Objective—To compare long-term results of radiotherapy alone versus radiotherapy followed by exenteration of the nasal cavity in dogs with malignant intranasal neoplasia.

Design—Retrospective study.

Animals—53 dogs with malignant intranasal neoplasia.

Procedure—All dogs underwent radiotherapy consisting of administration of 10 fractions of 4.2 Gy each on consecutive weekdays. For dogs in the surgery group (n = 13), follow-up computed tomography was performed, and dogs were scheduled for surgery if persistent or recurrent tumor was seen.

Results—Perioperative complications for dogs that underwent surgery included hemorrhage requiring transfusion (2 dogs) and subcutaneous emphysema (8). Rhinitis and osteomyelitis-osteonecrosis occurred significantly more frequently in dogs in the radiotherapy and surgery group (9 and 4 dogs, respectively) than in dogs in the radiotherapy-only group (4 and 3 dogs, respectively). Two- and 3-year survival rates were 44% and 24%, respectively, for dogs in the radiotherapy group and 69% and 58%, respectively, for dogs in the surgery group. Overall median survival time for dogs in the radiotherapy and surgery group (47.7 months) was significantly longer than time for dogs in the radiotherapy-only group (19.7 months).

Conclusions and Clinical Relevance—Results suggest that exenteration of the nasal cavity significantly prolongs survival time in dogs with intranasal neoplasia that have undergone radiotherapy. Exenteration after radiotherapy may increase the risk of chronic complications. (J Am Vet Med Assoc 2005;227:936–941)

In dogs, intranasal neoplasia continues to be a difficult disease to control, with recurrence rates exceeding 60% in most reports involving large numbers of treated dogs. In 1 study, exenteration of the nasal cavity alone resulted in a median survival time of <6 months, and radiotherapy is currently recognized as the most effective treatment modality. A combination of surgery followed by orthovoltage radiation was reported to result in a median survival time of 23 months; however, more recent studies have not substantiated these results. Megavoltage radiotherapy given soon after exenteration of the nasal cavity does not appear to improve survival times in dogs with intranasal neoplasia, compared with megavoltage radiotherapy without surgery. A higher dosage megavoltage radiotherapy protocol has proven unacceptable for tumors in this site because of severe damage to the surrounding unaffected tissues, and the use of chemotherapy in combination with radiotherapy has met with limited success.

Previous studies of the results of combining radiotherapy and surgery for the treatment of dogs with intranasal neoplasia have involved administration of external beam fractionated radiotherapy beginning 14 to 21 days after exenteration of the nasal cavity. To our knowledge, the effectiveness of performing radiotherapy prior to exenteration of the nasal cavity in dogs with intranasal neoplasia has not been determined. The purpose of the study reported here, therefore, was to compare clinical outcome for dogs with intranasal neoplasia treated with radiotherapy alone with outcome for dogs that underwent exenteration of the nasal cavity ≥6 weeks after undergoing radiotherapy.

Criteria for Selection of Cases

Medical records of dogs examined at the University of Wisconsin Veterinary Medical Teaching Hospital between January 1990 and January 2002 because of intranasal neoplasia were reviewed. Dogs were eligible for inclusion in the study if the diagnosis had been confirmed histologically, the dog had undergone radiotherapy, and follow-up information regarding cause of death was available in the medical record or through telephone conversations with the owner or referring veterinarian. Dogs were excluded from the study if they had received chemotherapy or immunotherapy before, during, or after undergoing radiotherapy.

Procedures

In all dogs, computed tomography was performed for purposes of tumor staging and treatment planning. Biopsy specimens were collected following computed
tomography, and tumors were classified as stage 1, 2, 3, or 4 on the basis of criteria previously reported to be associated with prognosis following radiotherapy (stage 1 = unilateral disease with no bone destruction; stage 2 = bony involvement beyond the turbinates; stage 3 = orbital, subcutaneous, or submucosal mass; and stage 4 = mass involving the nasopharynx or invasion through the cribriform plate).

Radiotherapy was initiated within 3 weeks after computed tomography and consisted of administration of 10 fractions of 4.2 Gy each on consecutive weekdays, beginning on a Monday. The radiotherapy protocol was planned on the basis of computed tomographic images with a 2-dimensional computer planning system. The usual radiotherapy protocol included a lateral and a dorsal field with 30° wedges and blocking of the contralateral eye. In 4 animals, an additional ventral or opposite lateral field was included. In 2 dogs with evidence of cribriform plate involvement or 5 dogs had a 50% to 70% reduction in tumor volume. The remaining 4 others had a <50% reduction in tumor volume. Of the 13 had a ≥80% reduction in tumor volume. Of the 2 dogs with evidence of cribriform plate involvement prior to radiotherapy, 1 had a 60% to 70% reduction in tumor volume. The remaining 5 dogs had a <50% reduction in tumor volume.

Follow-up examinations were continued at 2- to 3-month intervals until 1 year after surgery and then at 6-month intervals until death. Complications associated with radiotherapy or surgery were recorded at the time of each follow-up examination. For dogs included in the study, the following information was obtained from the medical records: signalment, tumor type, tumor stage, radiotherapy and surgery details, other treatments administered, perioperative complications, recurrent and late complications, and overall survival time.

Statistical analyses—Survival curves were generated by means of the Kaplan-Meier method, which accounted for (ie, censored) dogs that were alive, had been lost to follow-up, or died of unrelated causes. Effects of treatment group, histologic type, and clinical stage were examined by use of log-rank tests to determine significant differences between curves. The Fisher exact test was used to compare signalment data, histologic type, clinical stage, recurrence rate, and complications between treatment groups. Relative risk of developing complications was determined with standard methods. Age and body weight were compared between treatment groups with the Mann-Whitney U test. All analyses were performed with standard software; values of \( P < 0.05 \) were considered significant.

Results

Fifty-three dogs met the criteria for inclusion in the study. Forty dogs underwent radiotherapy alone. Twenty-three of these dogs had been examined and treated prior to 1998, when surgery was not offered for treatment of intranasal neoplasia, and 17 were examined and treated after 1998, but their owners declined surgery. Owners of the remaining 13 dogs agreed to allow surgical removal of any persistent tumor observed on follow-up nasal computed tomography. All 13 dogs returned for follow-up computed tomography, and 11 eventually underwent exenteration of the nasal cavity. The remaining 2 dogs did not undergo exenteration because tumors were considered to be inoperable at the time of follow-up computed tomography. However, data for these 2 dogs were included with data for the 11 dogs that underwent surgery to diminish the possibility of selection bias in statistical analyses (ie, intent-to-treat analyses).

Pretreatment findings—Pretreatment body weight was not significantly different between treatment groups (Table 1); however, dogs in the radiotherapy group were significantly (\( P = 0.024 \)) older than dogs in the radiotherapy and surgery group. Sex, clinical stage, and histologic-type distributions were not significantly different between groups.

Radiotherapy and surgery group—For the 13 dogs in the radiotherapy and surgery group, the initial follow-up examination was performed 6 to 10 weeks after completion of radiotherapy. Four of the 13 had a ≥80% reduction in tumor volume, as determined by means of computed tomography, and 4 others had a 50% to 70% reduction in tumor volume. The remaining 5 dogs had a <50% reduction in tumor volume. Of the 2 dogs with evidence of cribriform plate involvement prior to radiotherapy, 1 had a 60% to 70% reduction in tumor volume. The other had a <50% reduction in tumor volume. Both had evidence of recalcification of the cribriform plate.

For the 11 dogs that underwent surgery, median time to surgery following completion of radiotherapy was 10 weeks (range, 6 to 73 weeks), with 10 of the 11 dogs having surgery by 14 weeks after radiotherapy was completed. In 8 dogs, surgery was performed
because of persistent residual tumor seen on the initial follow-up computed tomograms obtained 6 to 10 weeks after radiotherapy was completed (50% to 90% tumor reduction). In 2 dogs, surgery was performed because a persistent or progressive tumor was seen on a second follow-up computed tomogram obtained between 10 and 13 weeks after radiotherapy. In the remaining dog, 8 follow-up computed tomograms were obtained before tumor recurrence was identified; that dog underwent exenteration 73 weeks after radiotherapy. For dogs that underwent surgery, perioperative complications included epistaxis necessitating blood transfusion (2 dogs) and self-limiting subcutaneous emphysema (8). Surgical removal of the grossly visible tumor was incomplete in 1 dog because of brain involvement; this dog was euthanatized 8 days after surgery because of complications.

In 9 of the 11 dogs, results of histologic examination of biopsy specimens obtained at the time of nasal cavity exenteration were positive for tumor cells. In the remaining 2 dogs, only inflammatory changes were seen.

**Complications**—Nine of the 13 dogs in the radiotherapy and surgery group developed rhinitis. Four of these dogs had a single episode of rhinitis after undergoing radiotherapy; in all 4, the rhinitis was responsive to treatment with amoxicillin or amoxicillin-clavulanic acid. Five other dogs in this group developed chronic or recurrent rhinitis that progressed to osteomyelitis with or without bone necrosis and persisted for 4 to 29 months. These dogs were treated with a variety of antimicrobials, including amoxicillin-clavulanic acid, enrofloxacin, cephalixin, doxycycline, and metronidazole. One of these 5 dogs developed rhinitis associated with an antimicrobial-resistant *Staphylococcus* sp and required surgical debridement. That dog developed a permanent nasocutaneous fistula, and chronic mild rhinitis persisted until it died of unrelated causes 29 months after radiotherapy was completed. Two dogs developed persistent nasal aspergillosis that was partially controlled for 30 months with intermittent administration of itraconazole; tumor recurrence was documented in both dogs.

Two dogs in the radiotherapy and surgery group that had had extensive tumor-related bone destruction prior to undergoing radiotherapy developed shortening of the maxilla, resulting in a brachycephalic appearance. One of those dogs developed an osteosarcoma of the maxilla 5 years after undergoing radiotherapy.

Dogs in the radiotherapy-only group were not administered antimicrobials following radiotherapy. Four dogs in that group developed chronic rhinitis after treatment. In 3 of the 4, rhinitis was associated with osteonecrosis. Two of those dogs developed oronasal fistulas at 5 and 9 months after radiotherapy. The one that had the fistula at 5 months underwent 3 attempts at surgical repair, but a small fistula persisted at the time of euthanasia 31 months after radiotherapy. No tumor recurrence was suspected. The other dog with an oronasal fistula had 2 surgeries for bone debridement and dental extraction and had a persistent fistula at the time tumor recurrence was documented 21 months after radiotherapy. That dog was euthanatized 4 months later. The third dog developed a nasocutaneous fistula near the medial canthus of 1 eye at 23 months after radiotherapy. Despite 3 months of treatment with trimethoprim-sulfonamide for a susceptible hemolytic *Streptococcus* sp, the fistula was still draining 5 months later when the dog died. The referring veterinarian thought that extensive maxillary osteonecrosis contributed to that dog’s death. No tumor recurrence was suspected on the basis of computed tomographic findings. The dog that developed chronic rhinitis was given multiple courses of ampicillin between 1 and 9 months after radiotherapy. Improvement was noted during periods of antimicrobial treatment, but signs recurved when medication was discontinued. Rhinitis and recurrent tumor with pulmonary metastasis were identified at necropsy 9 months after radiotherapy was completed.

Three dogs in the radiotherapy and surgery group eventually lost sight in the eye included in the radiation field. Of these, 1 required enucleation 22 months after radiotherapy was completed because of glaucoma. Twelve dogs in the radiotherapy-only group lost sight in 1 (8 dogs) or both (4) eyes following radiotherapy. Of these, 3 underwent enucleation because of descemetomeces or keratoconjunctivitis sicca.

**Table 1**—Signalment, clinical stage, and histologic type for dogs with intranasal neoplasia enrolled in a study comparing outcome of radiotherapy alone with outcome of radiotherapy followed by exenteration of the nasal cavity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Radiotherapy alone (n = 40)</th>
<th>Radiotherapy and surgery (13)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>11.3 (2.7–14.7)</td>
<td>7.6 (5.5–12.0)</td>
<td>0.024</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>0.999</td>
</tr>
<tr>
<td>Female</td>
<td>18 (45)</td>
<td>6 (46)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22 (55)</td>
<td>7 (54)</td>
<td></td>
</tr>
<tr>
<td>Clinical stage</td>
<td></td>
<td></td>
<td>0.999</td>
</tr>
<tr>
<td>1</td>
<td>8 (20)</td>
<td>2 (15)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13 (33)</td>
<td>3 (23)</td>
<td>0.740</td>
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<tr>
<td>3</td>
<td>5 (12)</td>
<td>4 (31)</td>
<td>0.200</td>
</tr>
<tr>
<td>4</td>
<td>14 (35)</td>
<td>4 (31)</td>
<td>0.999</td>
</tr>
<tr>
<td>Histologic type</td>
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<td></td>
<td>0.690</td>
</tr>
<tr>
<td>Carcinoma</td>
<td>9 (23)</td>
<td>3 (23)</td>
<td></td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>12 (30)</td>
<td>3 (23)</td>
<td></td>
</tr>
<tr>
<td>Anaplastic carcinoma</td>
<td>12 (30)</td>
<td>2 (15)</td>
<td></td>
</tr>
<tr>
<td>Squamous cell</td>
<td>0 (0)</td>
<td>2 (15)</td>
<td></td>
</tr>
<tr>
<td>carcinoma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chondrosarcoma</td>
<td>4 (10)</td>
<td>1 (8)</td>
<td></td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td>0 (0)</td>
<td>1 (8)</td>
<td></td>
</tr>
<tr>
<td>Soft tissue sarcoma</td>
<td>3 (7)</td>
<td>1 (8)</td>
<td></td>
</tr>
</tbody>
</table>

Data are given as median (range) or number (percentage).
and root canal procedures 2.5 to 4 years after radiotherapy. Numbers of dogs in each group that developed these complications were too small to allow for statistical analysis.

**Outcome**—Analysis of censored survival curves indicated that 68%, 44%, 24%, and 12% of dogs in the radiotherapy-only group were alive 1, 2, 3, and 4 years, respectively, after completion of radiotherapy, compared with 77%, 69%, 58%, and 46%, respectively, of dogs in the radiotherapy and surgery group. Median survival time for dogs in the radiotherapy-only group (19.7 months) was significantly ($P = 0.022$) shorter than median survival time for dogs in the radiotherapy and surgery group (47.7 months; Figure 1), even after controlling for age.

Twenty-six of the 40 (65%) dogs in the radiotherapy-only group had local recurrence of intranasal neoplasia without evidence of metastasis. Nine of the 26 (35%) dogs that underwent radiotherapy alone and had evidence of recurrence of intranasal neoplasia without evidence of metastases were euthanatized within 10 months after completion of radiotherapy because of progressive disease. Between 10 and 19 months following radiotherapy, 7 more succumbed to progressive local disease; between 20 and 29 months, another 3 succumbed to local disease; and between 30 and 51 months, 4 more succumbed to local disease. Two others were euthanatized because of metastasis <9 months after radiotherapy was completed, and 1 was euthanatized because of metastasis 31 months after radiotherapy was completed. Of the remaining 11 dogs, 9 died or were euthanatized for unrelated disease 1 to 65 months after radiotherapy and 2 remained alive without evidence of recurrence 34 and 47 months after radiotherapy.

Six of the 13 dogs in the radiotherapy and surgery group had local recurrence of intranasal neoplasia 3 to 48 months after treatment, including both dogs that did not undergo surgery. Of the remaining 7 dogs, 4 died or were euthanatized for an unrelated cause 29 to 68 months after radiotherapy and 3 were alive without evidence of recurrence 30 to 57 months after radiotherapy.

The rate of local recurrence of intranasal neoplasia for dogs in the radiotherapy-only group (68%) was not significantly different from the rate for dogs in the radiotherapy and surgery group (60%) that have died. Metastasis to the regional lymph nodes or lungs was documented in 4 of the 40 (10%) dogs in the radiotherapy-only group following radiotherapy; metastasis was not observed in any of the dogs in the radiotherapy and surgery group.

For the 40 dogs in the radiotherapy-only group, median overall survival time for dogs with a carcinoma (21.6 months) was not significantly ($P = 0.603$) different from median overall survival time for dogs with a sarcoma (18.3 months). No significant ($P = 0.669$) differences in median overall survival times were detected among groups when the 40 dogs were grouped on the basis of clinical stage prior to radiotherapy (stage 1, 25 months; stage 2, 21.6 months; stage 3, 11.6 months; and stage 4, 18.3 months). Similarly, median survival time for dogs classified as stage 1 or 2 prior to radiotherapy was not significantly ($P = 0.18$) different from median survival time for dogs classified as stage 3 or 4.

**Discussion**

In dogs with intranasal neoplasia, the condition is generally advanced by the time of referral to a specialty center or teaching hospital and is not eliminated by curative-intent radiotherapy in 60% to 80% of dogs.3-6 This coincides with findings in the present study, in that tumor was identified histologically in 9 of 11 dogs that underwent surgery between 6 and 73 weeks after completion of radiotherapy.

Reported median survival times for dogs with intranasal neoplasia treated with megavoltage radiotherapy alone ranged from 8 to 14 months.3,4,16 In the present study, median survival time for the 40 dogs that underwent radiotherapy without surgery, chemotherapy, or immunotherapy was 19.7 months. However, 68% of the dogs that underwent radiotherapy alone were euthanatized because of recurrence of clinical signs indicative or suggestive of local tumor regrowth.

Tumors that have undergone radiotherapy may express early local recurrence. In this study, 33% of dogs in the radiotherapy-only group were euthanatized within 10 months of radiotherapy because of local recurrence. We theorized prior to initiation of the present study that resection of residual tumor following radiotherapy might eliminate or delay early recurrence following radiotherapy; this was the reason we began offering surgery to owners of dogs with evidence of persistent or recurrent disease following radiotherapy. Although overall local tumor recurrence rates were not significantly different between treatment groups, 3-year survival rates for the radiotherapy and surgery group and the radiotherapy-only group were 58% and 24%, respectively. Also, 3 of the dogs in the radiotherapy and surgery group were alive without evidence of disease 30, 55, and 57 months after radiotherapy was completed. Importantly, results of the present study indicate that intranasal tumors may recur years after treatment as evidenced by 2 dogs in the radiotherapy-only group and 1 dog in the radiotherapy and surgery group that were euthanatized between 46 and 51 months after radiotherapy because of local recurrence.
In the present study, dogs that underwent nasal cavity exenteration following radiotherapy had a substantial risk of developing postoperative complications. In particular, the risks of developing chronic or recurrent rhinitis and ostomeylitis were significantly higher for dogs in this group than for dogs that underwent radiotherapy alone. Although these complications did not appear to affect outcome, chronic bacterial or fungal rhinitis resulted in long-term management responsibilities for the owners. During exenteration, all nasal cavity tissue, including the periosteum lining the nasal cavity, is removed. Healing occurs by formation of granulation tissue over the bone and subsequent epithelialization. A chronic nasal discharge is common in dogs that undergo nasal cavity exenteration (without radiotherapy) but commonly resolves within a few months after surgery, although a serous or purulent discharge may persist.18 In dogs that undergo radiotherapy prior to nasal cavity exenteration, however, the compromised blood supply in the underlying bone could impair healing of the exposed bone surfaces, resulting in poorly vascularized granulation tissue that is susceptible to opportunistic infection. One approach that might help to reduce this problem would be to resect turbinates only in the area of any persistent or recurrent tumor. However, this presents a challenge because it can be difficult to identify the margins of a nasal tumor in the presence of substantial exudate and grossly abnormal, but nonneoplastic, turbinate tissue. In such a situation, it may be advisable to preserve the periosteal lining of the nasal cavity as much as possible to minimize compromise of the blood supply to the bone surfaces. This approach may better preserve local defenses against opportunistic infection and reduce the incidence of postsurgical rhinitis and ostomeylitis. We currently recommend long-term (months) treatment with broad-spectrum antimicrobials (typically amoxicillin-clavulanic acid) to reduce the incidence and severity of bacterial rhinitis in dogs undergoing nasal cavity exenteration following radiotherapy.

An unexpected late effect observed in the present study was the development of caries and dental pulp death between 2.5 and 4 years after radiotherapy. Tooth death and xerostomia-induced caries are well-recognized late complications following radiotherapy of oral and maxillary neoplasms in human patients.5,62 The paucity of information regarding this complication in dogs may be attributable to limited information concerning long-term outcome of dogs that have undergone radiotherapy of tumors of the head. Results of previous studies15,17 suggest that doses commonly used for megavoltage radiotherapy of intranasal neoplasia in dogs are inadequate. However, increasing the radiation dose or using a radiation sensitizer can lead to severe acute mucositis, ocular inflammation, bone surface necrosis and therefore may not be advisable.11,21 Use of surgery following completion of radiotherapy, as described in the present report, appears to offer a viable alternative.

The relationship, if any, between histologic type and outcome for dogs with intranasal neoplasia is controversial14,5; however, recent reports5,7,10 have not substantiated any such relationship. In the present study, we also did not find any difference in survival time between groups when dogs were grouped on the basis of histologic type.

Age of the dog at the time of radiotherapy has previously been suggested to be associated with outcome in dogs with intranasal neoplasia.7 Although median age of dogs in the radiotherapy and surgery group in the present study was significantly less than median age of dogs in the radiotherapy-only group, we did not identify any effect of age on overall survival time in the present study.

Whether there is any relationship between clinical stage and outcome in dogs with intranasal neoplasia is also controversial.1,4,7 In a previous study7 that used the same radiotherapy protocol used in the present study, clinical stage was significantly associated with survival time. In the present study, however, no significant difference in survival time was found among groups when dogs that underwent radiotherapy alone were grouped on the basis of pretreatment clinical stage.

For dogs in the present study, the time between radiotherapy and nasal cavity exenteration was determined for individual dogs on the basis of results of follow-up computed tomography. However, the specificity of computed tomography for identifying viable tumor following radiotherapy must be in question. Two dogs in the present study that had a 50% to 70% reduction in tumor volume on computed tomograms obtained 6 weeks after radiotherapy had no histologic evidence of tumor at the time of surgery and died of unrelated causes 28.5 and 52 months after undergoing radiotherapy. Conversely, a dog that had an 80% to 90% reduction in tumor volume on a computed tomogram obtained 11 weeks after radiotherapy had histologic evidence of viable tumor cells at the time of surgery. The most accurate means of documenting persistent viable tumor is probably comparison of serial computed tomograms or magnetic resonance images for evidence of progressive disease. The use of positron emission tomography would theoretically also be a means of determining viability of suspected persistent tumor; however, documentation of progressive disease on serial imaging studies is still the most accurate means of identifying residual tumor.

Limitations of the present study include the small number of dogs in the radiotherapy and surgery group and the lack of consistent follow-up computed tomography for dogs in the radiotherapy-only group, which precluded an accurate determination of the time to local recurrence. The finding in the present study that survival time was longer in dogs that underwent surgery will require verification with a randomized controlled trial in which groups undergo identical follow-up. Despite these limitations, the longer survival time for dogs in the radiotherapy and surgery group in the present study suggests that further application and evaluation of this treatment strategy for intranasal neoplasia are warranted.

b. Prowess 3000 Radiotherapy Treatment Planning System, SGGI, Chico, Calif.
c. Prism 4, GraphPad Software, San Diego, Calif.
References


Selected abstract for JAVMA readers from the American Journal of Veterinary Research

Effects of routine prophylactic vaccination or administration of aluminum adjuvant alone on allergen-specific serum IgE and IgG responses in allergic dogs
Kathy C. Tater et al

Objective—to determine the acute corn-specific serum IgE and IgG, total serum IgE, and clinical responses to SC administration of prophylactic vaccines and aluminum adjuvant in corn-allergic dogs.

Animals—20 allergic and 8 nonallergic dogs.

Procedure—17 corn-allergic dogs were vaccinated. Eight clinically normal dogs also were vaccinated as a control group. Serum corn-specific IgE, corn-specific IgG, and total IgE concentrations were measured in each dog before vaccination and 1 and 3 weeks after vaccination by use of an ELISA. The corn-allergic dogs also had serum immunoglobulin concentrations measured at 8 and 9 weeks after vaccination. Twenty allergic dogs received a SC injection of aluminum adjuvant, and serum immunoglobulin concentrations were measured in each dog 1, 2, 3, 4, and 8 weeks after injection. The allergic dogs were examined during the 8 weeks after aluminum administration for clinical signs of allergic disease.

Results—The allergic dogs had significant increases in serum corn-specific IgE and IgG concentrations 1 and 3 weeks after vaccination but not 8 or 9 weeks after vaccination. Control dogs did not have a significant change in serum immunoglobulin concentrations after vaccination. After injection of aluminum adjuvant, the allergic dogs did not have a significant change in serum immunoglobulin concentrations or clinical signs.

Conclusions and Clinical Relevance—Allergen-specific IgE and IgG concentrations increase after prophylactic vaccination in allergic dogs but not in clinically normal dogs. Prophylactic vaccination of dogs with food allergies may affect results of serologic allergen-specific immunoglobulin testing performed within 8 weeks after vaccination. (Am J Vet Res 2005;66:1572–1577)