INTRODUCTION. Fresh osteochondral allografts have demonstrated more than 75% clinical success in treatment of femoral condyle lesions, avascular necrosis and iatrogenic cartilage injury [1]. However, long-term maintenance of allograft tissue is challenging. Dexamethasone is a synthetic adrenal corticosteroid with a potent anti-inflammatory property and is used in treatment of a wide variety of inflammatory conditions such as rheumatoid arthritis [2]. It has also been shown that dexamethasone has protective effects against catabolic-inducing factors [3, 4] and induces the expression of anabolic growth and differentiation factors [5]. A previous study showed that functional properties of the juvenile bovine cartilage can be successfully maintained for up to 6 weeks in medium supplemented with dexamethasone [6]. For these reasons, we speculate that dexamethasone can play a role in maintaining or even enhancing the mechanical properties of the cartilage explants in serum-free medium. In this study, we explore the effects of dexamethasone on long-term maintenance of mechanical and biochemical properties of bovine and canine cartilage explants.

MATERIAL AND METHODS. In Study 1, juvenile bovine cartilage plugs (Ø4 x 5-6mm) were harvested from the femoral condyles of calves. Middle zone explant disks of 2.2 mm thickness were obtained by removing both the superficial (0.25-0.5 mm) and deep zone layer from the cartilage plugs. In Study 2, full-thickness osteochondral plugs (Ø3mm) were harvested from mature (1-2 year-old) bovine femoral condyles and cleaned of bone marrow. In Study 3, full-thickness osteochondral plugs (Ø3mm) were harvested from mature (1-2 year-old) canine femoral condyles and cleaned of bone marrow. Explants were grown in chemically defined serum-free medium (CM) (DMEM, 1% ITS+ Premix, 50 µg/ml L-proline, 0.9 mM sodium pyruvate) for 4 weeks [7]. In Study 1 and 2, three groups were: explants were cultured with continuous supplementation of 0.1 µM dexamethasone (Dex); with dexamethasone removed after 2 weeks of culture (2wk); without dexamethasone throughout the culture (NoDex). In Study 3, only Dex and NoDex groups were used. The equilibrium moduli ($E_0$) of the explants were evaluated by an equilibrium stress relaxation test. Explants were halved and either digested with 1.0mg/ml Proteinase-K to quantify their biochemical content (GAG, collagen, DNA) or processed for histology (Safranin O). Statistics were performed using ANOVA and the Tukey post-hoc test, n=4 per group.

RESULTS. After 28 days, $E_0$ of juvenile bovine explants grown with continuous supplementation of dexamethasone increased by around 50% (reaching value of 2800 kPa) from the day 0 value while that of the explants grown without dexamethasone dropped to 30% of the Day 0 level (drop to about 400 kPa) (Figure 1 A). Removal of dexamethasone after 14 days resulted in significant reduction in the $E_0$ of the juvenile bovine explants (Figure 1 A). In Study 2, the effects of dexamethasone on $E_0$ of mature bovine cartilage were not significant and all experimental groups stayed at the Day 0 levels (Figure 1 B). In Study 1, the GAG content of the juvenile bovine cartilage grown with continuous supplementation of dexamethasone increased slightly from the day 0 on Day 28, whereas those of the other groups (NoDex, 2wk) stayed at initial levels (Figure 1 C). The collagen content of the NoDex group dropped and became significantly lower than the Day 0 level on Day 28 (Figure 1 E). In Study 2, the effects of dexamethasone on the GAG and collagen content of the mature bovine cartilage were not significant and all experimental groups stayed at the Day 0 levels (Figure 1 D F). In Study 3, the effects of dexamethasone on $E_0$, GAG, collagen and DNA content of the mature canine cartilage explants were not significant and all experimental groups stayed at the Day 0 levels (Figure 2).

ACKNOWLEDGEMENT. This work was supported by NIH grants AR46568 and AR53530 and the Musculoskeletal Transplant Foundation.