Refinement of Core Body Temperature Collection in Macaques Using Implantable Temperature Microchips

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Introduction

Core body temperatures give invaluable insight to physiological changes and general animal health and as such are a critical component in pharmacokinetic and biologic drug analysis. Historically, rectal probes have been used to determine core body temperature in research animals and are proven to provide reliable and accurate data. However, this method is an invasive procedure that requires considerable handling and restraint, as well as safety considerations for both animals and technical staff.

To refine the core body temperature procedure in nonhuman primates, improve the well-being of our animals and minimize safety issues, this trial evaluated implanted UID (UCT-2112) microchips to collect core body temperatures with a high powered reader, without the need to remove the animal from its cage.

The study was conducted in an AAALAC-accredited facility according to Animal Welfare Regulations and after IACUC approval.

Objective

Find a reliable, minimally invasive method to collect core body temperature while reducing handling stress and exertion.

Materials

- UID (UCT-2112) 2 identical temperature reading microchips and applicator (Figure1a)
  - Each re-usable microchip was pre-programmed with the animal's unique identification number before implantation.
- UID URH1 Reader (Figure 1b)
- UID URH-300HP High Power Reader (Figure 1c)
  - The high power reader allows the user to get the data from further away (~4-6 inches instead of 1-1.5 inches)
- DSI L20 telemetry device (previously implanted) receiver and Ponemah software
- Rectal thermometer and probe covers

Figure 1a

Figure 1b

Figure 1c

Methods

Four cynomologus macaques were anesthetized, the injection site was aseptically prepared and the temperature reading microchip was implanted in the intraperitoneal cavity using the applicator (Figures 2-5). Each animal was then implanted with an identical microchip, injected subcutaneously in the scapular region while still under anesthetic.

The animals selected for this study had been previously implanted (IM) with a DSI L20 telemetry device, which allowed for the collection of comparative body temperature data. Each method of collection was then compared to a rectal temperature reading to determine the reliability and accuracy of the data against a known standard. Temperatures were recorded immediately after implantation and for 4 consecutive days thereafter. The collections were repeated once weekly for a further four weeks to assess the proper functioning of the microchips and readers.

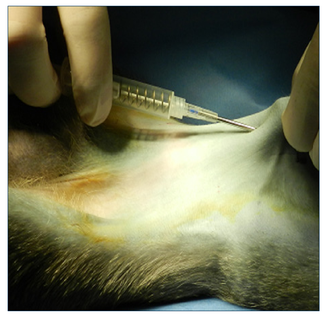


Figure 2

Figure 3

Figure 4

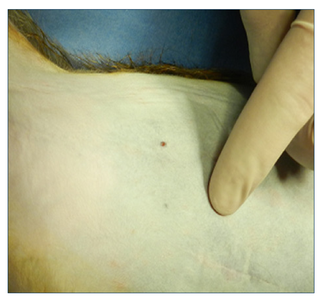
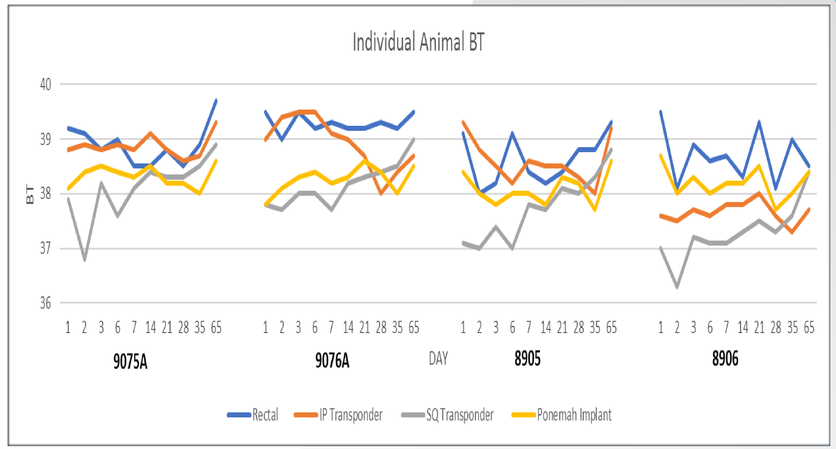


Figure 5

Results

The data showed that the intraperitoneal implanted microchip gave reliable data, averaging within 0.9% of the rectal temperature values throughout. The intramuscular telemetry readings were within 1.7% and the subcutaneous microchip values were within 2.7% of the rectal temperature readings.



BT=Body Temperature - values shown in degrees Celsius

Conclusion

When the data was collected from the animals using the UID URH-300HP high powered reader, the technicians were able to identify each animal and collect the body temperature data by simply moving each monkey to the front of the cage. In addition, the data could be safely and easily obtained at multiple time intervals. This reduced handling stress and exertion for the monkeys, factors that can influence the core body temperature.

The intraperitoneal implant readings remained consistently close to the rectal temperature values throughout the trial. The data obtained by this method was considered to be a reliable and accurate replacement for rectal temperatures.

Acknowledgements

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