

Measurement of body temperature by use of auricular thermometers versus rectal thermometers in dogs with otitis externa

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Objective—To compare measurements of body temperature obtained with auricular thermometers versus rectal thermometers in dogs with otitis externa.

Design—Prospective study.

Animals—100 client-owned dogs: 50 with and 50 without clinical evidence of otitis externa.

Procedure—Dogs were evaluated for the presence of otitis externa on the basis of clinical signs, otoscopic examination, and cytologic evaluation of ear exudate. Auricular and rectal temperatures were obtained simultaneously in all dogs prior to and following ear examination.

Results—There was a high correlation between auricular and rectal temperatures in dogs with otitis externa both prior to and after ear manipulation. Significant differences were not detected in temperature measurements among dogs with different degrees of otitis externa.

Conclusions and Clinical Relevance—Auricular temperature readings obtained by use of an auricular thermometer in dogs with otitis externa are accurate measurements of body temperature, compared with rectal temperature measurements. Temperature measurements are reliable before and after examination of the ear canal. (*J Am Vet Med Assoc* 2002; 221:378-380)

The use of auricular thermometers is gaining popularity in veterinary medicine, because temperature readings are available within seconds, and animals do not resist these devices as much as traditional rectal thermometers.¹⁻³ This can be related to pediatric medicine in which there has been good success using auricular thermometry, as human ear thermometers are accurate, fast, and well tolerated by children.^{4,5} Auricular thermometers also allow for better estimation of core temperature, compared with rectal readings, thereby providing more precise determination of actual body temperature.^{3,6} However, the first auricular thermometers available were designed on the basis of human ear canal conformation, which resulted in erroneous measurements when used on companion animals.¹⁻³ Also, there is variable reliability when using dif-

ferent brands of human auricular thermometers and when the measurement is performed by multiple operators.⁷ Recently, a veterinary auricular thermometer was released with a smaller probe and an angle that allows better placement for access of the tympanum in dog and cat ears than do human auricular thermometers, thus providing more accurate assessment of core body temperature.^{3,8} Results of a study³ performed by the company that developed this veterinary thermometer revealed its accuracy in comparison to rectal thermometers, but the effects of otitis externa on thermometer readings were not evaluated. Otitis externa affects 5 to 20% of dogs and 2 to 6% of cats.⁸ Given that otitis externa is a common disease in companion animals, it is important to determine the efficacy of ear thermometers in this population. The purpose of the study reported here was to determine whether auricular inflammation, infection, and drainage significantly affected the readings obtained with this veterinary auricular thermometer in dogs.

Materials and Methods

Dogs—The dogs included in this study were patients examined at the University of Missouri-Columbia Veterinary Medical Teaching Hospital Community Practice Service, regardless of primary complaint. Concurrent auricular and rectal temperatures were obtained in 50 dogs with clinically evident otitis externa and 50 dogs with no history or clinical signs of otitis during the 6 months prior to examination. Auricular temperatures were obtained from both ears on each dog by use of a veterinary auricular thermometer.⁴ Rectal temperatures were obtained with a commercially available digital thermometer.⁶ Following temperature measurement, cytologic and otoscopic examinations were performed on both ears in all dogs. Three of the authors (AMG, DEP, RLM) were responsible for obtaining auricular temperature measurements, preparing and reviewing cytologic specimens, and grading the severity of ear disease. Material for cytologic evaluation was obtained by use of cotton swabs inserted into the entrance of the horizontal canal. The material collected was rolled out onto a glass slide, briefly heat-fixed, stained with a modified Wright-Giemsa stain, and examined for evidence of bacteria, yeast, and WBC. If the otoscopic examination revealed *Otodectes cynotis*, the exudate was typical in appearance for an ear mite infection, or if the dog's history indicated exposure of the dog to other dogs or cats, a sample of the exudate was prepared in mineral oil to examine specifically for ear mites. All dogs then had an otoscopic examination to assess degree of inflammation, erythema, and amount and character of exudate. To the authors' knowledge, there is no standard reference for grading otitis. For the purpose of this study, the following system to grade otitis was created by the authors: 1) mild = head shaking or scratching, with erythema and mild exudate on otoscopic examination, and presence or absence of infectious organisms on cytologic evalua-

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tion, without the presence of inflammatory cells; 2) moderate = discomfort on ear manipulation, malodor, erythema, moderate-to-severe exudate on otoscopic examination, and presence of infectious organisms on cytologic evaluation, without inflammatory cells; 3) severe = painful on ear manipulation, malodor, erythema, severe exudate, with or without stenosis of the ear canal on otoscopic examination, and infectious organisms and inflammatory cells on cytologic evaluation.

Auricular and rectal temperature measurements were repeated after ear examination to evaluate whether there was a difference between readings, because the possibility existed that manipulation of the ear and insertion of the otoscope and cotton swabs could increase inflammation and alter the auricular temperature readings. The time between measurements was recorded to document that the second reading was performed shortly after ear examination.

Statistical analyses—Descriptive statistics (mean, SD, SEM, and range) were determined for the thermometer readings on both rectal and auricular temperatures obtained before and after otoscopic examination and for the time between temperature measurements. The Spearman rank order correlation coefficient was calculated to determine the strength of the association between the rectal and auricular temperatures. The Mann-Whitney rank sum test was used to compare different degrees of otitis externa. Values of $P < 0.05$ were considered significant.

Results

For the 50 dogs with otitis, each ear was evaluated individually. Of the 100 ears, 53 were classified as having mild, 34 as having moderate, and 10 as having severe otitis externa. Three dogs were affected in only 1 ear and had no clinical or cytologic evidence of otitis in the contralateral ear. Therefore, the results from 97 ears were used for statistical purposes. Of the cytologic evaluations, 25 specimens did not reveal infectious organisms or inflammatory cells, 47 had yeast infections only, 6 had bacterial infections only, 11 had both yeast and bacterial infections, 4 had *Otodectes* spp and yeast infections, 1 had *Otodectes* spp and bacterial infections, and 3 had bacterial infections and neutrophils.

Both right and left auricular temperature readings were compared to rectal readings before and after ear manipulation. A significant ($P < 0.001$) correlation was detected between auricular and rectal temperatures at both times readings were obtained (ie, prior to ear examination and after ear examination) in both otitis and nonotitis groups. Mean time between readings was 3.6 minutes (range, 3.0 to 15.0 minutes) in dogs without otitis and 5.1 minutes (range, 2.0 to 30.0 minutes) in dogs with otitis externa. The time lapse between readings is important, as it reveals that the second temperature measurement was performed shortly after ear examination in most dogs.

Temperature readings were compared on the basis of severity of otitis externa. Because the severe otitis group was underrepresented in the study (10 ears) and the severe- and moderate-otitis groups had considerable erythema and exudate formation, compared with the mild group, the 2 groups (moderate and severe) were combined for statistical purposes. Mean (\pm SD) temperatures for the mild ($n = 53$) and moderate-severe groups (44) were 102.2 F (± 1.043 F) and 102.4 F (± 0.893 F), respectively. Significant differences were

not detected between the mild and moderate-severe otitis groups ($P = 0.094$).

Discussion

The data reveal that there is a strong correlation between rectal and auricular temperatures in dogs with and without otitis externa. It has been reported^{1,3} that human ear thermometers are not highly accurate in animals, most likely because of the difference in ear conformation between humans and dogs. Our results revealed that the animal ear thermometer yields an accurate assessment of body temperature, which is of importance to practitioners, because they are offered a method of measurement that is not only reliable but also convenient to use and well accepted by dogs and their owners.

We compared results from the mild otitis group to the moderate-severe otitis groups and did not find any significant differences. However, the severe group was underrepresented, and most dogs with severe otitis were too painful to withstand the probe being inserted in the ear. Therefore, although the auricular thermometer appears to be accurate in patients with severe otitis, rectal temperature measurements may be indicated to avoid discomfort and lack of patient compliance.

Our results also revealed that there were no significant differences between auricular temperatures obtained before and after otoscopic examination and sample collection. Therefore, the auricular thermometer can be used at any point during the physical examination, and multiple readings may be obtained on the same patient within a visit. However, it is important that users become accustomed to the optimal technique required for obtaining accurate temperature measurements, because there is the potential for error from inappropriate usage.^{3,6}

Knowing that auricular thermometry is accurate in dogs with otitis is important, because otitis is a common medical problem in dogs.⁸ Also, there are situations in which a rectal temperature measurement would be contraindicated, such as in animals with rectal lesions or animals that become aggressive when the hind end is manipulated. On the basis of results of this study, temperatures can be assessed with confidence by use of auricular thermometry in dogs with mild-to-moderate otitis externa. However, most dogs in this study had no extra-auricular conditions that caused an increase or decrease in body temperature. Further work is necessary to assess the accuracy of auricular temperatures in other species with and without ear lesions, in febrile and hypothermic animals that have otitis, and in animals without tympanic membranes.

*Vet-Temp VT-100 instant animal ear thermometer, Advanced Monitors Corp, San Diego, Calif.

[†]Basis Model 720 digital fever thermometer, Polymedica Healthcare Inc, Golden, Colo.

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