Obesity & Feline Diabetes

Type 2 diabetes mellitus (DM) is associated with defective insulin secretion, insulin resistance, loss of pancreatic β-cell mass, and islet amyloid deposition. Islet amyloid polypeptide (IAPP) is a normal secretory hormone product of β-cells. Intracellular oligomeric aggregates of IAPP are an early step in amyloid formation. These aggregates are toxic to β-cells and may be linked to cell loss in humans and cats with type 2 DM. This study investigated whether an association between obesity and changes in IAPP exists in cats. Fasted serum or plasma concentrations of insulin, glucose, and IAPP were compared in 3 groups of cats: nondiabetic (n = 82), nonketotic-diabetic (DM, n = 21), and ketoacidotic diabetic (DKA, n = 6). Body condition score (BCS) was assigned on a scale of 1 to 9; only cats with a BCS ≥ 5 were included in the study. Cats in the DM and DKA group had significantly higher mean glucose concentrations than nondiabetic cats. Although mean serum insulin concentrations were lower, there was no significant difference between the DM-nondiabetic and the DKA–DM cats. Mean IAPP plasma concentrations were significantly different between cats with a BCS of 5 and 7. Mean IAPP plasma concentrations were similar between the DM group and nondiabetic cats with a BCS of 8 or 9. Mean IAPP plasma concentrations were significantly lower in the DKA group compared with nondiabetic cats [BCS 6/9] and cats in the DM group. Statistical analysis revealed a significant positive correlation between BCS and IAPP and insulin concentrations in nondiabetic cats.

Commentary: These findings support the theory that obesity contributes to insulin resistance and may predispose cats to DM. Although as a population overconditioned cats had higher serum insulin and IAPP levels, considerable variability was noted; some obese cats had levels comparable to cats with an ideal BCS, while others had significantly higher levels. This leads to the question of why some overconditioned cats show evidence of insulin resistance while others with a similar BCS do not. Although obesity may be a risk for DM in cats, additional genetic and/or environmental factors may be at play.—Jennifer Ginn, DVM, Diplomate ACVIM


Antibiotic Gel: Efficacy & Clinical Use

Standard culture and susceptibility methods may not appropriately estimate antimicrobial concentrations necessary for treating deep surgical infections. This can lead to underestimation of in vivo minimal inhibitory concentration values needed to resolve infection. Local therapy is a useful adjunct to systemic antibiotics, as high local concentrations can be obtained with minimal risk for systemic toxicity. Antibiotic-impregnated implants are used most often for this purpose, achieving up to 20 times the therapeutic level obtained in serum after systemic administration. The most common vehicle for local deposition is antibiotic-impregnated polymethyl methacrylate (AIPMMA) cement. However, because AIPMMA cement is nonabsorbable, additional surgery for removal is usually required to avoid foreign-body reaction or bacterial colonization. AIPMMA cement may also induce inflammatory and/or cellular immune responses. The ideal vehicle would be sterilizable, stable in storage, biodegradable, and bio-compatible and would consistently release medication from the implant (ie, have a consistent elution profile).

This study evaluated the elution and bioactivity of 2 antibiotic combinations (amikacin and clindamycin; amikacin, clindamycin, and vancomycin) in a dissolvable, cross-linked dextran polymer matrix (R-gel, royerah.com). Both R-gel formulations showed rapid release in the first 24 hours with gradually decreasing concentrations over a 10-day period. There were no significant differences between the formulations; bioactivity against Staphylococcus aureus was still present in both groups on day 10. Vancomycin was included, as it is frequently used to treat methicillin-resistant S aureus infections in humans; however, no form of vancomycin is currently approved for veterinary use.

Commentary: Systemic treatment of local infections, especially in postoperative cases, can be challenging. This benchmark study evaluated elution (leaching out) for a commercially available gel. Because antibiotic gel is considered a device and not a drug, testing by the FDA has not occurred. Therefore, this experiment was useful for demonstrating efficacy. The quick, large amount eluted in the first 24 hours is consistent with elution characteristics of antibiotics impregnated in bone cement, plus the gel is absorbable. The gel also does not release heat when the dextran molecule polymerizes, alleviating concerns of heat damage to the antibiotic before implantation. This experiment provides needed science to support clinical use of this product.—Jonathan Miller, DVM, MS, Diplomate ACVS