USE OF A COMMERCIAL CONTINUOUS INTERSTITIAL GLUCOSE MONITOR IN RABBITS (*ORYCTOLAGUS CUNICULUS*)

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Abstract

The objectives of the research study described in this article were to establish a technique of applying a commercial continuous interstitial glucose monitoring (CIGM) system in the rabbit (*Oryctolagus cuniculus*) and to describe the longitudinal glucose curve. A total of 7 rabbits were included in the study and each was outfitted with a CIGM monitor with glucose data from the subject animals continuously recorded for up to 7 days. The CIGM system successfully recorded glucose values and allowed for the description of longitudinal glucose data in rabbits. The results of this CIGM research investigation in rabbits indicated that the use of the commercially available system was feasible and provided increased insight into glucose metabolism in this species.

Key words: rabbit; continuous interstitial glucose monitor; glucose; CIGM

INTRODUCTION

In human medicine, continuous interstitial glucose monitoring (CIGM) is an essential tool for modern diabetes therapy. The technology has been developed as an alternative to traditional blood glucose monitoring methods. The predominant aims of CIGM are to improve glycemic control and to prevent hyperglycemia and hypoglycemia to delay the onset of diabetic complications, thereby improving both patient treatment response and quality of life. Several CIGM systems are available for the human market, some of which have been used over the last few years to evaluate blood glucose levels in veterinary patients. The main use of CIGM in veterinary medicine is monitoring the insulin response of cats and dogs that are often hospitalized for the diagnosis and the treatment of diabetes.[1] The use of the glucose monitoring technology in this manner sheds light on the physiological changes in glucose concentration over a prolonged period without interference from handling or from other stressors, thereby providing insight into longitudinal changes in the animal's glucose metabolism. To the knowledge of the authors, the normal glucose pattern of the rabbit has not been investigated over a prolonged period using a commercially available CIGM device. The correlation of blood glucose with interstitial glucose in the rabbit was previously described using custom-made monitors.[2] This study describes the longitudinal pattern of interstitial glucose values for the domestic rabbit (*Oryctolagus cuniculus*) and describes the feasibility of using a CIGM system in this species while at the veterinary hospital or at the patient's home.

MATERIALS AND METHODS

Animals

A total of 7 New Zealand white rabbits were used for the study described in this article and they were

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housed at the animal-holding facilities located at the University of Georgia, College of Veterinary Medicine. The animals were involved with another study; however, the CIGM devices were implanted 24 hours before the start of the primary research project. At the time of device implantation, the animals had been housed at the facilities for 7 days as part of the conditioning period. The animals were all housed individually in the same room under standard laboratory conditions. The study was approved by the Institutional Animal Care and Use Committee and the Clinical Study Protocol Review Committee.

CIGM System

A professional CIGM system (i-Pro 2, Medtronic, Northridge, CA USA) was used for this study. The complete system consisted of a single-use sensor, a recording monitor, a docking station, a computer, and the requisite software. The sensor was an amperometric device designed to automatically measure glucose in the subcutaneous interstitial fluid every 5 minutes for up to 7 days. The sensor was housed in flexible tubing enclosed by a polyurethane membrane, which allows the active electrode to interact with the interstitial fluid. The tubing containing the sensor was contained within a 30-g needle for introduction through the skin into the subcutaneous tissue. Once the flexible sensor was placed and the needle was removed, the sensor was secured to the skin and attached to a small recording device. The recorder was removed at the end of the research investigation, and the data then uploaded via a docking station and USB cable. During the upload, the manually obtained blood glucose values were added, which then were used as reference values for the sensor. After the computer upload of the CIGM data, the software automatically generated graphs for the longitudinal glucose curves.

Experimental Procedure

Animals were manually restrained and a small area (10 × 10 cm) of the skin on their dorsum was clipped. A placement site directly between the scapulae was selected to minimize sensor damage by self-grooming; in other animal models, this site was also shown to provide the benefit of a large subcutaneous area and a less restrictive tissue space.[1,3] The clipped area was aseptically prepared and the CIGM sensor inserted and attached to the skin with tissue glue (Gluture, Abbott Laboratories, Abbott Park, IL USA) (Fig. 1). The recording monitor was attached after 30 minutes,

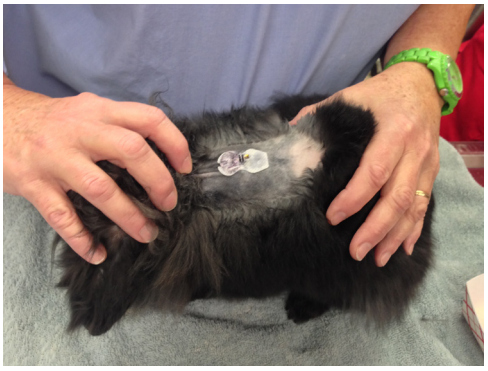

FIGURE 1. This image illustrates the clinical setup of the stylet placement in a pet rabbit.

allowing time for the sensor to become moist and set for data collection (Fig. 2). To avoid accidental removal of the stylet, the monitor was taped to the skin with medical tape. Each day, 2 blood glucose samples were obtained and analyzed using a portable blood glucometer (PBGM) (Alphatrek, Abbott Laboratories. Abbott Park, IL USA). These values were entered into the computer program during the download of the final data set at the end of the data collection period. Data were collected for 5 to 7 days, during which the animals underwent a routine ovariohysterectomy procedure followed by 2 different analgesic treatment regimens as part of another research project.

FIGURE 2. The computer is attached to the stylet and can be kept in place to collect data for up to 7 days, for up to 2016 glucose measurements.