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# Making sensible decisions on microchips: radio frequency identification — past, present and future

**Ted Donelan**

## WHAT IS RFID AND HOW DOES IT WORK ?

Radio Frequency Identification (RFID) is a method of identification which utilises a signal transmitted between an electronic device (known as a 'tag', 'transponder' or 'microchip') and a reading device (or 'scanner'). The information provided by the transmitted signal identifies the transponder and, from reference to stored linking data (in a 'database' or 'registry'), identifies whatever is carrying that transponder.

RFID can be used to identify almost anything, be it car, animal, fish, bird, box, industrial sub-assembly or waste container. There is a range of RFID systems and the nature of the thing to be identified and the circumstances under which the signal is transmitted determine the type of system used.

In situations where long distance identification is needed, as in tracking wild animals from a helicopter etc, a battery operated device is preferred. This article does not deal with these 'active' devices.

The RFID devices most widely used in animals are passive in nature. They have no battery or source of power of their own but pick up the energy they require from the scanner. Devices of this type are called transponders and small transponders are called microchips. This method of energising the transponder severely limits the effective operating distance between the scanner and the transponder.

The scanner creates an energy field when it is turned on and the transponder picks up energy when its antenna enters this energy field. The transponder uses the energy to power an integrated circuit attached to its antenna. The integrated circuit creates a signal of specific characteristics including the transponder's identification data and transmits it using the same antenna.

The signal is then received by the scanner, either by the same antenna that created the energy field or by a separate receiving antenna. The scanner interprets the signal, converting it from binary data to decimal or other format, then sends it to a display, computer, or other device. In some cases transponder data alone is sufficient to identify whatever is carrying the transponder. However in many other situations, and in particular the identification of domestic animals, it is necessary to refer to information stored in a database registry to effect identification.

## WHY THE INTEREST IN RFID?

Ultimately all animal management and control is dependent on identification of the animal and linking of this identification to information regarding the owner. The Australian Veterinary Association (AVA) believes RFID is the preferred form of permanent identification of companion animals and is committed to the development of RFID in Australia. Amongst all the arguments and deals and development of policies and standards there often seems to be a lack of comprehension of the raison d'etre of RFID for us — namely, that it is an identification system to be used as a management tool in relation to the dog and cat populations. This means that the focus has to always be on practicality and performance in the field.

Our objective is to have an effective national system that not only enables the aims of animal control and management, but also facilitates the recovery and reunion of animals (injured or not) that have, for whatever reason, become separated from their owners.

## REQUIREMENTS OF A MODEL RFID SYSTEM

The big promise of RFID technology is the provision of lifetime identification, operating anywhere pets may go at any time of their life whether within a country or internationally. The efficient, practical functioning of a system which can link the animal to the owner is dependent on management and performance considerations regarding an inseparable trilogy of microchips, readers and database registries. In addition, there have to be accepted standard procedures for implantation, scanning, and recording animal and owner details.

### Microchip requirements

The microchip itself must function effectively. It must carry a unique identification number, be durable enough to last the life of the animal and be safe and non-reactive. In terms of performance it must be able to be read at a practical distance (we suggest 50mm) and speed (scanner sweep of 0.5 m/sec). It will not operate unless it is technically compatible with the reader network. We need a **microchip standard**.

### Reader requirements

Microchips will not be detected in animals unless there is a network of competent and compatible readers installed in pounds and shelters, animal welfare agencies and veterinary clinics. For the system to function in the field readers must be able to read all of the types of microchips likely to be implanted, at the distance and speed detailed above. We need a **reader standard**.

### Database registry issues

Registries and data base management are integral to the actual functioning of the system in the field. There is little merit in knowing the animal's number if that number cannot be linked to the owner or other data. Since animal RFID exists to provide this link it is essential that there be an integrated system of access to the other data needed to make use of the number. There is also a critical role for the database in ensuring the integrity of microchip code numbers and preventing number duplication.

From a practical point of view the database registry of information linking animals and owners must be directly and reliably accessible at any time by any authorised persons on the reader network. If the database is unreliable, unable to be contacted or not responsive to a simple access system, the system will be useless.

Nationally it is likely that we will have several database registries rather than a single one. Hence an essential component of operation and management will be integration and interfacing with other database registries in the national network.

From a management point of view there are issues such as independence and community confidence in the system and public interest considerations such as privacy and owners' rights to stored information. There are operational considerations such as backup and security of data. We need a **registry standard** to ensure the proper operation and management criteria are observed.

### Operational requirements

There are several other considerations to ensure the practical functioning of the system. The microchip must be handled and implanted correctly in a standard site. The animal and owner details must be accurate. The data must be captured at the time of implantation and stored in the registry for the life of the animal. There has to be a standard procedure for scanning animals for the presence of microchips. If the record is wrong or the chip incorrectly implanted or the animal wrongly scanned it won't link reliably and it will be useless. We have to have an **operational standard.**

## RFID IN AUSTRALIA

### Australian requirements

Australia is different to many other countries in that we have sovereign states and territories each setting their own controls over companion animals. This makes it virtually impossible to establish national legislative controls such as happens with livestock. The irony is that if we are to have an effective system for RFID in dogs and cats it is absolutely essential that we have a national perspective.

Microchips in companion animals can't be quarantined to a particular location. Australian pets are an open system; pets and their owners move around the country all the time.

It has been estimated that at least half of the companion animals identified by microchip will, within five years, be living some place other than the place where their chip was implanted. For microchips to be able to provide lifetime identification, they have to be readable wherever these pets go — anywhere in this country — at any time of their life. Hence, for any chip supplier, municipality (or state government for that matter) to unilaterally choose any particular 'stand alone' microchip/reader system is to demonstrate a dangerous ignorance of this critical national perspective issue. It also condemns their project to failure.

The other vital ingredient in the development of RFID systems (one that has been singularly absent in Australia) is consideration of the needs and the expertise of user stakeholder groups such as local government, animal welfare and the veterinary profession. Often there seems to be an inverse relationship between knowledge and power to make decisions. I am concerned that the interests of these user groups seems to be overwhelmed by the lobbying of massive vested interests in the development of RFID policy.

### The Australian experience

The basic requirements of a functional system of companion animal RFID are essentially quite simple and have been well documented. However, some ten years since we first started implanting microchips, we still do not have all the elements of a national scheme in place. What should have evolved rapidly as a result of consultation and cooperation between users and regulators has been festering along without real direction. The industry has been remarkable for its competing claim and counter-claim, misinformation and techno-babble. The environment is tense and the background seethes with hostility. We have seen self interested and ill-advised schemes and inadequate performance lead to system failures, loss of confidence in the technology and 'microchip aversion'. In my opinion this frustrating debacle is an indictment on our planners and policy makers.

### The incompatibility conundrum

The uncontrolled development of RFID in Australia has resulted in different technologies that are intrinsically incompatible because they operate on different radio frequencies — Destron (400 and 125), Trovan and AVID (plus its Global and Identichip clones). Technically these are all FDX-A technologies. We now have some 500,000 to 700,000 dogs and cats implanted with these types of microchips.

The registry side of things has been similarly disappointing. Haphazard proliferation, variable performance, inaccessibility, lack of coordinated operating protocols and inadequate communication between competing registries have all been major impediments to the proper functioning of our RFID system.

The introduction of multireaders able to read all these technologies and cooperation between the two major registries resulted in a workable and competitive though integrated system of known performance. However with the possible introduction of other proprietary technologies there was an obvious need for standardisation. Meanwhile internationally there has been the slow and painful development of an International Standards Organisation (ISO) standard designed to meet these problems. Paradoxically, if Australia adopts the ISO standard this means the introduction of yet another technology type requiring readers with different capabilities.

**Development of an Australian Standard — Committee IT/28**

In mid 1997, partly prompted by requests from the NSW government who wanted a standard on which to base the RFID provisions of their new legislation, Standards Australia set about developing an Australasian standard for electronic identification of animals. Committee IT/28 was given the role of developing standards based on the ISO RFID Standards 11784 and 11785. Rather naively we imagined that user/consumer groups like the AVA, the RSPCA, the Australian Local Government Association (ALGA) and so on, would determine in that committee process what was needed to suit Australia's needs before a framework of standards were drawn up to accommodate competent providers in a controlled but competitive environment.

In my opinion the Standards Australia process has unfortunately failed to adequately consider the interests of the important stakeholder groups mentioned above.

Rather than discussion and cooperation, committee processes have been notable for lack of consensus, mistrust and acrimony. I have the distinct and persistent feeling that neither Standards Australia, nor the NSW government, has ever properly understood the application of this technology in urban animal management.

Draft Australasian standards for electronic animal identification were released for public comment earlier this year. In the postal ballot of IT/28's 26 members in May this year the standards failed to gain approval when only some two thirds voted in favour of accepting the drafts. The main reason given for negative votes was lack of incorporation of a registry component relating to dogs and cats. Currently IT/28 is attempting to resolve these negative votes by developing a registry component acceptable to all parties that can be included in the standards.

The NSW government has made their preference clear by choosing to move to ISO product as soon as possible. However we have to retain our national perspective. NSW state and local government are represented on IT/28 but no other states are represented.

It would obviously be preferable for a suitable Australian standard to evolve from the IT/28 process. However if this does not happen there are other options.

We could well follow the Canadian model where user groups (the veterinary association, local government, kennel clubs and animal welfare) joined together to develop a practical standard that works well.

**INTERNATIONAL TRENDS**

In my opinion there is no doubt that the trend is to ISO, but while most countries are committed to the adoption of ISO they are taking their time to make the transition.

Companion animals dominate the RFID market in most countries and so are the first animals to face the need to convert. Commonly expressed concerns are lack of ISO reader network and non-conforming installed microchips. There are few instances of compulsory RFID, but even amongst those countries that have formally endorsed ISO, only a few are implanting ISO transponders en masse at the present time. The stimulus for widespread implantation in Europe is the implementation of the policy for free movement of animals within the European Union (EU) and the need for identification (ID) for rabies control. In Europe, the sale of non-ISO transponders for companion animals has effectively stopped.

In the case of livestock industries there is much less use of RFID and more of it is proprietary technology. A lot of testing and trialing is being done. There is not likely to be massive usage of ISO product until the completion of current field trials and then almost exclusively only in Europe. Again, the EU ID (animal passport) changes coming in 2002 is a deadline. In countries where there is no compulsion to identify livestock, the economics do not generally support RFID at the present time.

## UNDERSTANDING ISO STANDARDS

The International Standards Organisation is an international association of national standards bodies. It has no regulatory authority. It limits itself to producing guidelines, procedures and policies on a wide range of issues and applications. These international standards provide a template for member bodies to develop their own standards. Regulators may adopt these ISO standards unchanged or modify them to suit local conditions or requirements. The result is standards that are internationally compatible, consistent and clear.

ISO standards have no legal status on their own. When countries, regulators or users specify that products or services must conform to a standard, these organisations give their legal authority to the standard and they are responsible for enforcing the use of the standard, not ISO itself.

The ISO system does however provide for some degree of quality assurance. ISO may appoint other organisations to assess products or services and certify that they comply with particular standards. In this situation it is the registration organisation which bears the legal responsibility for the correctness of such certification.

### What are the ISO RFID Standards or animal identification?

**a. ISO 11784**
This international standard describes the structure and the information content of the radio-frequency identification code for animals. It is sometimes referred to as the ‘chip standard’.

It sets the length of the 132-bit binary message sent by the transponder to the scanner and the meaning of every bit in it. The message is split into several sections with specific meanings, including indicating whether the transponder is for animal use, manufacturer and/or country code and the fixed transponder identification code. There is also an error detection section to ensure the message is read correctly by the scanner, and some sections that are reserved for future use.

ISO 11784 states that it is a national responsibility to ensure that transponders carry a unique number within that country and says that ideally every country should maintain databases of information about all issued codes and the associated animals. Number uniqueness is supported by the use of a country code (based on another ISO standard) and/or a manufacturer code assigned by an organisation authorised by ISO.

**b. ISO 11785**
This international standard defines the technical aspects of communication between transponder and scanner. It is sometimes referred to as the ‘reader standard’.

It sets the frequencies of activation and response, the encoding format, and the precise interaction between the scanner and the transponder. This standard permits either one-way at a time signal transmission (Half Duplex — HDX) or simultaneous two-way signal transmission (Full Duplex — FDX). There is an explanation of how the two systems can be combined into one scanner.

ISO 11785 also discusses the problem presented by large numbers of animals having already been identified by various non ISO transponders (ones that do not conform to ISO 11784), and shows how these technologies can be incorporated into a scanner in accordance with ISO 11785.

### Are all ISO transponders the same?

No. There is a range of transponder size, type and intended use. Within each type there will also be variations in terms of performance. Importantly, they will all transmit the same format of message at the same frequency, though they could be either FDX or HDX. Technically, ISO transponders are FDX-B.

All transponders contain an integrated circuit (microchip) but these can differ widely in complexity and performance. They are made to specification in a specialised factory (a wafer fabricator) which makes chips for many other applications. These microchips are then assembled into transponders including an antenna of some type and packaged in the format required: glass rod, plastic ear tag, rumen bolus etc.

Some of the variations in construction will confer variations in performance characteristics such as read speed and distance — see subsection 5. These variations will probably be reflected in prices.

**Are all ISO readers the same?**

No. An ISO reader must read both HDX and FDX transponders according to the ISO communication protocols. It may also read other types but each additional technology reduces the overall efficiency of its operation (speed, range etc.) For a given transponder, scanner read distance can be enhanced by having a larger antenna which creates a larger, less intense electromagnetic field. Since the size and features of scanners can vary greatly, so does their cost.

**Do the ISO Standards guarantee number uniqueness?**

ISO does not guarantee or regulate anything. The ISO standards and associated protocols provide a mechanism whereby countries can guarantee number uniqueness using a combination of country and manufacturer codes and database management.

If country codes are used, they are issued in accordance with a separate standard ISO 3166: Codes for the Representation of the Names of Countries.

ISO have appointed the International Committee on Animal Recording (ICAR) to issue manufacturer codes to manufacturers who can demonstrate that their transponders comply with the standards. The contract permits ICAR to check on any complaints or randomly inspect transponders sold by that manufacturer. In addition the contract requires the manufacturer to guarantee that all transponders he sells will have unalterable and unique code numbers. The manufacturer code is included in the message sent by the transponder instead of a country code. If anyone copies his manufacturer code legal remedies are available based on product misrepresentation etc.

Countries can guarantee uniqueness by utilising country and manufacturer codes, database management and national laws and regulations. The national body may control the distribution of transponders under its jurisdiction, or it may have a contractual arrangement with all approved suppliers, and an approval system. It may require that all numbers to be used be recorded first on a national database, then only eligible numbers can be registered. In any case it must provide itself with legal remedies if any crime is committed, whether it is fraud, misrepresentation or other.

**Performance of ISO Products**

Some consumers have been reluctant to change from existing non ISO-compliant technologies of proven performance capabilities to the new and untried ISO products. ISO has authorised ICAR and other laboratories to test the field performance of ISO compliant transponders and scanners for which manufacturer numbers have been issued. When this process is complete consumers should have objective analysis of the performance capabilities of these products.

There are obvious differences in performance due to differing types of transponders. For example, small transponders such as 12 mm glass rods cannot be read at as great a distance as those with large antennas such as plastic ear tags.

However, for transponders of each particular type, there will also be variations in performance due to differing design. The most important variable is the antenna size and configuration, which determines the amount of energy captured by the transponder to operate the microchip. This in turn affects the strength of their signal transmission and hence the read distance.

Considering that ISO compliant products are made with the most recent components and are distributed in a rapidly expanding world market where product innovation and improvement are proceeding at a rapid pace, it is reasonable to expect improvements in performance. Intense competition enhances the likelihood of that outcome and also reduces the price.

**Effect of standardisation on technological developments and cost**

While it is true that to a certain extent having fixed standards is intrinsically limiting to technological development, there is still room for some development within the parameters defined in the standard

Manufacturers now face a real challenge. As an increasing number of users insist on ISO products, manufacturers lose their ability to keep existing markets closed and extract maximum profits. They now have to compete with other manufacturers. However since the market for ISO products is now expanding quickly because of confidence that compatibility is assured, other manufacturers choose to join the race to serve them. They must all compete on quality, features and price.

Standardisation has already delivered lower costs. This should continue as manufacturers recoup development costs. There is of course quite a price range relating to product design and hence performance.

The area of major new technological development is advanced transponders. The key is the extra space in the electronic message in ISO 11784. It permits the development of a virtually limitless number of new types of transponders with an enormous range of potential applications such as biological sensors, additional data storage and advanced security levels. A new standard which builds on ISO 11784 & 11785 is now under discussion to facilitate this progress in order to avoid future incompatibility among devices. At this point in time there seems little relevance to most consumers in these products.

**THE WAY FORWARD**

**Transition to ISO**

As I stated earlier, I believe the world is changing to ISO. The attraction of using ISO compliant products is that the ISO standards provide assurance that animals can be identified by any ISO scanner, anywhere, anytime. The concept of a single standard technology to which anyone can manufacture chips or readers encourages healthy competition. Consumers can be assured of several suppliers competing for their business with fully compatible products, rather than being limited to one manufacturer or at the mercy of the introduction of technically incompatible products. Ensuring compatibility creates confidence amongst users and permits rational planning.

There are also advantages in using internationally compatible products. Whilst with companion animals there are not the same implications for international trade, commerce and residue management as is the case with livestock, universal RFID could be vitally important in disease management and control in dogs and cats if a disease such as rabies were to be introduced to Australia.

What we should be considering at present is the transition phase to universal use of ISO products. Given that it has taken ten years to get to the current stage, it is critical that this transition period is sufficient to allow time for the development of a national scanner network capable of reading ISO microchips. Whilst some of our existing readers are ISO compatible, this is by no means universal and to some extent the adoption of ISO microchips will entail the deployment of a new reader network. Scanning centres need clear direction from policy planners to allow time to select and purchase new readers. Communication is critically important.

**Microchip considerations**

Whilst it may marginally increase costs it is imperative that microchips are individually packaged and that both the microchip and the delivery system are pre-sterilised.

In this transition stage it is important that we do not import additional technologies that cannot be read by the existing reader network and further complicate matters.

Any Australian Standard will recognise that significant numbers of animals have been implanted with ‘non-ISO’ microchips (i.e. the current AVID, Destron and Trovan microchips) and there will be a requirement for ISO compliant readers to be able to read these technologies for a period corresponding to the expected lifespan of these animals (‘backwards compatibility’). Hence the reassurances from microchip sellers that it is safe to continue to implant conventional technologies, at least in the short term.

Remember that the ISO standards contain no performance criteria. As noted before, not even all ISO microchips are the same. If purchasing ISO compliant products, check for a manufacturer's code and deal with manufacturers of known performance.

The answer to the question "what microchip should I implant?" is "the one that you know will be read by the reader network".

**Reader Considerations**

There is enormous variation in reader design and features. Power may come from single use batteries, rechargeable Ni-Cads or mains supply. Units range from pocket size through hand held models to large built in units. There are variations in antenna design, power output and technologies that can be read.

More recent models feature electronic capabilities such as advanced memories, computer interfaces and translation software. These features confer corresponding variations in performance and cost.

From a practical point of view, our major consideration is the range of technologies that can be read by the particular scanner. The older multireaders can detect and read all the conventional FDX-A microchips; some can be upgraded to also read the new ISO compatible or FDX-A microchips. Newer readers can read both FDX-A and ISO microchips. There are also readers available that only read ISO microchips. The critical consideration for scanning centres is that they are equipped with readers capable of reading the types of microchips likely to be present in the animals they handle. Increasingly this will include ISO microchips.

I believe that read distance is also very important in the real world of live animals. Read distance is a function of both the microchip (the energy required to activate the microchip) and the reader (the energy output and sensitivity of reception). However, it is more complicated than just maximum read distance. We also need to consider read area.

For most microchips and readers, the greatest read distance is achieved when the long axis of the microchip is perpendicular to the face of the reader. However, in reality the microchip is most likely to be lying parallel to the reader face when we are scanning animals.

Considering that microchips are implanted into young animals, many of which will develop substantial fat layers under the skin, long thick coats or fractious manners when being scanned, the AVA considers 50mm to be a practical minimum read distance. The performance abilities of a reader can be gauged in the following manner:

Place the microchip flat on a table (wood, not metal). Set the reader 50 mm above the table surface. Keeping the long axis of the microchip parallel to the long axis of the reader, slide the microchip across the table until it is read and mark the spot. Allow 25 sec for the microchip to ‘cool down’. Repeat the process from another direction, keeping the microchip in the same orientation. If you keep repeating this process long enough you will obtain a plot of the area within which the reader can read the microchip. You will probably find that there are in fact several ‘read’ areas.

Rotate the microchip 90 degrees and repeat the process. You will find that your reader reads the same microchip over an area quite different in size to before!

These read patterns are different for each microchip type with the same reader. There is even some variation with ISO microchips. In addition, different readers will give different read patterns with the same microchip.

When we are scanning an animal it is rather analogous to examining the animal with a torch in a dark room. Scanners vary in terms of the number, area (spot or flood) and brightness (read distance) of the torch beams we are sweeping over the animal. All these factors are important in determining whether or not we find the microchip.

There are several lessons from this exercise. Scanner performance varies greatly, even with ISO microchips. Read distance and read area do have practical significance. Scanning technique is similarly important. It is important to know your scanner and use it according to the manufacturer's directions. Make sure you have fresh batteries — performance will drop significantly before you are warned that battery levels are low. There is a reasonable correlation between performance and price.

**Registry Issues**

The fundamental role of the database system in ensuring unique identification numbers and providing audit trails, as well as storing data and facilitating reunions, has not been generally appreciated. As a result registry development has been uncontrolled and haphazard.

Registries must guarantee the safety and security of the data they contain. Registries function to enable data retrieval, but access to this data and its use must be limited to authorised persons. Again, performance is the key issue.

There has been considerable discussion regarding the desirability of having a single national registry. To me, function and performance are more important than the number or perceived degree of independence from other commercial activities.

We need to be pragmatic and I see no problems with the current multiple registries provided they can agree to operational protocols and are well integrated to enable data retrieval by a single telephone call for authorised users. Ultimately, competition may well stimulate better and cheaper services.

The guaranteeing of unique identification numbers is dependent on the database. The manufacturers' skeleton microchip data must be recorded somewhere in the system, together with details of sales and implanting centres. Comparison with pet and owner details once the microchip is implanted provides a full audit trail. As well as the unalterable identification number unique to the microchip, manufacturers also place their own allocated code on the microchip to indicate its source of manufacture.

Many of these database functions involve interfacing and communicating with other registries. As with all of these functional issues we need operational and management protocols to ensure effective performance. The question then becomes how to best develop and enforce these protocols.

**Registry issues and IT/28**

As mentioned earlier, the principal reason given for rejection of the draft Australasian standards for electronic animal identification earlier this year was the lack of a registry component relating to dogs and cats. Currently (July 99) IT/28 is attempting to resolve these negative votes by developing a registry component acceptable to all parties that can be included in the standards. Given the stated position of IT/28 committee members this will not be an easy task to achieve.

Whatever the outcome with the fledgling Australian standard, it is important to remember that such standards are only voluntary documents; they have no teeth unless they are adopted by government legislation. In other words the development of an Australian standard will not ensure compliance in those jurisdictions where there is no appropriate legislation.

**The domestic animal registries protocols**

Historically Victoria has for some time been plagued with registry problems. The main concerns were inadequate record keeping, difficulties in gaining adequate access to the information, information not being recorded for the life of the animal and proprietorship issues regarding the stored data. These problems were compounded by lack of public confidence because of poor performance and perceived conflicts of interest and a reluctance of state government to play a supervisory role.

In an attempt to address these problems, in March 1998 the Australian Veterinary Association joined with the RSPCA and the Cat Protection Society to establish an independent legal entity, Domestic Animal Registries Inc. (DAR) to oversee the proper and secure use of microchip technology in animals. The purposes of this organisation are:

a. to enable the establishment of, and through commercial service providers, to control the management and operation of, registries of data about domestic animals that have been permanently identified by permanently implanted RFID technology (‘microchips’) to ensure that these registries perform satisfactorily and have the confidence of the public;
b. to establish a mechanism for the repository of implanted RFID technology information convenient or necessary for the purposes of the Victorian Domestic (Feral and Nuisance) Animals Act or for any other relevant state, territory or local legislation regarding animal management;
c. to develop a legally binding framework of operation and management protocols to specify the minimum performance standards required of domestic animal database registry service providers. These protocols are to ensure that practical performance is guaranteed and the interests of animals, the pet owning public and local government are addressed and protected. In particular, to ensure that:

(i) rights of owners regarding recorded data are maintained by community trusteeship rather than ownership by a commercial entity;

(ii) adequate performance of the service provider is guaranteed;

(iii) data collected remains confidential, privacy issues are addressed and commercial exploitation of the data prevented;

(iv) continuity of register activity is assured in the event of default by the service provider;

(v) there is no favouritism of one technology or commercial entity over another.

Under the rules of the association, there will be no use whatsoever of the data in the registry or registries under the control of the association by any of the members of the association. In addition, no income or property of the association is to be distributed, paid or transferred directly or indirectly as a dividend, bonus or profit to any member of the association.

DAR developed appropriate operating protocols consistent with the aims list above and all commercially operating registries have been invited to comply and adopt the new proposals.

In September 1998 the major Victorian registry Central Animal Records (CAR) became the first commercial service provider to sign a legally binding agreement with DAR to comply fully with the DAR operating protocols and supervisory role. CAR has recently passed its first independent audit and the arrangement is working well.

I believe this arrangement provides an excellent model for ensuring registry quality control, either by using the DAR protocols or the Australian standard if that eventuates. The DAR concept allows for competition, it accommodates competent service providers, it meets consumer needs and it enables community control. Most importantly, it provides for user groups, particularly including local government, an operational framework within which competent providers can work cooperatively to deliver a functional result.

**CONCLUSION**

RFID has enormous potential as a tool in urban animal management. We have quite acceptable microchips and quite effective multireaders capable of detecting and reading all the currently used FDX-A technologies. There are still significant problems, especially with database operation, that need to be addressed if the system is to function optimally.

There is no doubt that the trend is to the use of ISO compliant technologies. However the use of ISO compliant product will not in itself solve our problems. In many respects the introduction of ISO will create new problems, hopefully only temporarily. Our immediate concerns revolve around managing the transition. Proper planning, advance notice of changes and effective communication are vitally important in managing the change.

Implanting a chip that cannot be scanned by the reader network or where details are not listed in an accessible registry amounts to little more than fraud. In the short term we choose microchips that are compatible with the local reader network, and consider upgrading our scanning potential to include ISO compatible products.

RFID can be a very complex and confusing subject. There are enormous vested interests, and the experience of the past ten years has been one of disempowerment of consumers and user stakeholders. It can all become very frustrating and depressing. However, rather than throwing up our hands in despair, I believe that those of us in animal welfare, local government and the veterinary profession owe it to our community and the animals in our care to inform ourselves on the subject and try to influence the powers that be to give us the best possible system for Australia.

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Dr Ted Donelan is a veterinarian with some thirty years experience in private practice. He currently has two practices in the Eastern suburbs of Melbourne. Ted has always been particularly interested in both animal welfare and the relationships between animals and their human companions. This has lead to extensive participation in urban animal management at both planning and practical levels.

Over the past ten years Ted has had wide-ranging involvement in the development of RFID technology on the national and international scene. He represents the Australian Veterinary Association on Standards Australia's Committee IT/28 and is Chairman of IT/28's Registry Subcommittee. Ted is the inaugural President of the registry watchdog Domestic Animal Registries Inc.

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