

Positive identification of animals by Radiofrequency Identification Device (RFID or Microchip)

Positive identification of animals and products is mandatory to all veterinary certification as one can only certify what one can verify. In this regard identification by means of a Radiofrequency Identification Device (RFID) or microchipping can be of great value. It is also a valuable identification tool in many other spheres of veterinary science.

The SAVC does not legislate animal identification, but supports the use of electronic identification in animals and the standardization in materials, procedures, equipment, and registries. The SAVC also views this method as an advance in animal identification and from an ethical point of view prefers this to conventional methods such as hot-iron branding.

The branding, tattooing and ear tags that have always been used have inherent deficiencies, and the objective of this guideline is to facilitate better animal identification by use of Radiofrequency identification device (RFID) systems.

Because of the rapid development of technology this will be seen as a working document, and will be subject to change.

RFID uses a radiofrequency signal transmitted between a reading device (scanner) and an electronic device (transponder or microchip) which is passive and is activated by the scanner. The information provided by the transmitted signal identifies the transponder and, by cross-reference to stored data (in a database or registry), identifies the animal carrying that transponder or microchip.

There are different types of RFI devices developed to meet different identification needs in the field of animal production, control and care. Some of these may need specific technical and operational considerations not mentioned here.

The OIE is prescriptive that all animals need to be identified 'from farm to fork' but is silent on the method of identification and does not offer any guidelines.

Several countries have well developed RFID systems in place and these were consulted. Also, the International Standards Organization, or ISO, has approved and recommended a global standard for microchips with the intention to create an identification system that is consistent worldwide and will allow for international tracing of animals

It is accepted that the gold standard on identification will have to be gene typing but due to practical reasons, microchipping is for now the method of choice.

In South Africa RFID is not regulated by legislation and the trade, possession and use of microchips and scanners are not restricted. Also, since branding, tattooing and injecting may be done by any animal owner on his own animals, it has been accepted that inserting a microchip can be done by owners also. Unfortunately this situation has given unscrupulous individuals the opportunity to remove and replace chips from live or dead animals to commit insurance fraud, or from rhino horn to impede tracing.

The Registrar of the Animal Identification Act No 6 of 2002 now allows for alternative ways of identifying animals, as follows:

- “Stockowners must, however, take note that this will not apply to individual owners. Only requests for the marking of certain groups of animals or species will be considered.
- Should such a request be granted, it would be subject to strict conditions in order to simplify the work of the inspector and the SAPS.
- Provisions that would be implemented in such a case would include the application of a single mark (brand/tattoo) indicating that the animals are micro-chipped.
- It will also be a requirement that all those using this method have a scanner/reader available at all times”

Under the FEI (International Federation for Equestrian sports) all sporting horses need to be microchipped under the veterinary rules, but not necessarily by a veterinarian.

The SAVC believes that, while there may be scope for owners to identify their own livestock simply for managerial purposes where no certification is needed:-

- Veterinarians or para-veterinary professionals are the best people to implant microchips due to their knowledge of sterility, anatomy and pain relief required for animals.
- Where the security of the country’s livestock is at stake, microchipping should be a veterinary or para-veterinary procedure only.
- The accountability of the registered veterinary team fosters accuracy, confidentiality and expertise in record keeping;
- Veterinarians should be the point of contact where stray pets are taken to for identification.
- The sale of microchip scanners should be regulated.

According to the Veterinary and Para veterinary profession’s Act, Act 19 of 1982, while an owner may do a minor invasive procedure on his own animals, if it is done for another person's animals, it falls into the realm and requirement of a person registered under the Act and is illegal in terms of the Act.

According to the Animal Identification Act No 6 of 2002, all marking operators need to be registered by the Registrar of Identification Marks, and it is an offence to mark animals for financial gain without being registered.

Additionally any implantation by methods other than the subcutaneous route, ear tag or bolus will amount to veterinary surgery and should be done by veterinarians.

Only Veterinarians have the mandate from the Minister of Agriculture to certify animals.

The Limitations of RFID:

- Microchips can neither be administered or read over a distance and as yet do not function as tracking devices; especially in game this poses a problem
- Microchip identification is not as visible as hot branding, which is regarded as less traumatic in wildlife than in domestic species, as wildlife need to be anaesthetized for such procedures.
- The reading of microchips can be subject to interference by other electromagnetic activity and steel structures;
- The possibility exists to amend microchip numbers and veterinarians and para-veterinarians must ensure as far as possible that the chips they insert cannot be re-written;
- It cannot be expected from any veterinarian or para-veterinarian to know what the origin of a chip in an animal is, and/or if it has or can be altered or not;
- Microchips sometimes cannot be found because of factors such as migration, inactivity, scanner dysfunction, implant error and more.

The Microchip

A microchip is a small RFID (Radio Frequency Identification Device) or transponder embedded in an inert substance such as glass, and can be implanted by sub-cutaneous injection for the positive identification of animals.

It is encoded with a unique number and is relatively tamper proof.

It is inert but is activated by the radio waves from a scanner, for its encoded data to be 'read'.

Because of the variety of products on the market and lack of legal directives, veterinarians and para- veterinarians need to be discerning and should select only quality products with consistently good reputes and with internationally benchmarked standards.

Microchips used for the identification of animals must conform to the following criteria.

- ISO (International Organization for Standardization) compliant RFID technology that adheres to and is based on ISO 11784/11785
- The transponder must carry a 15 digital code with a unique identification number and a manufacturer code issued by the International Committee of Animal Recording (ICAR);
 - Three digits of the identification number designate either the 3-digit country code of the country in which the animal was implanted - if there is a central, national database that takes on the responsibility of administering number allocation and uniqueness - or the 3-digit manufacturers code as assigned by the International Committee on Animal Recording [ICAR] if there is no such national database;
 - One digit denotes the animal's category (optional); and
 - The remaining 8- or 9-digits denotes a unique animal identification number.
- ICAR compliance: Manufacturer codes are assigned by ICAR following an application and review process that includes signing a "code of conduct." A list of Manufacturer Codes can be found on the ICAR site.
- If 999 are the first 3 characters of the 15-digit number, it represents a non-unique 'test chip' and should not be distributed or implanted into animals for identification purposes.
- In South Africa 10-digit microchips have been marketed for many years and are preferred in certain circumstances. Such microchips will be acceptable for the identification of privately owned animals or for sale locally, but not for use in official sporting events or international export or travel. The reason for identification of the animal and/or acceptance by the relevant sporting authority of insurance company must therefore be established before these chips are used. The transponder shall have an effective 'minimum read range' of 50 mm with the appropriate reader.
- The chip must be unalterable and devices that can be re-programmed after implantation must not be used for identification purposes.
- The implant and transponder shall be robust enough to withstand the anticipated traumas at its implantation site
- The lifespan of the device and the transponder must be compatible with the expected maximum lifespan of the species being implanted.
- The implant shall be biologically inert
- It must be packaged sterile and ready for implantation via a delivery system that maintains the sterility of the device and the implantation process.
- Microchips shall be designed and manufactured to minimise migration once implanted. Transponders shall be visible radiographically (x-ray) and by ultrasound.
- Must be readable by universally used scanners
- Due to risk of ingestion, glass chips are not advisable for food producing animals, except for highly valuable bulls and rams, and then it must be implanted by a veterinarian or para-veterinarian and not migrate.

The Scanner

The scanner creates an energy field that powers the transponder to transmit a signal back to the scanner; the scanner then converts the signal to readable format and displays the number.

- Veterinarians and para-veterinarians should make use of universal scanners that can read both the 134.2 kHz (ISO standard) microchips, as well as the 125 kHz or 128 kHz (non-ISO standard) microchips to offer improved chances of detecting and reading a microchip, regardless of its brand
- The scanner should display the complete unique identification number, namely, the manufacturer code followed by the microchip's identification number.
- It must be able to read the identification details when the reader is passed over the site of implantation at approx. 50mm-from the microchip.
- Technical / medical services should be provided by manufacturers/distributors:
 - I. Provide for means of receiving reports of adverse reactions and provide recommendations of medical mitigation of the situations;
 - II. Respond to technical questions concerning implantation or device operation

The Database

The SAVC believes that

- Electronic identification of animals is a national concern and that there should be effective and centralised control over the management, security and accountability of electronic identification systems; and that
- All database systems should be linked to a single search engine that is available at all hours, to allow microchip information to be easily traced.
- Security of information must be ensured :
- Owners should be educated to understand the need to register data and how to recover information

Implantation sites

Dogs and cats:

The chip is implanted by subcutaneous injection on the dorsal midline in the the dense connective tissue, just cranial to the shoulder blades

Horses:

Inject into the Ligamentum nuchae in the horse, 3 cm below the crest and approximately half-way between the poll and the withers on the **left side**.

Alpacas:

Midway on the **left neck** under the skin, or on top of the head, behind the left ear

Cattle and other ruminants:

Due to the risk of the glass capsule of the microchip getting ingested, the use of micro-chipping is not recommended in production animals as a rule. The most effective

method of identification of cattle has proven to be ear tags: all ruminants should have two devices that are cross referenced to each other: either two ear tags (with or without RFID) or a tag and RFID rumen bolus. Boluses cannot be seen so the ear tag needs to indicate its presence, and boluses can be regurgitated so needs to be cross referenced to the animal's ear tag

Only very valuable animals should be microchipped and then it must be given behind the poll at the insertion of the Ligamentum nuchae or behind the ear, and the site recorded; it should be given by a veterinarian or para-veterinarian, and not migrate to edible parts of the carcass

Wildlife (ruminants):

The left side of the neck, by subcutaneous implantation.

Wildlife (predators):

On the dorsal midline in the dense connective tissue, just cranial to the shoulder blades.

Alternately - especially cheetah - on the **left side** of the tail base, at the level of the pubic bone.

Wildlife (rhinos):

The left nuchal hump by subcutaneous injection, and at the base of both horns, by drilling and plugging with permanent glue or epoxy.

Birds:

Inject intramuscularly in the left pectoral muscle.

Small birds:

Inject subcutaneously over the left pectoral muscle

Crocodiles:

Inject just rostral to the nuchal cluster.

Turtles;

Implant in the hind limb fossa

Lizards and snakes:

Subcutaneously in the caudal body.

Small lizards (less than 12.5 cm snout to vent length):

Intracoelomically.

All other animals are implanted on the left side at varying sites.

The manufacturer may have specific instructions regarding anatomical position of the tag which may be followed if the above is kept in consideration

Implantation Procedure for All Animal Species

- Scan animal thoroughly to ensure a microchip is not already in place.

- If the animal has been chipped before the number should be noted and the role-players informed
- Scan the microchip before it is implanted to verify that it can be read and that the number corresponds to its documentation.
- Ensure adequate control of the patient.
- Sedation and pain management should not be needed but can be administered if regarded necessary.
- Use appropriate sterile technique for the procedure
- Implant the microchip in the animal at the correct site
- Make sure that the plunger was pushed down all the way before removing the injecting device
- Scan the patient again to verify the position and function of the microchip
- Attend to the registration of the information on the relevant database and enter the number in the patient's certificates and medical record.
- It is good policy to sign next to the bar coded sticker in an animal's passport as proof that the procedure was indeed done by a professional
- Owners should be advised to keep their microchip database contact information current
- All adverse reactions should be recorded and reported to the manufacturers.

Scanning of Animals for Microchip Implants:

All animals – especially strays or animals of uncertain ownership - should be scanned routinely for the presence of a microchip. The number must be recorded, and the position if abnormal. Scanning forms part of identification of any animal and all regulatory work like vaccinations or certification should be preceded by scanning and verification of the animal's microchip.

Dogs and cats should be scanned by sweeping two times steadily at a distance of 50 mm along the long axis of the neck and thorax and twice over the back from elbow to elbow, and a maximum speed of 0.5 m/s.

Other animals are scanned in the relevant area by sweeping twice steadily at a distance of 50 mm along the length and the breadth of the area

Avoid interference by scanning away from computers, metal tables and fluorescent lighting and remove metal collars before scanning.

Certification:

Certification is always a veterinary procedure.

When a veterinarian inserts a microchip, he/she is seen to stand surety for the integrity of the process, the position and readability of the microchip, and the data in that chip and on the record base.

As with any identification, the veterinarian records what he/she perceives, including the numbers of all the chips he/she can scan in an animal, together with the other visual attributes.

Where the microchip was administered by a lay person, the veterinarian can only certify that on such date a chip with such a number is present in the animal of a said-description, equally to a brand or tattoo number applied by the owner.

Under no circumstance does a veterinarian take over the responsibility of proving the ownership of a microchipped animal.

Removal of a microchip:

Documentation of ownership should be required when a client requests that a veterinarian remove a microchip

Problems encountered

Veterinarians and para-veterinarians working with microchipping should take cognisance of the following documented side effects to the patient:

- Infection, abscesses, swelling, or trauma to spinal cord;
- Damage due to breakage of the glass after trauma or rough play;
- Possible MRI incompatibility;
- Tumours at the site of microchip implants has been well documented although rare.

For this reason the microchipping should not be enforced unless the authorities take responsibility in case of negative side effects; and the veterinarian or para-veterinarian may insist on owners signing indemnity before the procedure

However, considering the relative scarcity of these side effects, especially the-possibility of cancer, it is internationally accepted that there is more benefit than harm in using microchips

There are also problems with the microchips themselves:

- microchips that fail-to read;
- microchips that got lost;
- Migration of microchip is relatively common with the elbow and shoulder becoming the most common locations for errant transponders in small animals;
- Cloning an RFID implant is relatively easy and there is a need to facilitate authenticity validation of the tag itself and its stored and transmitted information; and
- RFID technology will eventually include the market availability of advanced transponders having enhanced data storage and read-write capabilities. Data security issues exist and are being addressed by the ISO, such as through the development of ISO 14233. The SAVC would support the use of advanced transponders when an open-standard solution for advanced transponders exists.