, the flow of agriculture has stayed flowing!

Dairy sector has however seen a 30% dip in demand following the covid scare. 15% of the revenue comes from home sales, with "No human-human contact" interaction, the sales have come to a halt. The 100,000 Crores INR industry has suffered ever since the lockdown. With consumers hoarding milk, with hotels/restaurants coming to a total shut, there has been some falls in the sector. However, like I said earlier, there is always a greener grass on the other

side. The small farmers are selling their milk to federations like AMUL [GCMMF], Mahanand [Maharashtra], Karnataka Milk federation which has been buying 7 to 8 Lakhs Litres of additional milk per day. The co-operatives are using the surplus milk to make milk powder, butter and skimmed milk powder. Milk products like paneer, cheese, ghee are still in demand in metropolitan cities with people tending to home experiments like 'cooking' 'baking' etc. amidst lockdown.

Similar story applies to the meat industry, initially it showed a dip due to coronavirus scare but it's not all gloom and doom for the poultry-meat sector. Many consumers are buying packaged meat as a source for their daily protein home, with eggs still in high demands.

"For humans there are medical doctors and for the rest of the world, there are veterinarians"

This covid19 pandemic has shown a clear cut demarcation where we, as human society stand. And Veterinarians are the connecting bridge between nature and man. With epidemiologists working on the global trends to ensuring the food products of animal origin reaching you is completely safe to consume by conducting quality tests, to wildlife vets ensuring that our natural balance is maintained. With veterinarians in the public-health sector to vet pharmacologists, covid has brought us closer to nature. As if nature is trying to call us to co-exist with its other beings. Vets are working closely with other scientists to crack the genome of Indian Covid strain. Hospitals and clinics being opened to ensure that animals are not affected adversely amidst lockdown.

Veterinarians are providing their services to clinics, hospitals, research programmes, public health sector, many vet-epidemiologists working on the novel-coronavirus strains, regulatory medicines, bacteriological and immunological inspections, wildlife care and management, food inspection, milk-meat product quality assessment [FSSAI] etc. which implies that vets are the silent warriors in this war against covid'19.

"You cannot get through a single day without having an impact on the world around you."

It's a lot to think when it comes down to this tiny little virus who has been changing the world, maybe for our own good. Maybe COVID is nothing but a warning bell which nature has given us to ensure we stop looking at our differences and start looking at our foundation "NATURE" and that we are in this together, that we shall overcome this pandemic as a responsible child of the mother earth, caring for our ecosystem, our animals, our trees, our ozone, our oceans, our sky, our soil, our planet, OUR EARTH.

"What you do makes a difference and you have to decide what kind of difference you want to make."

-Jane Goodall

Role of Veterinarians in Wildlife Conservation

Tanvi. G. Shendye

3rd Year student, B.V.Sc & A.H.

" The beautiful trees, that long for potent seeds,
The beautiful flowers that for buzzing bees.
The thunderous clouds that spark the light,
Ignites the roar of lion and honours his might.
The circle so delicate, so fragile yet complete
Encompasses the wildlife, the nature, you and me. "

Wildlife, a word so short, simple yet holds the power of keeping the entire civilization on it's lap. Wildlife is not just a word we use to refer to our animals and birds but it also holds the essence of civilization, of our history, of our evolution.

"Mankind finds his roots in the nature - the ocean,
from a tiny fish to the mighty homo sapien "

Wildlife is thus, not just a phrase we use but is basically a story of us, as the kids of mother earth.

The way we grew, evolutionary events occurred, was the same way we grew backwards, we forgot our roots, our true nature, our nature - our wildlife, birds, trees, animals, US. Wildlife is an emotion we forgot that existed and started using the phrase to emphasize on conserving the remainder of nature to ensure that the circle, the balance is not disturbed. We started conserving the wildlife in hopes of conserving ourselves. How is this evolutionary? Is this not devolutionary? In a sense?

Let's take a look on what exactly went wrong, and what exactly is Wildlife Conservation.

Wildlife conservation refers to the practice of protecting wild species and their habitats in order to maintain healthy wildlife species or populations and to restore, protect or enhance natural Ecosystems. Now ofcourse, as i am talking about man's evolutionary legends, let me tell you how evolution and devolution go hand in hand, nature's law and our dear Newton agrees to this, his famous law is the witness " Every Action has an equal and opposite reaction "

Let's take a look on how our evolution is basically marching on to the trumpets to our nature's devolution. There are innumerable threats to wildlife which includes -

- i) Habitat destruction, ofcourse to build a habitat for us Humans in forms of buildings, industries etc.
- ii) Degradation/Fragmentation - the unquenchable thirst to expand land and prove to others our superiority.
- iii) Overexploitation - because hey! We can't just stop at bossing and boasting our powerful capabilities.
- iv) Poaching - because we need trophies, even though it means the loss of our cyclical balance and loss of our nature.
- v) Pollution and climate change -

Some might say, well I am not encroaching the land of animals, I am 1000s of miles away, but look, the action no

matter where it is performed is going to have an equal reaction despite the distance. You creating pollution 1000s mile away, in your habitat will for sure have an equal reaction inside the habitat of Elephants in Africa.

We being technical people, as veterinarians know that even a single mutation or single loss of amino acid will change the entire sequence of RNA and ultimately cause disorders. Let's take an example of Gluconeogenesis Cycle, I know, I know 1st Year Biochemistry! But the loss of one enzyme will ultimately cause no production of Glucose, and ofcourse we will die. There's no question of debate. Similarly, loss of one species, just ONE can cause similar drastic effect on our nature of which you and me are a part of. Scary? Let's dig in more.

The IUCN estimates that 27,000 species of the ones assessed are at risk for extinction. Expanding to all existing species, a 2019 UN report on biodiversity put this estimate even higher at a million species. Habitat destruction can increase the vulnerability of wildlife populations by reducing the space and resources available to them and increase the likelihood of conflict with humans. Species including large mammals like African elephants, tigers, and rhinoceros are killed and traded for their tusks, skins, and horns respectively. Other causes of poaching include the harvest of protected plants and animals for souvenirs, food, skins, pets, and more.

The list of problem goes on and on. But again, if there's a problem, there is a solution. We come back to Newton's Law "Every Action has an equal and opposite reaction ". So if we have a big problem, we do have a even bigger solution!

Veterinarians.

Well, really? Just one word is the solution?

Hear me out.

Let's look at the emotions behind words and not just literal meanings.

What role would a vet have ?

The solution for such habitat and wildlife threat is to conserve, preserve and expand the habitats of animals. Protection of Habitats - A veterinarian being appointed as a forest officer takes the role of protector and ensures no illegal activities occur on the land by poachers or encroachers.

Through law and order, a forest officer takes up the role of being the conservator and holds the power to help and save our wildlife.

We can broadly term this as IN SITU CONSERVATIVE APPROACH.

The process of protecting an endangered plant or animal species in its natural habitat is commonly known as in situ conservation. About 4% of the total geographical area of the country is used for in situ conservation.

With around 18 Biosphere Reserves - like the Sundarbans in Bengal, Nanda Devi in Uttarakhand and Manas in Assam.

Around 104 National Parks including the SGNP in Mumbai excellent example for a National Park within city limits ! The Kaziranga National park, and so on where in our Veterinarians work at field level to ensure animals are healthy, so is the habitat and so the cycle is preserved.

Well that's not all,

There are about 543 Wildlife Sanctuaries and few biodiversity hotspots as well !

That includes the Western Ghats, the Himalayas, Nicobar Range etc. The benefits of in situ conservation is that it maintains recovering populations in the environment where they have developed their distinctive properties and this helps ensure the ongoing processes of evolution and adaptation within their environments

Another way is through EX SITU APPROACHES.

Ex situ conservation literally means, "off-site conservation". It is the process of protecting an endangered species, variety or breed, of plant or animal outside its natural habitat; for example, by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans.

Animal species can be preserved in genebanks, which consist of cryogenic facilities used to store living sperm, eggs, or embryos. For example, the Zoological Society of San Diego has established a "frozen zoo" to store such samples using cryopreservation techniques from more than 355 species, including mammals, reptiles, and birds.

A potential technique for aiding in reproduction of endangered species is interspecific pregnancy, implanting embryos of an endangered species into the womb of a female of a related species. Ex-situ conservation involves maintenance and breeding of endangered plants and

animals under partially or wholly controlled conditions in specific areas including zoo, gardens, nurseries, etc. It gives longer life time and breeding activity to animals, Genetic techniques can be utilized in the process. Captivity breed species can again be reintroduced in the wild. There are more than 800 professionally managed zoos around the world with about 3000 species of mammals, birds, reptiles and amphibians. Many of these zoos have well-developed captive breeding programmes.

Modern zoos and aquariums have a responsibility towards the animals under their protection, through their whole life stages. Captivity can affect drastically animal behavior. By confining animals to a cage or enclosure, we reduce the complexity of their environment, severely narrowing the natural control they should detain over it and restricting the range of behaviors they are able to exhibit .

When it comes to decide whether to prioritize the interests or rights of animals individually or to focus on the global viability and health of populations and species in specific situations zoological veterinarians are those in the best position to offer a balanced view concerning what the best is

for the animals, either from an individual or population perspective. They are expected to actively promote and safeguard animal welfare on the grounds of scientifically justified practices which encompasses a wide range of medical activities.

A Veterinarian is appointed as a chief head of such organization like zoos to make sure, animals are safe and happy and our nature is balanced.

As a conservationist outdoors, a veterinarian also works indoors in labs to specifically save, manipulate and procreate animals through Gene Techniques such as Biobanks that store biological samples for research and as a backup resource to preserve genetic diversity. Examples include the San Diego Frozen Zoo, the numerous seed banks.

This type of in vitro conservation is done in liquid nitrogen at a temperature of -196°C . The rapidly falling costs of genome sequencing has sparked initiatives to sequence the genomes of all living species, and thanks to improved ancient DNA methods the genomes of extinct species such as the woolly mammoth, and passenger pigeon are also attainable. Cloning could be a game-changer when it comes to helping recovering and critically imperilled mammals.

A Veterinarian is not simply involved in forest conservation outwardly but also is involved in gene manipulation and preservation inwardly. And along with these, speeches, educative sessions are being held by vets to highlight these things and bring to the notice of general public.

So a Veterinarian in short is a power packed word with dynamic emotions behind it. As a ecological warrior to a supportive healer for wildlife, to an educator to gene manager! Wildlife veterinarians and the zoological community have a pivotal role to play in the future of biodiversity conservation as, apart from saving numbers of species and understanding the consequences of animal diseases to human communities, they also encompass the protection of functional and integrated ecosystems. Veterinarians have most to contribute to wildlife conservation through activities revolving around wildlife health. The traditional veterinary role, where the focus is on individual animals, becomes secondary to one where the ultimate goal is healthy populations, healthy species and healthy ecosystems.


What lengths do vets go to make sure the dead, living and even the endangered species who would probably die are looked after and cared for.

For the dead and extinct through genetic works, and for the living through treatment care and management of habitats, with educational works.

Truly, Role of Veterinarians in Wildlife Conservation can't be expressed in 2000 words, but can be felt, seen, and appreciated by all the field works they do. At the end i would love to quote a sentence from Veterinarian's oath/slogan that we live by and abide by -



" Welfare of Human Beings through Welfare of Animals and Nature "

PPAM CE held on 08.11.2020 by Dr. Avinash Deshmukh



SMALL ANIMAL NUTRITION PAEDIATRIC & GERIATRIC PATIENTS

DR. AVINASH DESHMUKH MVSc, PHD
Scientific communication Manager
Royal Canin, USA



**Sunday, 08th Nov 2020
at 5:00 PM to 6:30 PM IST**

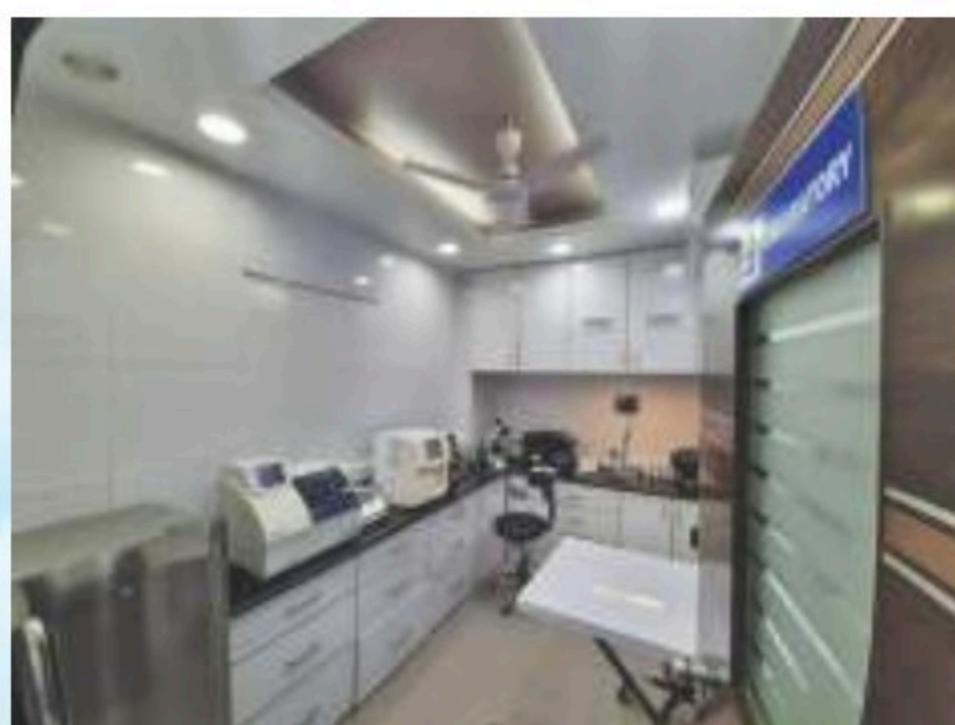
Total registrations 876. Attended by 791 participants.

A view of Dr. Shyam. M. Gadge Speciality Clinic, Malad, Mumbai.

Dr. Shyam M. Gadge speciality vet clinic has completed 20 years of practice in Malad, Mumbai.
Delivering the services for approximately 50 patients daily.

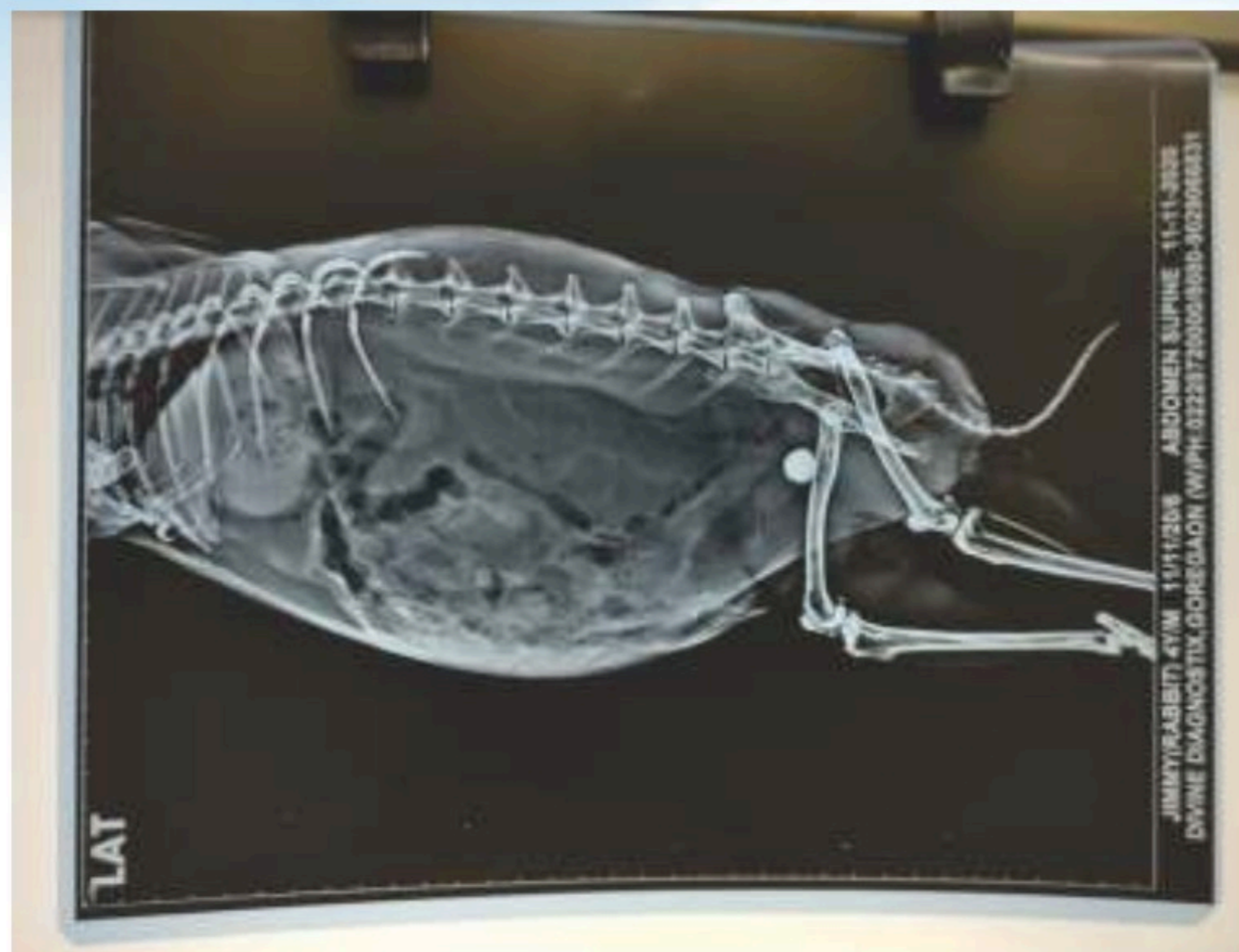


Facilities include
Routine Medical
Consultations, Surgeries,
Orthopedics, Endoscopy,
Laparoscopy, Pathology
and Radiology.



Ovariohysterectomy and Cystotomy in a 4 years old female rabbit Named Jimmy

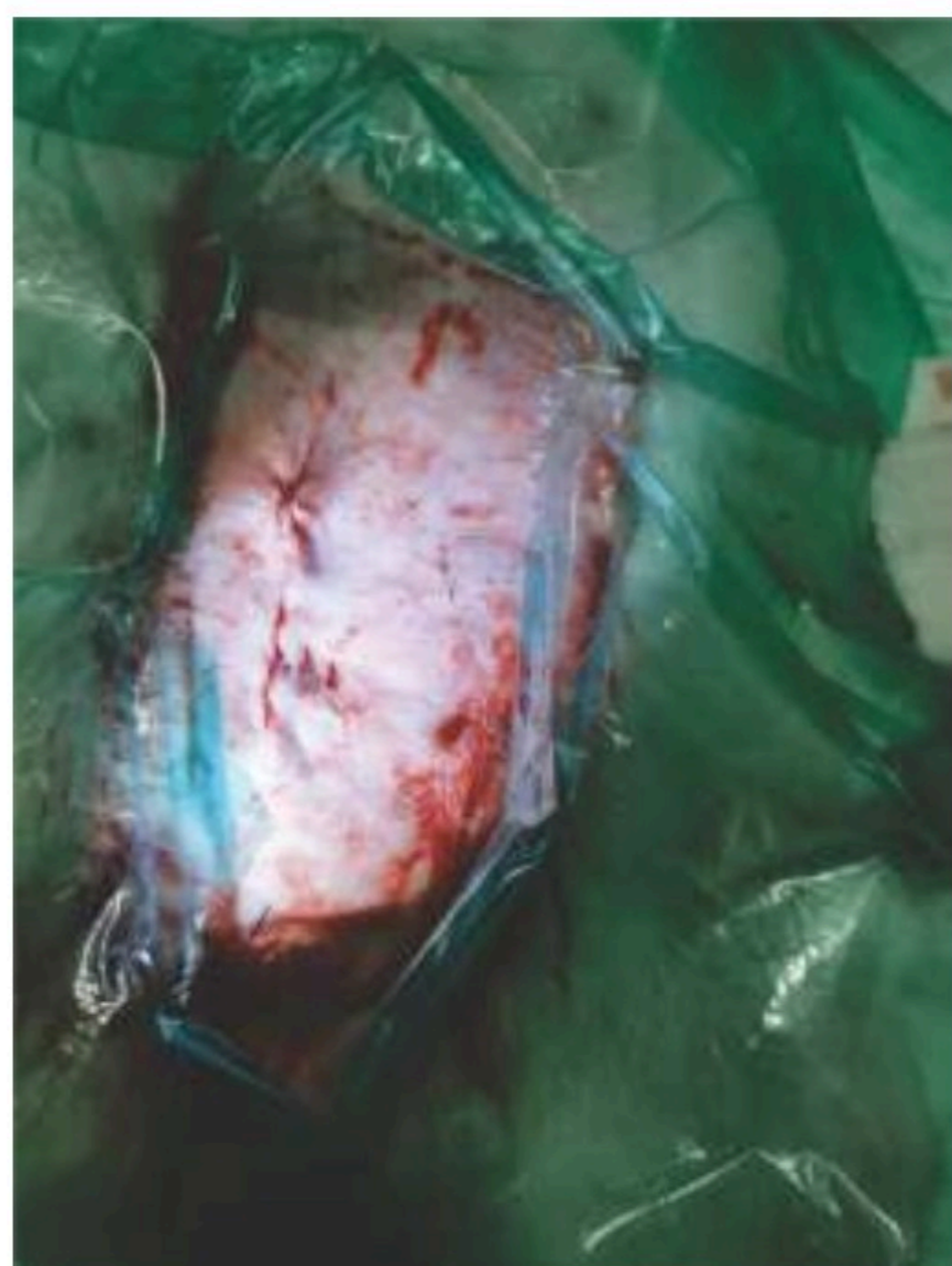
Dr. Nihar Jayakar



Jimmy was presented to clinic with hematuria and slight anorexia. On X-ray - one big cystic calculi was noted. Operation was carried out at Pawprints Veterinary clinic. Anesthetic protocol: daizepam 1mg/kg, Ketamine 40mg/kg. Buprinorphine 0.05mg/kg. Isoflurane @3%, and oxygen flow at 2L/min. Post operatively rabbit was kept on Perinorm for management of colic and meloxicam 1mg/kg to prevent post-operative gastric stasis. Jimmy had an uneventful recovery.



Dr. Nihar Jayakar



Appeal to PPAM Members to Renew Membership

- | | |
|---------------------------------|--|
| 1. Renewal of Annual Membership | Rs. 1500.00 + GST (Rs. 270.00) = Total Rs. 1770.00 |
| 2. New Membership | Rs. 1750.00 + GST (Rs. 315.00) = Rs. 2065.00 |
| 3. Life Membership | Rs. 17500.00 (No GST) |

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Indian Bank; A/c name - Pet practioners association
A/c no. 744946564

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(As soon as payment transfer is made please send a message to Treasurer Dr. Anil Vade on 9820016420. Please also mention your complete name, date of payment and transaction id)

Proud moment for PPAM and Dr. Kishor D. Batwe

Proud moment for Dr. Kishor D. Batwe and PPAM.
Corona Warrior Award at the hands of Hon. Governor of Maharashtra.



A practical approach to Anesthesia in Reptiles

Professor Knotek

Avian and Exotic Animal Clinic,
Faculty of Veterinary Medicine, University of Veterinary and Pharmaceutical Science, Brno city, Czech Republic

SUMMARY

Various combinations of anaesthetics have been recommended for surgical procedures in reptiles. The challenging categories of reptilian patients include – reptiles suffering from dehydration, anaemia or hypoglycaemia, reptiles with ascites, patients suffering from gastrointestinal tympany and metabolic bone disease. The minimum diagnostic testing includes packed cell volume, complete blood count, total protein, phosphorus and uric acid concentrations. Preoperative fasting is recommended in all cases of reptile anaesthesia if the surgery is performed as emergency procedure. The combination of ketamine with benzodiazepines results in smooth induction and recovery with muscle relaxation and analgesia. The effects of propofol and alphaxalone in reptiles can be seen within one minute, producing short-term anaesthesia for about 20 minutes. Intravenous administration of alphaxalone in small reptiles is easier than with propofol. Inhalant anaesthesia with isoflurane or sevoflurane is preferred to injections because of easy control of anaesthetic depth and rapid recovery. During the recovery period it is essential to keep reptiles in their preferred optimum temperature zone. All fluids have to be warmed prior to administration – to have the similar temperature like the body of the patient 30–35°C.

Key Words: Reptiles, monitoring, propofol, alphaxalone, inhalant anaesthesia

Introduction

In modern reptilian medicine, the need for an improved quality of anaesthesia and analgesia is evident. Safe anaesthesia of long duration is still important, despite the dynamic development of minimally invasive surgical techniques. Some of the hidden problems (metabolic diseases) have a strong influence on the quality and safety of the anaesthesia. Therefore all reptiles before anaesthesia induction should be examined physically (Fig. 1) and blood profile examination and radiographs must be performed. The challenging (critical) categories of reptilian patients include – reptiles suffering from dehydration, patients with anaemia, hypoglycaemia, females with a high number of

eggs or foetuses, reptiles with ascites, patients suffering from gastrointestinal tympany and metabolic bone disease.

Preanaesthetic assessment

The minimum diagnostic testing required includes packed cell volume, complete blood count, total protein, phosphorus and uric acid concentrations. It is also recommended to stimulate the urination reflex of the reptile patient by gently massaging the cloacal mucosa (the urinary bladder of some reptiles has a very high capacity and would be extremely distended by urine). Some authors have suggested that pre-anaesthetic fasting is not necessary for most reptiles^[1-2], but I strongly recommend fasting for



Fig. 1 Pale mucosa in lizard suspected to have chronic renal failure (CRF).

reptilian patients. Preoperative fasting is recommended in all cases of reptile anaesthesia if the surgery is not performed as an emergency procedure. The minimal fasting period for big carnivorous reptiles (crocodiles, aquatic turtles, monitor lizards, boid snakes and pythons) is two to four days. I recommend the minimal fasting period for herbivorous reptiles to be four days. Please do not forget to ask the reptilian owner about the time of the last feeding (force feeding)! The gastrointestinal tract (especially the stomach) of small lizards (chameleons, geckoes, anoles, basilisks) would be very full with invertebrates! In herbivorous tortoises when the colon is full with faeces it would be a large heavy organ that could be responsible for lung depression during prolonged surgery.

Anaesthetics

Various combinations of anaesthetics with analgesics have been recommended for surgical procedures in reptiles^[1-11]. Intramuscular or subcutaneous injections are preferentially administered into the cranial part of the reptilian body (front legs of chelonians and lizards, the first third (cranial) of the snake body).

There should theoretically be some differences in the pharmacokinetic processes when comparing intramuscular with subcutaneous administration of anaesthetics, but it is without any significant effect in clinical practice with reptiles. Compared with birds and small mammals vascular access is more difficult to perform in reptiles. The palatine vein should be very gently catheterized in large snakes, but any trauma of the mouth cavity mucosa in snakes would be followed by inflammation and infection (stomatitis caused with *Aeromonas* sp., *Pseudomonas* sp.). Intracardiac injection has been described for administration of parenteral anaesthetics in snakes, but it is associated with the risk of the trauma to the heart^[2]. The ventral coccygeal vein is the site of choice for intravenous drug administration

in snakes, lizards and small crocodiles^[1,3-5,7,12]. The subcarapacial plexus is the optimal site for intravenous injections in chelonians (jugular or dorsal coccygeal veins are easy to be catheterized in large tortoises, but it is not easy to use them for intravenous administration in medium to small turtles and terrapins)^[10]. Intraosseous catheterization of long bones (humerus, tibia, femur) has been described in turtles and lizards^[2,13,14]. It is recommended to use the local anaesthesia (lidocaine infiltration of the cannulation site).^[4,13] The correct and easy placement of the catheter depends on the needle quality and the bone structure. In large lizards the cannulation of the bone is not easy, and general anaesthesia with radiography to ensure the correct placement of the catheter is therefore recommended. Intraosseous catheterization of the bony bridge between the carapace and plastron of tortoises has also been described^[2], but another author has been unsuccessful with this method^[6,7]. The limited intramedullary space of the bridge was responsible for the problem and fluid infusion ran directly into the coelom. It is possible that another part of the chelonian shell bone would be more suitable for catheterization.

Recently, different vascular access points for fluid therapy in tortoises have been investigated. The feasibility of the use of catheter placement into the bony bridge between the carapace and plastron or gular scute was controlled with a gamma camera after administration of a radioisotope. None of the bone sites (bony bridge between the carapace and plastron, gular scute, femur or humerus) distributed the fluid as efficiently as the jugular site^[15].

Ketamine, tiletamine

Dissociative anaesthetics ketamine and tiletamine are characterized by the reduction of impulse transmissions and with a limited capacity of inducing visceral analgesia in reptiles.^[16] Ketamine produces hypertension and can cause tachycardia, bradypnoea and hypoventilation.^[1,2,4,7,9,17,18] Repeated administration is not recommended, because it results in accumulation and a risk of overdosing.

Ketamine and tiletamine are not appropriate for use as stand-alone analgetics in painful surgeries. These agents used alone at high dosages, are associated with cardiopulmonary depression, prolonged recovery time and poor muscle relaxation. Ketamine or tiletamine-zolazepam would not be used in reptiles suffering from severe renal or liver failure.^[11,19] The combination of ketamine with benzodiazepines and propofol results in a smooth induction and recovery with good muscle relaxation and analgesia. Semi-aquatic terrapins are very resistant to the ketamine or tiletamine-zolazepam activity.^[20] High doses of tiletamine-zolazepam will produce variable sedation in red-eared terrapins and it is therefore the author's recommendation to only use tiletamine-zolazepam in this species for the induction of anaesthesia (with low doses).^[8,19] Xylazine or medetomidine alone produces minimal sedation. However in combination with dissociative anaesthetics (ketamine), they produce very good chemical immobilization.^[1,2,20,21]

By combining it with xylazine, the dosage of ketamine is reduced. The important advantage of using α -2 adrenergic agonists for anaesthesia is the possibility to reverse their effect with the antagonist (atipamezole). This reduces the recovery time. The combination of medetomidine with ketamine (and atipamezole for rapid reversal) is a feasible method for anaesthesia in large lizards.

Propofol

When administered properly (intravenously), the effect of propofol in reptiles can be seen within one minute, producing a short duration anaesthesia of about 20 minutes.^[4,7,13,14, 22] Propofol is rapidly metabolized, but it is a poor analgesic. Reptiles show a marked change in the respiratory frequency that is not accompanied by any significant change in SpO₂. The duration and severity of respiratory depression (apnoea) depends on the dose.

Although dosages in reptiles of 10 to 15 mg/kg have been reported, it is the author's opinion (which is in accordance with other colleagues) that dosage 5 mg/kg may be enough to allow for intubation in many reptilian species.^[7,22,23] Low doses (1-5 mg/kg) are safe, without any negative influence on the respiration. Nevertheless it is recommended to use propofol very carefully in reptiles suffering from chronic heart diseases and/or respiratory diseases. Propofol induces central nervous system depression.

Alphaxanole

The combination of steroids alphaxalone (3 α -hydroxy-5 α pregnane-11, 20-dione) with alphadolone (21-acetoxy-3 α -hydroxy-5 α pregnane-11, 20-dione) has been used for anaesthesia in many reptiles, with good results in snakes, chelonians and lizards.^[24] This combination is not available on the European veterinary market, but alphaxalone alone is available for use in reptiles as Alfaxan (Vetoquinol, France).^[2,25] The main advantage of the steroid anaesthetic alphaxalone in reptiles is its short duration of effect. If administered intravenously, the effect of alphaxalone begins within one minute. Shortterm anaesthesia is maintained for about 20 minutes. Propofol and alphaxalone are not painful for reptiles and perivascular injections are not associated with tissue necrosis. The manipulation with alphaxalone is very easy (it would be stored within the room temperature).

The fact that alphaxalone is a clear fluid makes the intravenous administration of this drug easier than propofol, especially in very small reptiles. No adverse reaction or side effects have been documented in reptiles after alphaxalone anaesthesia. Alphaxalone has become the author's most popular choice for induction of all reptilian species, when intravenous access can be obtained.

Inhalation anaesthesia

Inhalation anaesthesia is preferred to injections because of easy control of anaesthetic depth and rapid recovery.^[4,7,8,9,10,23,26] However inhalant anaesthesia is not the method of choice for induction of anaesthesia. The existence of air sacs in snakes and some groups of lizards accounts for the

observation that reptiles remain anaesthetised even during a prolonged period of apnoea.

Tidal volume, oxygen requirement, CO₂ elimination, respiratory rate and body temperature must all be maintained under anaesthesia. Inhalation anaesthesia in reptiles is performed by the use of simple machines (Fig. 2 - 4). The breathing system for a majority of reptile patients is



Fig. 2 Bearded dragon. Recovery period.



Fig. 3 Green iguana – monitoring the vital functions by BAS Vital Scan monitor (Vetronic, UK).

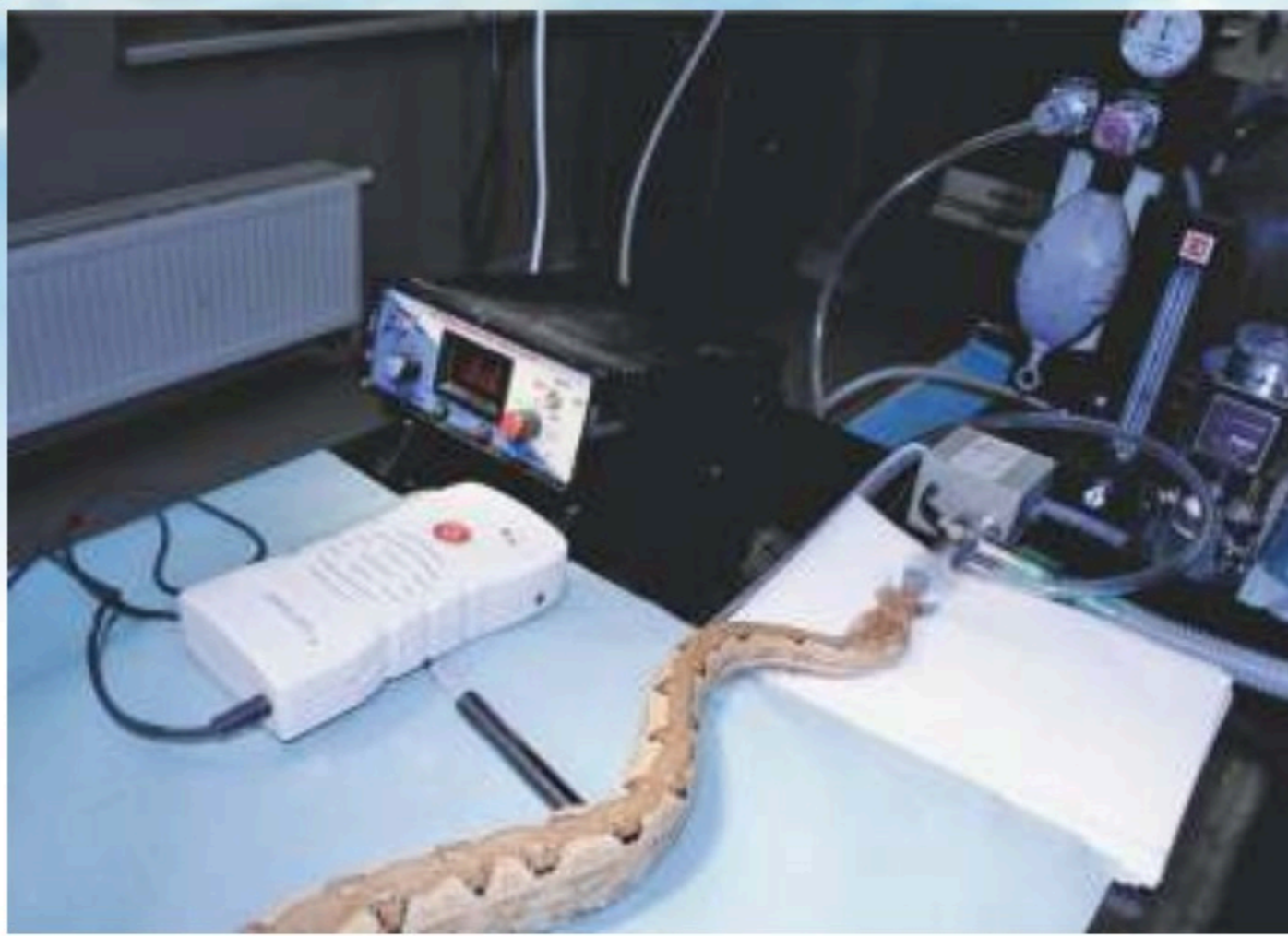


Fig. 4 Boa constrictor – snake connected to small animal ventilator.

Heart frequency controlled with Doppler pencil probe.

non-rebreathing. The optimal O₂ rates for reptiles lie from 200 to 1.000 ml/min, depending on the size and species of reptile. Masks for inhalant anaesthesia of medium to large reptiles are constructed from syringes and plastic bottles. Masks for very small reptiles can be constructed from a piece (finger part) of gloves. Good quality endotracheal tubes and a system free from leaks are essential. Small endotracheal tubes are constructed from over-the-needle catheters. Many anaesthetic agents depress respiration in reptiles and this can lead to the production of hypercapnia, hypoxia and acidosis. To maintain blood carbon dioxide and oxygen concentrations within normal levels, it is often necessary to assist ventilation. Inspiration and expiration have to be regulated by the veterinarian (manually) or with special ventilators. Using a ventilator will often be more convenient than manually assisting ventilation. There are basically two ways in which gas can be delivered during inspiration. The ventilator may deliver gas at a set pressure pattern, but another type of ventilator may be set to produce a fixed flow pattern. In selecting a ventilator for use in reptiles, the most important factor to be considered is the ability to ventilate a wide range of patients. Volume cycled ventilators should generally be avoided for small reptiles because the margin of error in volume delivery is very small. Pressure cycling

ventilators are therefore better suited to these patients.

Most patients require a ventilation pressure of between 5 and 12 cm water pressure. The minute volume is calculated on a very basic principle (minute volume = 10 ml/kg tidal volume x breaths per minute). Fresh gas flow is recommended to be 3 x minute volume (inspiration to expiratory ratio is assumed to be 1:2). An excellent piece of equipment for inhalant anaesthesia in reptiles is the Small Animal Ventilator (SAV 03, Vetronics, UK, (Fig. 5 - 8). This ventilator has been used for exotic anaesthesia since 1994. It has been designed to perform the repetitive task of intermittent positive pressure ventilation (IPPV). It enables careful control and monitoring of intra-airway pressure and ventilation rate.^[23] The SAV machine is used as a classical T-piece system, with the IPPV switch off until IPPV is required.

Anaesthetic induction of reptiles with mask has been published by number of authors and therefore seems to be a very easy procedure. Large reptiles like green iguanas could stop breathing for more than 20 minutes after a mask with isoflurane is attached to the head.^[27] The most difficult and dangerous procedure for the staff is the mask induction in large and aggressive aquatic chelonians or crocodiles. Similar problems appear with the induction-chamber method. The best and safest method of anaesthesia induction is the use of parenteral administration of drugs like propofol, alphaxalone or tiletamine-zolazepam (in a very low dose).^[7,8,11,17,19,23] Intubation is very easy in snakes, but it is a difficult step of the inhalant anaesthesia in some species of lizards and chelonians. Special approach has to be used for intubation of crocodiles (Fig. 9) and small chameleons. It is not only the presence of a large tongue in the mouth cavity, but the shape of the cranial part of the trachea that makes the intubation of small chameleons rather difficult.

Isoflurane, sevoflurane

The inhalant anaesthetics of choice for reptiles are isoflurane and sevoflurane.^[1,3,4,6,28] Both of these inhalant agents produce a dose dependent cardiopulmonary depression (decrease of the blood pressure).^[4,29] Isoflurane delivered at 2.5–3% results in sustained depression of blood

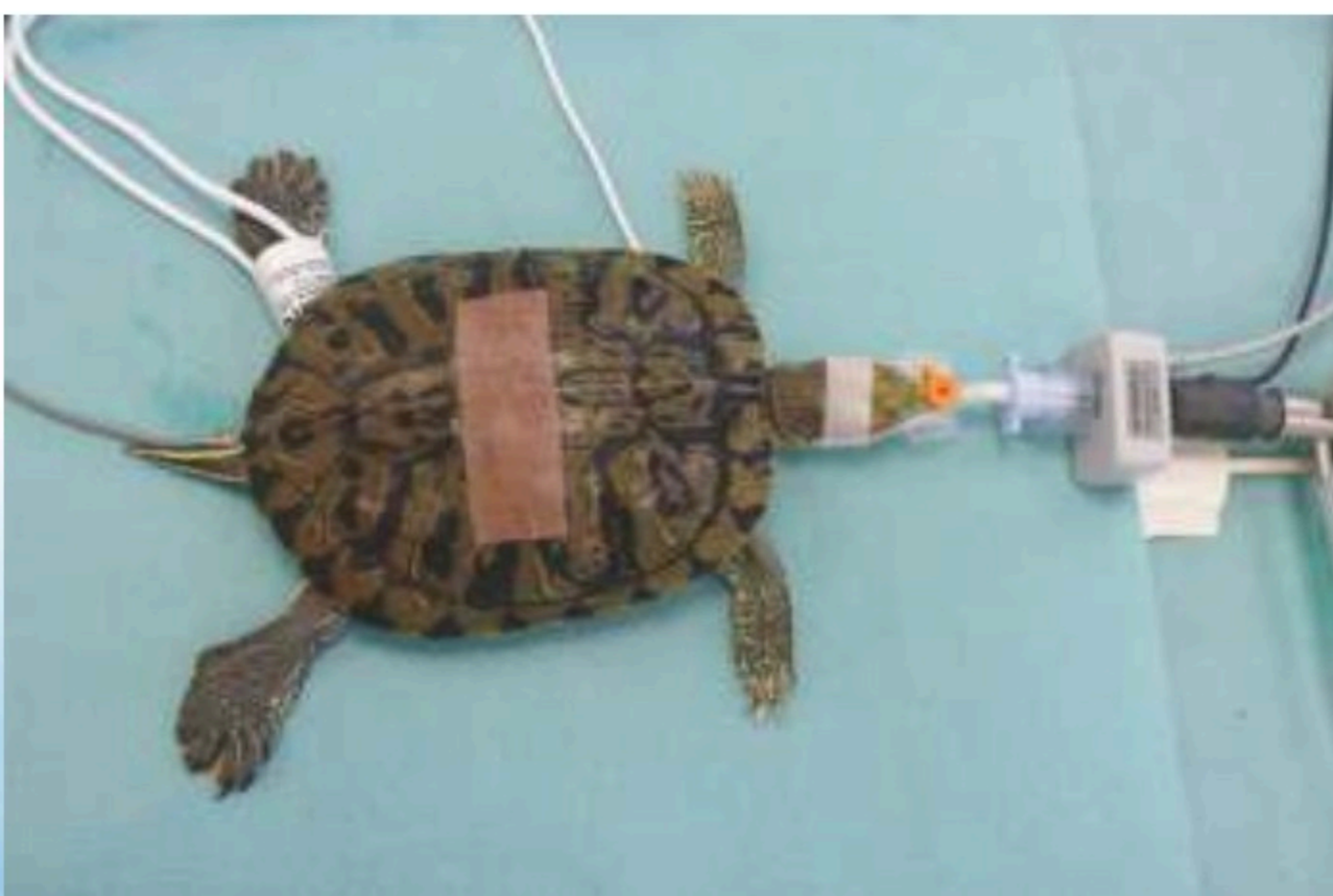


Fig. 5 Red-eared terrapin – monitoring the vital functions by BAS monitor (Vetronic, UK).



Fig. 6 Soft shell turtle – monitoring heart frequency during the recovery period.

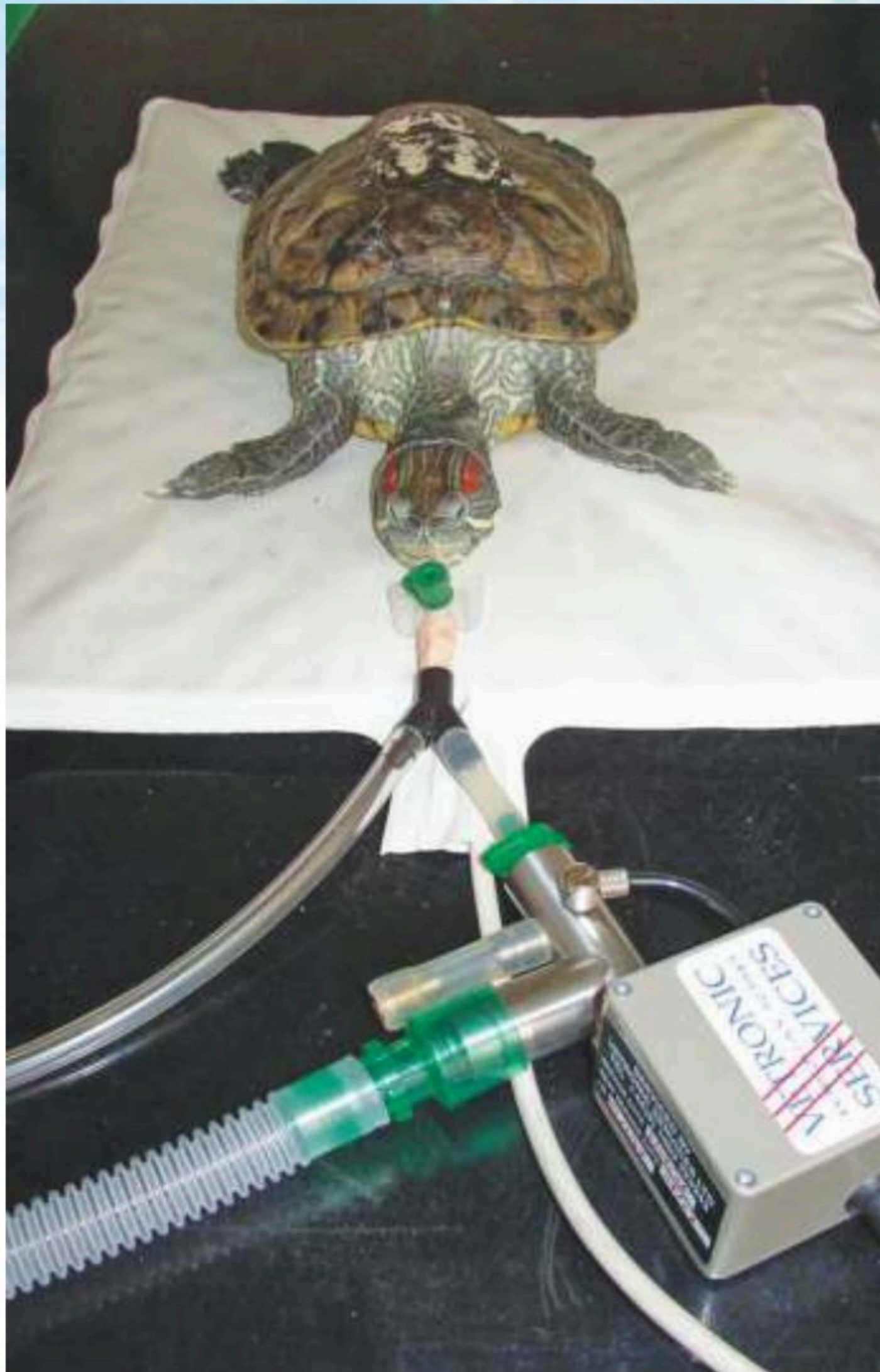


Fig. 7 Red-eared terrapin connected to small animal ventilator (SAV).

pressure in lizards and it is reported that only some of the adrenergic agonists used in veterinary anaesthesia (norepinephrine at 0.3-0.5 $\mu\text{g/kg/min}$) can significantly increase blood pressure in hypotensive reptiles.^[30] Minimum anaesthetic concentration (MAC) in reptiles is defined as the anaesthetic concentration that produces immobility in 50 % of anaesthetized animals. Maintenance of surgical anaesthesia requires vaporizer settings that are approximately 25 % higher than MAC. Premedication with opioids and the use of parenteral anaesthetics for induction decrease MAC in reptiles. The cardiopulmonary effects of butorphanol-isoflurane and butorphanol-sevoflurane anaesthesia is similar, however the quality and speed of induction and recovery was significantly shorter with sevoflurane when compared to isoflurane in green iguanas.^[31]

Monitoring

Assessing anaesthetic depth in reptiles is challenging. The assessment of the depth of chemical drug desensitisation in reptiles is based on evaluation of the righting reflex, and the control of head, neck, and frontal body lifting reflexes.^[1-3,7,8] In terrapins, the disappearance of the reflex of hiding the head, neck, and legs in the carapace upon touch is an evidence of



Fig. 8 Young crocodile – inhalant anaesthesia with isoflurane.

good immobilization, but it is the absence of a corneal reflex that indicates deep anaesthesia.^[10] The neck and legs can be easily pulled out even under light anaesthesia.

Heart rates and blood SpO₂ parameters, in particular, are commonly used for monitoring anaesthesia and analgesia in reptiles in clinical practice.^[32] Monitoring SpO₂ in small reptiles is challenging due to the low pulse volume and difficulty in probe placement. A tape would be used for marking the position of the heart in snake and for monitoring its activity.^[2] A Doppler flow monitor can be used to assist control of the heart function – the pencil probe is ideal for the majority of small reptiles^[2].

In comparison with mammals the anatomy of reptiles makes continuous monitoring of respiratory and heart rates, ECG parameters, tissue oxygen saturation and the CO₂ concentration in the expired gasses (ETCO₂), blood pressure and body temperature rather difficult. Continuous



Fig. 9 Tracheal tube insertion in a crocodile under alphaxalone anaesthesia.

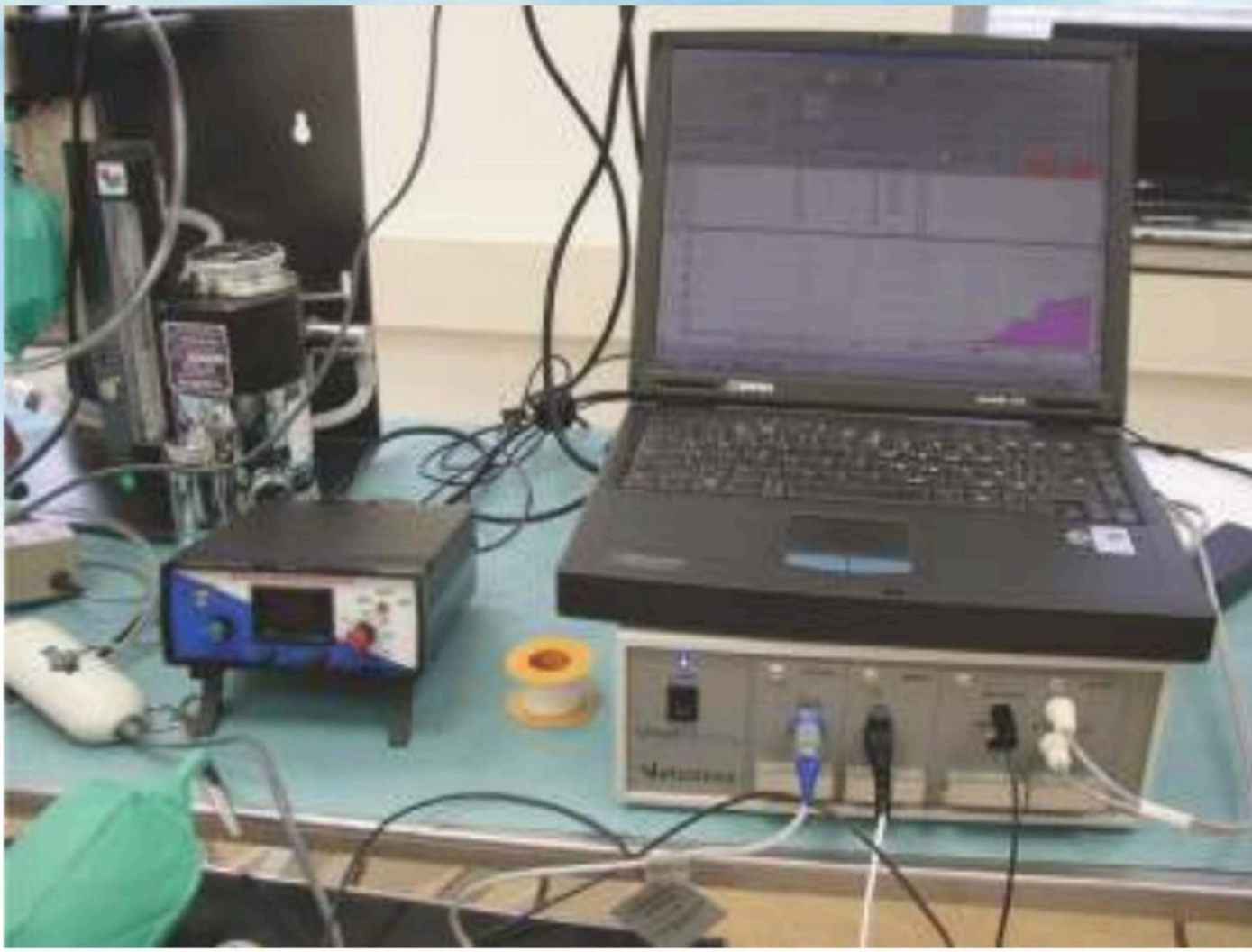


Fig. 10 BAS Vital Scan monitor connected with laptop.

monitoring of these functions is possible in medium to large reptiles with the use of BAS monitor (Vetronic, UK, Fig. 3, 10).^[2] Recently, an implanted direct blood pressure transducer and a non-invasive oscillometric unit were compared in a group of adult green iguanas.^[29] Blood pressure was measured non-invasively with a cuff over the left femoral region of iguana while the catheter tip of the blood pressure transducer was placed in the aortic arch of lizards. The oscillometric device failed to provide a reading in over 80 % of the attempts and it provided measurements that did not consistently correlate with the direct measurements^[29]. However it is not clear if the oscillometric device was unreliable or the problem resulted from the wrong system used.

Low metabolic activity and relatively very low oxygen rate consumption in reptiles lead to very specific challenges during the introduction of anaesthesia as well as during the recovery period (Fig. 11). The patient is allowed only oxygen during the period when the pleuropetionum is closed with suture (the reptile is ventilated with air when the skin is to be sutured). Spontaneous breathing is stimulated with gently touching the most sensitive parts of the body (tongue, tail, base of the tail). The heart is monitored with the Doppler flow monitor and the pencil probe. During recovery heat pads, infrared lamps, hair-dryers or another source of heat may be used to warm reptiles. Care should be taken not to exceed the species' optimum temperature range, otherwise the poor post-operative care would exacerbate and prolong the metabolic disturbances caused by the surgery. It is essential to keep reptiles in their preferred optimum temperature zone (POTZ), without any stress and pain.

Basic equipment of the post-operative box (terrarium) is a clean paper as a substrate and a shelter. Analgesics with long activity, like meloxicam or carprofen, are used at 24 hour intervals. Following a similar surgical procedure, different reptiles can have markedly different analgesic requirements. Dehydration is common in reptile patients. It is not true that subcutaneous administration of fluids is not used regularly



Fig. 11 Young crocodile – recovery period. Ventilation support with the use of Ambu-Vac.

in reptiles (due to slow absorption and a small subcutaneous space). Intravenous (or intraosseous) fluid administration is advisable, but it is not an easy method in reptiles. Intracoelomic fluid administration is a feasible method of rehydration, but with the risk of organ puncture. All fluids have to be warmed prior to administration – to have the similar temperature like the body of the patient (preferred body temperature, PBT), 30–35 °C.

Selected anaesthetic protocols

Excellent results have been reported with the following anaesthetic protocols:

Chelonians (terrestrial tortoises, semiaquatic terrapins)

- Induction (butorphanol+meloxicam) + 20-30 minutes propofol + intubation and isoflurane anaesthesia.
- Induction (butorphanol+meloxicam) + 20-30 minutes alphaxalone + intubation and isoflurane anaesthesia.
- Induction (butorphanol+meloxicam) + 20-30 minutes tiletamine/zolazepam + intubation and isoflurane anaest

Lizards, snakes (very small species)

- Induction (butorphanol+meloxicam) + 20-30 minutes – mask isoflurane + intubation/mask and isoflurane anaesthesia
- Induction (butorphanol+meloxicam) + 20-30 minutes tiletamine/zolazepam + intubation and isoflurane anaesthesia.

Class III Severe cardiac insufficiency

- Induction (butorphanol + meloxicam) + 20-30 minutes propofol + intubation and isoflurane anaesthesia.
- Induction (butorphanol + meloxicam) + 20-30 minutes alphaxalone + intubation and isoflurane anaesthesia.
- Induction (butorphanol + meloxicam) + 20-30 minutes tiletamine/zolazepam + intubation and isoflurane anaesthesia.

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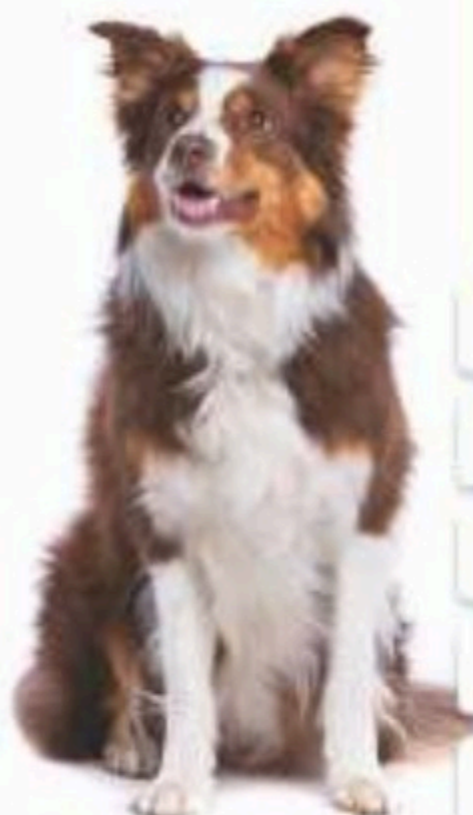
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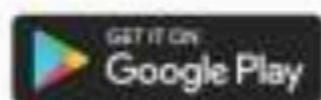
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Petofy - An Idea

A few years back I was planning on getting a pet for the first time in my life. I wanted to adopt a dog. Being an IT expert, I had always relied on the power of the internet to get all the required information and I thought of taking the same trusted route as always. But to my surprise, firstly not much information was available online and secondly, I couldn't find a single platform where I could get all the required information; I had to collect information from different sources and each source had a different opinion on the same topic.

I realized that everyone might be facing the same challenges and my personal experience, so I shared the feelings with my friend, who is working with Animal health sector since long. He reciprocated the idea, and the idea became Petofy - "EVERYTHING PETS"

Currently Petofy has a team of software engineers, veterinarians, market stalwarts and marketing team who are working with full zeal and zest to make this dream true.

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