TECHNICAL CONTRIBUTION

THE USE OF MICROCHIP IMPLANTS IN IDENTIFICATION OF TWO SPECIES OF MACAQUE

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Electronic microchip implants were used to identify groups of crab-eating (Macaca fascicularis) *and rhesus* (Macaca mulatta) *macaques. They were implanted in different body sites and monitored for up to fifteen months. One group of rhesus macaques was trained to present the wrist in which the microchip was placed, to enable it to be read easily with the scanner. An improved method of permanently identifying primates will lead to better record keeping and could benefit the animals' welfare.*

Keywords: *animal welfare, identification training, macaques, microchip, scanner*

Introduction

Electronic microchip implants ('transponders') are now in use for identification of pet animals and laboratory rodents. Each microchip has a different identification number. They replace the need for tattoos which can be difficult to read, ear tags which can be pulled out, or collars which can become detached. (Ball *et al* 1991, Rasmussen 1991).

In this study, firstly 44 crab-eating macaques *(Macaca fascicularis)* and secondly 27 rhesus macaques *(Macaca mulatta)* were implanted with the devices. They were monitored for periods of up to 15 months.

1. Crab-eating macaques

Materials and methods

The microchip (BioMedic Data Systems Inc, New Jersey, USA) is encapsulated in glass, cold sterilized and each one is supplied inside its own sterile 12G disposable applicator needle. The microchip is cylindrical, 12mm x 2mm and insertion is simple as a special device in the handpiece expels it once the needle has been correctly located subcutaneously (Figure 1).

The identification number on the microchip is read using a scanner, the head of which is a large black disc about 130mm in diameter, and the system operates on a frequency of 4kHz. The scanner reads and displays the individual 10 digit alphanumeric identification code. The total weight of the scanner and reading apparatus is 3.3kg (Figure 2). A wand-type scanner was also used which is a white probe about 2cm diameter and 30cm long. Both scanners are distributed by PLEXX, ELST, The Netherlands.

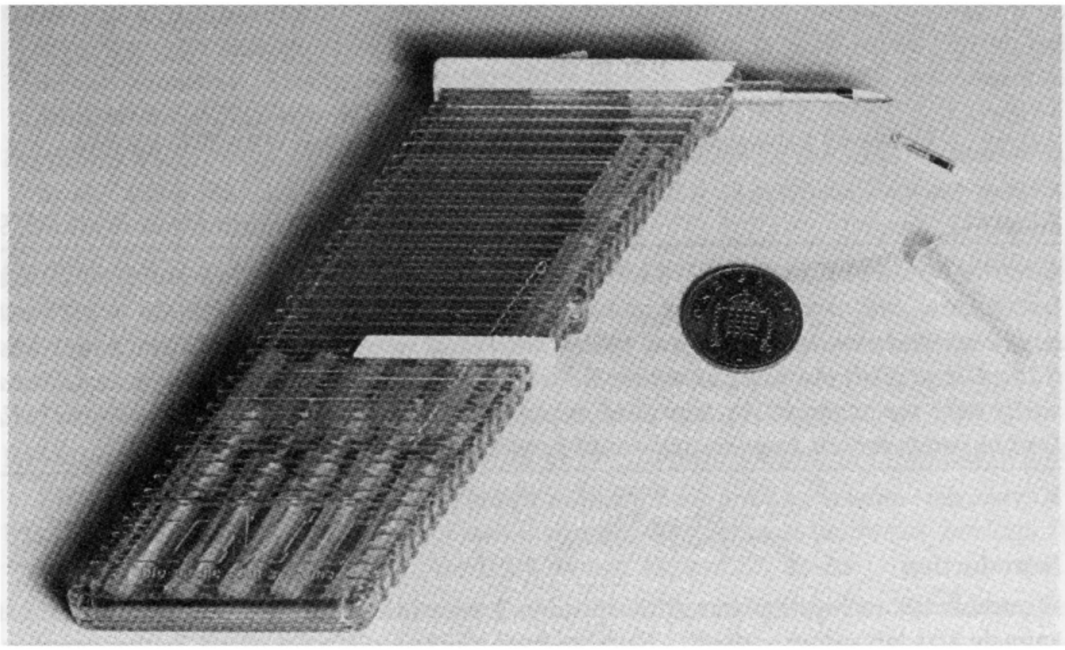

Figure 1 Implantation handpiece device and ejected microchip.

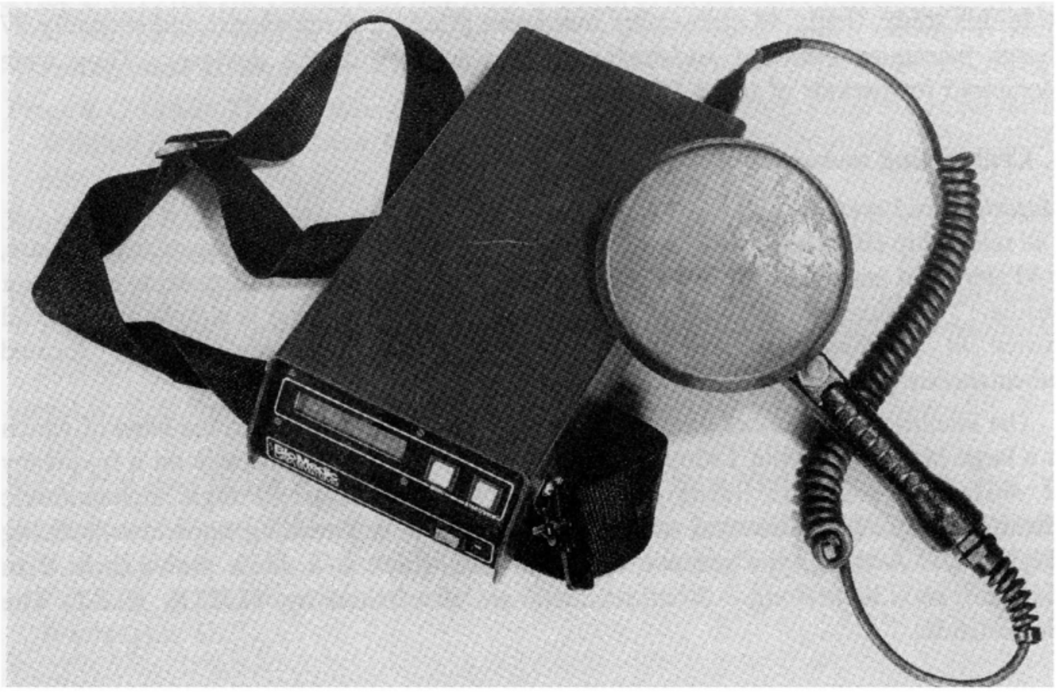

Figure 2 Circular head scanner and reading apparatus.

Forty-four male crab-eating macaques, of weight range 1.8 - 3.4kg, were implanted with the device, in the following body sites:

- scruff of neck (approximately midline over 4th cervical vertebra),
- right wrist (lateral to distal end of ulna),
- right side of tail base (lateral to the medial sacral crest),
- left elbow (caudo-lateral aspect overlying the borders of long head and lateral head of triceps),
- left ankle (lateral to Achilles tendon),
- sternum (overlying 7th sternebra).

Microchips were inserted while the animals were under ketamine tranquillization for other routine procedures. On one occasion there was some minor haemorrhage immediately after insertion, which was quickly controlled.

All the animals were housed singly in crush-back cages of varying size and design, apart from one group of five animals which were in a modular system gang cage with crush facilities. Attempts were made to read an animal's microchip while the animal was conscious. A negative result was recorded if it could not be read within three minutes. The experiments for which some of the animals were subjects terminated before this study did, however as many animals as possible were examined at one, two, six and fifteen months after implantation. In some cases an attempt was made to read the microchip whilst the animal was conscious: in others the animals had been anaesthetized for other routine purposes, and the microchip was read and its position checked by palpation at the same time.

Results

Adverse reactions and loss

There were no adverse reactions to implanted microchips in any animal at any time. Two transponders were lost; one from the tail base which was due to operator error since it had not been correctly placed initially. The other, which had been correctly placed, was implanted in the lateral ankle. It is not known whether this was lost, or whether there was some malfunction of the microchip. It was not palpable. Both were lost soon after implantation, before the first follow-up. Table 1 shows the numbers of animals examined at differing times since microchip implantation.

Table 1 The numbers of animals examined at differing times since microchip implantation.

Time since implantation (months)	1	2	6	15
No of animals examined	36	27	34	18

Movement

The microchip was easily palpable under the skin. In some animals the microchip migrated from the original site of implantation. In no case had it moved more than 5cm. Mostly this occurred where implantation had been at the scruff of the neck where there is plenty of loose skin, but in one case, migration occurred proximally from the ankle site to somewhere deep in the leg, such that it could no longer be palpated. It could still be read with the scanner.

Reading

Reading the device in conscious animals was difficult. The major obstacle was the rather cumbersome nature of the reading apparatus, combined with the design of the cages: the food hoppers, cage catches and so on always seemed to be in the way. The animals did not like the large black head of the scanner: it appeared to frighten them. The wand-type scanner did not frighten the animals but was difficult to manoeuvre through the mesh of the cage. The animals' reaction was to hold it and chew on it or attempt to break it; it is doubtful that it would stand up to such treatment for very long. The wand-type scanner was not used in the second part of the study. Table 2 shows the success rate for reading the device in conscious animals using the original circular head scanner and a crush cage for restraint.

There were no difficulties reading the device in tranquillized animals and the readings were found to be 100 per cent accurate on comparison with the interpretation of the hand-written numbers on the inside of the thigh, which was the current method of identification. In the group of animals kept in a gang cage, the device was invaluable for identifying the individuals as all other identifying marks had been erased.

Table 2 **Success rate of reading microchips using the circular head scanner on conscious crab-eating macaques in a crush cage.**

Site of implantation	No of animals	No of attempts to read in the conscious animal	No of successes	% Success rate
Scruff of neck	5	12	0	0
Right wrist	8	22	9	41
Right side tail base	8	14	4	29
Left elbow	8	25	11	44
Left ankle	7	22	2	9
Sternum	8	24	1	4

2. Rhesus macaques

Materials and methods

Following the work done on crab-eating macaques which indicated that the wrist and elbow were the most satisfactory sites for implantation, 27 rhesus macaques were implanted, as in the first part of the study, with the device in these sites. There were 12 male and 15 female animals, their weight range being 3.5 - 9.0kg.

Nine of the male animals, which were singly caged, were pretrained to aid reading of their identification numbers. They were taught to accept a reward (banana chip, peanut or sugar sweet) through the bars of their cage. It was noted if the animal had a preference for using either its right or left hand to accept the reward.

The microchip was then implanted under ketamine tranquillization in the lateral carpus of the preferred hand, or the right hand if no preference had been detected. Six were put on the right side and three on the left.

Nine days later it was attempted to read the microchips by simply bringing the animals to the front of the cage using the crush-back mechanism. None could be read.

Four weeks after implantation, the animals were encouraged to put their arm through the bars to take a reward which had been placed on the surface of the scanner. The device was read easily in three mature animals. In the six younger animals, it was not possible as they appeared very nervous of the reading apparatus.

Over the next three weeks all the animals were trained (either two or three times weekly) to take rewards from a black wooden disc of a similar size to the head of the scanner. This was not particularly arduous for the researchers and did not add much time to the monkeys' usual routine. Eight of the animals were tested with the scanner after the three week training period. In all but one, the microchip could be read quite easily within three minutes. The individual bearing the microchip which could not be read within the three minute time limit would only reach for the reward with its left hand and the microchip had been implanted in its right wrist (Amstrad; see Table 3). All the animals were trained with the black wooden disc two or three times during the following week, and then the trial was repeated with all nine monkeys and the time taken to read the microchip from the beginning of scanning was recorded.

Results

The results are as shown in Table 3. The average time taken to read the identification was 45.8 seconds with a range of 2-140 seconds.

It should be noted that the reading was done by the same person that had trained them.

The other 18 rhesus monkeys were all implanted in the elbow, the three males on the left side and the 15 females on the right side. Some of these animals were kept in push front gang cages and reading these in the conscious animal was not possible. For those kept in single cages, six out of thirteen (46%) attempts at reading the device were successful. This is consistent with the success rate in the crab-eating macaques housed in single cages with the microchip in the lateral elbow position.

Table 3 **Time taken to read microchips using the circular head scanner on trained conscious rhesus macaques.**

Animal's name	Wrist implanted	Time taken to read (s)
Clive	L	7
Amstrad	R	140
Topaz	R	45
Citrine	L	20
Amethyst	R	70
Peridot	R	80
Taranta	R	2
Kojak	R	2
Sam	L	47

Discussion

This use of the microchip implant has indicated that as a permanent method of identifying the animal, it is very satisfactory. The use of elbow or wrist sites gives the greatest success in reading the identification number while the animal is conscious, but this was still only possible in under half the attempts. Modification of the scanner head so that it is less frightening to the animals may improve its usefulness. A hook on the side of the scanning machine for the scanner head would be a major improvement, enabling the operator to have two hands free to work the cage crush mechanisms. A lighter weight version would be more acceptable if it is to be used for prolonged periods of time. In larger cages, the animals appeared more confident and therefore less intimidated by the scanner head. On one occasion, a microchip placed at the sternum was read very easily and could also be palpated in the conscious animal in a different design of cage. It was felt that the previous failure to read these at the sternum was due partly to the cage design, rather than a fault in the microchip/scanner system.

Conclusions and welfare implications

With a simple training procedure, the rhesus monkeys were easily identifiable. However, such animals are usually known individually by their keepers, although electronic identification may be useful in the storage of experimental data, since the scanner can be linked into a computer system. Improved record keeping will enable a full history of individual animals to be easily retained which could be used to benefit their welfare: accurate permanent identification is vital to keeping such records.

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References

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