

Heartworm in Canada in 2010 with comments on Ontario

J. Owen D. Slocombe

Department of Pathobiology, Ontario Veterinary College
University of Guelph, Guelph, Ontario N1G 2W1

On November 30, 2010, 2816 questionnaires were sent by postal mail to small and mixed animal practices in Canada to determine the status of heartworm (HW) infection in dogs in 2010. On January 17, 2011, the questionnaires were sent again to clinics in Ontario, Quebec, and Manitoba (the HW endemic areas in Canada), that had not responded at that time.

In early February 2011, the response to the mail outs was relatively poor, and the pharmaceutical companies supporting the survey opted for a "fax blast" to all clinics urging a response from those who had not done so. Respondents could return a completed questionnaire by postal mail or submit data at a website online. The survey was closed on March 3, 2011. About 84% of the questionnaires came via postal mail, 16% were online.

A total of 1344 questionnaires were returned, but 75 were not included in the analysis of the data. Forty of the latter were returned by the postal services with notations of address unknown. The other 35 had either missing or questionable information and the data could not be verified, or were from specialized clinics with no HW testing. The response rate for the survey was 46.4%. In each year from 1976-2002, except 1999, I had sent to practitioners across Canada questionnaires to assess the prevalence of HW in Canada. In 2002, the response rate was 46.2%.

In 2010, 564 dogs were diagnosed with HW in Canada (354 in 2002). There were 367,385 dogs tested for HW in 2010 (317,182 in 2002), and an estimate of prevalence of HW in dogs in 2010 is 0.15% (0.11% in 2002). In 2010 in Ontario, three cats (one from Sri Lanka), two coyotes, and one fox, were found with HW at necropsy.

In 2010, a significant number of HW dogs, when compared to 2002 and previously, were from outside Canada. The primary impetus for this 2010 survey was some evidence that "Katrina dogs" ("rescue" dogs imported from southern USA states into Canada after hurricane Katrina in 2005) may have caused an increase in prevalence of HW in Ontario dogs. This

Table 1. 2010 Heartworm questionnaire results for Canada

1. When are most dogs routinely tested for HW(%)	Spring 67	Summer 20	Fall 3	Winter 3
	No Response 7			
2. No. of Dogs Tested for HW in 2010	367,385			
3. No. of Dogs Diagnosed with HW in 2010	564			
4. Travel History: Imported from southern USA (Katrina dogs)	49 (9%)			
Imported from other USA states or Countries	70 (12%)			
Traveled outside Canada six months or more prior to diagnosis	17 (3%)			
Traveled six months or more prior to diagnosis to Southern Ontario, Quebec, or Manitoba if not residing in those provinces	14 (2%)			
Never left your area	286 (51%)			
Travel history questionable or unknown	130 (23%)			
5. With <u>clinical signs</u> of HW	79 (14%)			
6 Diagnosed with HW <u>prior</u> to 2010	71 (13%)			
7. Diagnosed with HW <u>only</u> in 2010 and on preventative medication in 2009	77 (14%)			
8. If Question 7 is > 0 , Failure of preventative medication was due to:				
	Missed treatment 17	Inadequate dosage 1	Unknown 54	Other 5
9. No. of dogs tested in 2010 and on preventative medication in <u>2009</u>	305,709			
10. No. of cats and other animals with HW in 2010: Specify Animal:	6			
11. In 2005-2010 were Katrina dogs in your area and/or practice?% Yes 28 No 35 Unknown 37				

survey was not designed to evaluate what effect "Katrina dogs" may have had. However, in the 2010 questionnaire, there were more questions than in the previous surveys on the travel history of HW positive dogs that were, or had been, outside Canada.

In previous surveys, there was a single question on HW dogs that were outside Canada (Canadian dogs that had travelled outside of Canada, and dogs imported into Canada). In 2002, there were 17 such dogs (less than 5% of all HW dogs that year). In 2010, the request was to identify these HW dogs as either "Katrina dogs", or dogs imported from other USA states and countries, or Canadian dogs which had been outside Canada.

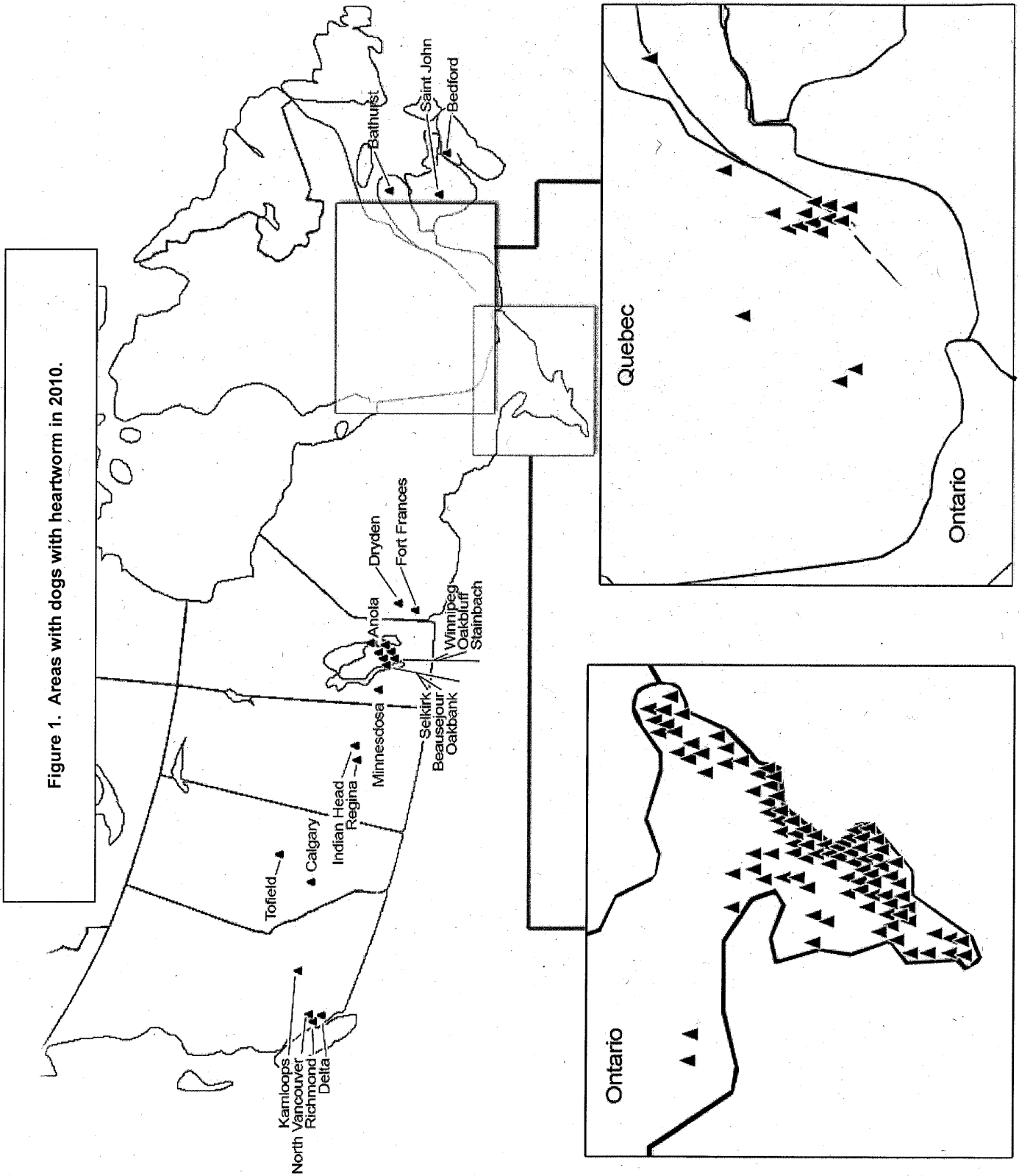
There were a total of 136 HW dogs in the three categories identified above (more than 24% of all dogs with HW in 2010). Only 49 dogs were identified as "Katrina dogs", and these were mostly in Ontario, with one each in British Columbia and Saskatchewan. But 28% of the

respondents, and from all provinces except Prince Edward Island, indicated that from 2005 through 2010 "Katrina dogs" had been in their area, and/or practice.

The major foci of infection in Canada continued to be in southern Ontario, southern Manitoba, and southern Quebec. The number of HW dogs in those provinces increased significantly over those reported for 2002. In Ontario, 431 dogs were diagnosed with HW in 2010 (268 in 2002). In Manitoba, there were 77 HW cases (53 in 2002), and in Quebec 41 (21 in 2002). In 2002 and 2010, most of these dogs had never left their provinces, and accounted for 62% and 51% of the HW positive dogs in 2002 and 2010, respectively. In 2010, HW was not found in Prince Edward Island or Newfoundland & Labrador, but 15 cases were diagnosed in the other five provinces.

The increased number of cases in Manitoba and Quebec in 2010 appeared unrelated to the number of "Katrina dogs"

Figure 1. Areas with dogs with heartworm in 2010.



and the other imports. In 2010, there were no "Katrina dogs" in Manitoba or Quebec. There were only two HW dogs in Manitoba and five in Quebec from other USA states and countries. There were 21, and 10 HW dogs in Manitoba, and Quebec, respectively, with travel history unknown. HW infected dogs in all these categories may have been in Manitoba and Quebec in 2005 through 2009. Whether their presence had any effect on the prevalence of HW in dogs in those provinces is unknown.

In previous surveys, I had indicated that in the endemic areas of Ontario, Manitoba, and Quebec, more attention needs to be focussed on dogs not on HW preventive medication. Most of these dogs are likely not ones that visit clinics routinely. In those provinces, of 482 dogs diagnosed with HW only in 2010, 408 were not on preventative medication in 2009.

Ontario

The findings in 2010 for Ontario are presented in one figure, four tables, and with some comments.

1. There were 1190 questionnaires sent out, and 688 returned, but 38 were not used in the analysis of the data for reasons indicated above. The response rate was 56.4% (59.5% in 2002).

2. There were 431 dogs reported with HW in 2010 (268 in 2002), and 49 of them were diagnosed with HW prior to 2010.

3. There were 289,229 dogs tested in 2010 (256,249 in 2002), and an estimate of prevalence of HW in 2010 is 0.15% (0.10% in 2002). The focus of infection continued to be in southwestern Ontario, where the prevalence of infection would be much higher than the average for the province.

4. There were 222 HW dogs that had never left their area (51% of all HW dogs in 2010). One of these HW dogs was reported from Fort Frances; one had been reported there in 1995. Fort Frances is the most northerly area in Ontario with reports in these surveys of HW dogs that had never left the area. In 2002, there were 177 HW dogs (66% of the HW dogs) that had never left their area.

5. In 2010, there were 47 "Katrina dogs" with HW, 55 were imports from other USA states and countries, and 13 had traveled outside of Canada. In 2002, only eight HW dogs had been outside Canada or imported into Canada. In 2010, there were

Table 2. 2010 Heartworm questionnaire results for Ontario

1. When are most dogs routinely tested for HW. (%)	Spring 76	Summer 19	Fall 2	Winter 2
2. No. of Dogs Tested for HW in 2010	No Response 1			
3. No. of Dogs Diagnosed with HW in 2010	289,229			
4. Travel History: Imported from southern USA (Katrina dogs)	47 (11%)			
Imported from other USA states or Countries	55 (13%)			
Traveled outside Canada six months or more prior to diagnosis	13 (3%)			
Traveled six months or more prior to diagnosis to Southern Ontario, Quebec, or Manitoba if not residing in those provinces	10 (2%)			
Never left your area	222 (51%)			
Travel history questionable or unknown	84 (20%)			
5. With <u>clinical signs</u> of HW	50 (12%)			
6 Diagnosed with HW <u>prior</u> to 2010	49 (11%)			
7. Diagnosed with HW <u>only</u> in 2010 and on preventative medication in 2009	66 (15%)			
8. If Question 7 is > 0 , Failure of preventative medication was due to:				
	Missed treatment 13	Inadequate dosage 0	Unknown 50	Other 3
9. No. of dogs tested in 2010 and on preventative medication in 2009 (No. should not be greater than the No. in Question 2)	244,187			
10. No. of cats and other animals with HW in 2010: Specify Animal: _____	6			
11. In 2005-2010 were Katrina dogs in your area and/or practice?(%) Yes 41 No 23 Unknown 36				

84 HW dogs for which the travel history was unknown (74 in 2002).

6. About 12% of the HW dogs were reported with clinical signs of HW disease.

7. There were 66 dogs diagnosed with HW and on preventative medication in 2009. The reason for failure of the medication for 13 was "missed treatments", for 50 it was "unknown", and three were listed under "Other" and with comments. The comment for one of these was the test was weakly positive, and likely a false positive. The comments for the other two were the dogs were placed on preventative medication without first testing for HW.

8. I sought from practitioners the number of dogs they tested for HW in 2010 and on preventative medication in 2009. The information could be used to provide an estimate of the prevalence of HW in unprotected dogs (dogs not on HW preventive medication). That statistic would be a better estimate of the level of risk to dogs of HW infection in an area than that shown in Item 3 above. But many practitioners did not provide the information. I solicited some practitioners, via email and telephone, for an approximation of the number of dogs in their practices tested for HW in 2010 and

on preventative medication in 2009. From that data a factor was derived to estimate the numbers for practices that did not provide the information.

The results reported here, therefore, should be considered with caution. The results are not dissimilar to those reported in the previous surveys, and are as follows; (a) most of the dogs tested were given preventative medication, (b) most of the dogs diagnosed in 2010 for the first time were not on the medication in 2009, (c) and the prevalence of HW in dogs tested and not on preventative medication in 2009, 0.81% (0.50% in 2002), was considerably greater than those on medication, 0.03% (0.01% in 2002). In HW endemic areas in the province, the prevalence in unprotected dogs would be considerably higher. The number of dogs tested, the number with HW, and the number not on preventative medication, for each town or city can be found in Tables 3 and 4.

9. About 41% of the respondents indicated that "Katrina dogs" had been in their areas and/or practices in 2005-2010.

10. In 2010, there were three HW cats; one in Cambridge, from Sri Lanka, and two in Brantford. In Brantford, there were two coyotes and one fox with HW. All animals were diagnosed at necropsy.

Table 3. Number of dogs diagnosed with heartworm in Ontario in 2010 and their travel history (number in brackets represents number of clinics).

Area	Imported		Canadian			Travel History Unknown	Total	No Medication in 2009
	"Katrina"	Other Imports	Visited Outside Canada	Visited Endemic Areas in Canada	Never left the Province			
Ancaster (2)	3	2	0	0	0	0	5	241
Ajax (1)	1	0	0	0	0	0	1	116
Alliston (1)	0	1	0	0	0	0	1	66
Amherstburg (2)	0	0	0	0	4	0	4	187
Aurora (2)	0	0	0	0	2	3	5	147
Aylmer (2)	0	0	1	0	1	4	6	146
Barrie (2)	0	1	0	0	2	0	3	206
Beamsville (1)	1	0	0	0	0	0	1	68
Belleville (3)	0	0	0	0	1	2	3	32
Bowmanville (1)	0	1	0	0	0	0	1	76
Bracebridge (1)	0	0	0	1	0	0	1	165
Brampton (2)	0	2	0	0	1	0	3	105
Brantford (6)	1	0	0	0	20	3	24	710
Burlington (2)	1	0	1	0	1	1	4	39
Caledonia (2)	1	0	0	0	62	2	65	597
Cambridge (2)	2	0	0	0	0	0	2	81
Carleton Place (2)	0	0	0	0	0	2	2	221
Chatham (3)	2	0	0	0	1	3	6	383
Cobourg (2)	0	0	0	0	1	1	2	250
Cornwall (1)	0	0	0	0	0	5	5	532
Drumbo (1)	0	0	1	0	0	0	1	20
Dryden (1)	0	2	0	0	0	0	2	59
Dundas (1)	1	0	0	0	0	0	1	49
Dunnville (1)	1	0	1	0	1	1	4	142
Durham (1)	0	1	0	0	0	0	1	9
Elmira (1)	0	1	0	0	0	0	1	64
Embrun (1)	1	0	0	0	3	0	4	190
Etobicoke (2)	0	0	0	0	3	1	4	339
Forest (1)	0	0	0	0	3	0	3	136
Fort Erie (2)	1	2	0	0	0	6	9	139
Fort Frances (1)	0	0	0	0	1	0	1	387
Grimsby (1)	1	0	0	1	0	0	2	40
Guelph (4)	2	4	0	0	0	1	7	680
Hagersville (1)	0	0	0	0	0	6	6	107
Hamilton (6)	9	0	0	0	1	4	14	390
Harriston (1)	0	0	0	0	0	1	1	11
Ingersoll (2)	0	0	0	0	2	0	2	8
Kemptville (1)	0	0	0	1	0	0	1	52
Kingston (2)	0	0	0	0	1	1	2	134
Kingsville (2)	0	0	0	0	2	0	2	22
Kitchener (1)	0	0	0	0	2	0	2	21
Komoka (1)	0	0	0	0	1	0	1	210
Lanark (1)	0	0	0	0	0	1	1	245
Leamington (1)	0	2	0	0	0	2	4	2
London (9)	1	2	0	0	13	1	17	1394
Markham (1)	0	1	0	0	0	0	1	150
Maxville (1)	0	0	0	0	1	0	1	17
Milton (2)	0	1	0	0	0	1	2	132
Mississauga (4)	0	1	0	0	1	2	4	481
Mount Brydges (1)	0	0	0	0	6	0	6	38
Napanee (1)	0	0	0	0	2	0	2	40
Navan (1)	0	0	0	0	0	1	1	759
Nepean (1)	0	0	0	0	0	1	1	79
Niagara Falls (2)	0	0	0	0	1	1	2	228
North Bay (1)	0	1	0	0	0	0	1	28
Norwich (1)	0	0	0	0	5	0	5	194
Oakville (4)	3	3	0	0	3	0	9	403
Orangeville (2)	0	1	0	0	2	0	3	101
Orillia (1)	0	0	0	0	2	0	2	30
Orleans (3)	0	5	0	1	2	1	9	544
Oshawa (2)	0	2	0	0	0	0	2	271
Ottawa (6)	0	2	1	1	2	2	8	691
Paris (1)	0	0	0	0	1	0	1	8
Parry Sound (1)	0	0	0	0	1	0	1	4
Perth (1)	0	1	0	0	1	0	2	109
Port Colborne (1)	1	0	0	0	0	1	2	18

Port Dover (1)	0	0	0	0	5	0	5	225
Table 3 - Continued								
Prescott (1)	0	0	0	0	0	1	1	169
Richmond Hill (1)	0	0	0	0	2	0	2	116
Rockland (1)	0	1	0	0	0	0	1	0
Sarnia (4)	0	1	0	2	2	6	11	175
Scarborough (1)	0	0	0	0	0	1	1	38
Sharon (1)	1	0	0	0	0	0	1	168
Simcoe (3)	2	0	0	0	18	1	21	319
Smith Falls (1)	0	0	0	0	0	2	2	134
Southampton (1)	0	0	0	0	0	1	1	100
St. Catharines (4)	3	1	0	0	2	0	6	233
St. Thomas (2)	0	0	0	0	0	2	2	89
Stayner (1)	0	1	0	0	0	0	1	21
Stoney Creek (2)	2	2	0	0	0	0	4	585
Stratford (1)	0	0	1	0	0	0	1	132
Strathroy (1)	0	0	1	0	7	0	8	217
Sturgeon Falls (1)	0	0	1	0	0	0	1	50
Thornhill (1)	0	0	0	0	0	1	1	68
Tillsonburg (2)	0	1	0	1	1	0	3	136
Toronto (10)	3	4	1	0	5	5	18	933
Trenton (1)	0	2	0	0	0	0	2	102
Unionville (1)	0	0	0	1	0	0	1	38
Uxbridge (2)	0	1	1	0	2	0	4	195
Vineland (1)	0	0	0	0	1	0	1	63
Wallaceburg (1)	0	0	0	0	12	0	12	11
Waterdown (2)	1	0	1	0	1	1	4	233
Welland (1)	0	0	0	0	1	1	2	199
Whitby (2)	1	1	0	0	0	0	2	157
Windsor (2)	0	0	0	0	2	1	3	36
Winona (1)	1	0	2	0	0	0	3	5
Zurich (1)	0	0	0	0	1	0	1	46
Total (179)	47	54	13	9	221	84	428	18536

11. There were 179 clinics (119 in 2002), and 907 towns (88 in 2002), reporting a diagnosis of HW.

12. Southwestern Ontario is the major focus of HW infection in the province and Canada. In 2010, a significant number of dogs were reported to the east and north of that focus.

13. Most of the increase in numbers of HW dogs in Ontario in 2010 over that reported in 2002 were "Katrina dogs" and other imports. The primary impetus for this 2010 survey was some evidence that "Katrina dogs" may have caused an increase in prevalence of HW in Ontario dogs. Dr. Randy Stirling, a small animal practitioner in Stoney Creek, in a survey of 32 clinics in and around Hamilton found 63 HW dogs in 2008; 45 US dogs, and 18 local dogs. These latter numbers were higher than normal for the area.

The 2010 survey was not designed to evaluate the effect of "Katrina dogs" on

the prevalence of HW in local dogs. However, in Table 4 is a comparison of data from the 2002 and 2010 surveys for a region in Ontario much larger than, but including, Dr. Stirling's study area. In 2010, 40 of the 47 HW positive "Katrina dogs" in Ontario were in this region. That region had also a significant number of HW dogs that were other imports. The region is defined with lines drawn from Toronto west to Guelph, south to Simcoe, east to Fort Erie, and north to Toronto.

When compared with 2002, the region had a marked increase in the number of HW dogs in 2010. The increases were equally in imported dogs, and dogs that had never left the area. Did the "Katrina dogs" and the other imports during 2005 through 2009 influence the increase of HW in local dogs?

Acknowledgments

Your interest in the survey and your comments were very much appreciated. I

thank Bayer Inc., Merial Canada Inc., Novartis Animal Health Canada Inc., and Pfizer Canada Inc., for providing the financial support for the survey. I thank the Canadian Veterinary Medical Association for the access to their membership, and the Ontario Veterinary College's Information Technology Service for hosting the website for the survey.

The veterinary provincial associations, and the CVMA, provided enormous assistance in promoting the survey through their e-letters and newsletters. I am most grateful for their kind support.

I sincerely appreciate the assistance of a number of individuals who supported me in this survey and publication of the report. To Dave Wood, Mary Lake, Paul Briggs, Elizabeth Gilbertson, Dr. Sylvain Bichot, Peter McCaskell, Paul McDonald, Jean Bagg, Marilyn Fowler, Nathalie Lemieux, Isabelle, Vallieres, Justina Slocombe many, many thanks.

Table 4. Heartworm in Dogs in Ontario in 2010 (number in brackets represents number of clinics).

Town	Total	No Medication in 2009	Town	Total	No Medication in 2009	Town	Total	No Medication in 2009	Town	Total	No Medication in 2009
Acton (3)	748	196	Dunrobin (1)	115	10	Midland (2)	643	32	Sault Ste. Marie (3)	96	34
Ajax (3)	2656	307	Durham (2)	172	48	Mildmay (1)	194	0	Scarborough (9)	3893	371
Alexandria (1)	500	0	Elliot Lake (2)	124	71	Milngrove (1)	257	205	Seaforth (2)	200	55
Alliston (2)	590	66	Elmira (2)	455	239	Milton (4)	2016	176	Seeleys Bay (1)	69	38
Almonte (1)	241	51	Elora (3)	716	334	Mindemoya (2)	151	1	Shallow Lake (1)	15	5
Amherstburg (2)	2267	187	Embrun (1)	516	190	Minden (1)	194	0	Sharon (1)	838	168
Ancaster (3)	1427	241	Essex (1)	230	30	Mississauga (19)	9530	1487	Shedden (2)	572	12
Apsley (1)	231	46	Etobicoke (4)	3873	599	Mount Brydges (1)	778	38	Simcoe (3)	4487	319
Arnprior (1)	374	75	Exeter (2)	343	41	Mount Forest (1)	57	21	Smith Falls (3)	744	134
Arva (1)	385	20	Fergus (1)	138	12	Napanee (3)	550	99	Smithville (1)	361	73
Athens (1)	236	92	Forest (1)	500	136	Navan (1)	760	759	South Porcupine (1)	10	0
Atwood (2)	64	7	Fort Erie (2)	1399	139	Neebing (1)	2	0	Southampton (1)	500	100
Aurora (5)	1424	167	Fort Frances (1)	577	387	Nepean (3)	1425	260	St. Catharines (7)	4747	405
Aylmer (3)	2910	222	Gananoque (1)	48	0	New Dundee (1)	300	36	St. George (1)	239	64
Ayr (1)	326	11	Georgetown (3)	1783	522	New Hamburg (1)	280	65	St. Marys (1)	380	10
Baillieboro (1)	24	9	Glanbrook (1)	500	100	New Liskeard (1)	34	4	St. Thomas (4)	2451	208
Bancroft (1)	300	0	Glenburnie (1)	95	5	Newmarket (8)	3484	604	Stayner (1)	221	21
Barrie (7)	3565	461	Glencoe (1)	53	19	Niagara Falls (4)	1889	631	Stirling (2)	344	121
Barry's Bay (1)	183	5	Gloucester (1)	716	156	Nobleton (1)	2000	200	Stittsville (2)	856	200
Beamsville (2)	847	68	Goderich (1)	132	17	North Bay (4)	353	195	Stoney Creek (5)	3427	731
Beeton (1)	93	10	Grassie (1)	303	3	North York (4)	2356	319	Stouffville (2)	554	54
Belleville (1)	962	42	Greely (1)	86	26	Norwich (1)	615	194	Stratford (3)	758	328
Belwood (1)	134	26	Grimsby (1)	540	40	Norwood (1)	279	9	Strathroy (2)	868	217
Binbrook (1)	450	20	Guelph (12)	5650	894	Oakville (9)	5697	546	Sturgeon Falls (1)	250	50
Bobcaygeon (1)	146	0	Hagersville (1)	457	107	Ormelee (1)	380	0	Sudbury (6)	1873	366
Borden (1)	800	50	Haliburton (1)	339	84	Orangeville (4)	1709	350	Sundridge (1)	18	6
Bowmanville (1)	380	76	Hamilton (12)	5892	774	Orillia (4)	1348	121	Sutton (1)	713	143
Bracebridge (1)	1100	165	Hanover (2)	106	67	Orleans (4)	2171	751	Sydenham (1)	400	50
Bradford (2)	999	164	Harriston (1)	16	11	Ormstown (1)	178	168	Tecumseh (1)	1042	21
Brampton (12)	6283	888	Hawkesbury (1)	304	147	Orono (1)	359	59	Thornburg (1)	5	5
Brantford (8)	6755	934	Hillsburgh (1)	734	37	Osgoode (1)	539	39	Thornhill (4)	1233	159
Brighton (1)	130	30	Holland Landing (1)	630	126	Oshawa (5)	3246	366	Thunder Bay (1)	789	474
Bright's Grove (1)	272	0	Huntsville (2)	350	90	Ottawa (17)	7931	1336	Tilbury (1)	300	60
Brockville (4)	1477	232	Ilderton (1)	261	41	Owen Sound (3)	706	260	Tillsonburg (4)	1994	220
Burlington (11)	3396	365	Ingersoll (3)	2163	56	Paisley (1)	46	0	Timmins (2)	60	38
Caledon (1)	800	160	Jackson's Point (1)	100	0	Paris (1)	765	8	Toronto (38)	17648	2199
Caledonia (2)	2645	597	Kanata (2)	905	215	Parry Sound (2)	340	50	Tottenham (2)	324	3
Callander (1)	9	0	Kapuskasing (2)	55	12	Pembroke (2)	632	170	Trenton (2)	893	159
Cambridge (11)	4082	548	Kemptville (2)	709	155	Penetanguishene(2)	771	156	Unionville (3)	1326	265
Campbellford (2)	438	69	Kenora (2)	497	197	Perkinsfield (1)	215	33	Uxbridge (2)	1340	195
Campbellville (1)	823	123	Keswick (3)	1074	279	Perth (1)	145	109	Val Caron (1)	190	79
Carleton Place (4)	1323	352	Kincardine (1)	164	76	Petawawa (1)	292	117	Vankleek Hill (1)	73	5
Carp (1)	283	11	King City (1)	573	55	Peterborough (5)	2603	268	Vaughan (4)	2098	738
Casselman (1)	252	52	Kingston (9)	2938	530	Pickering (5)	2536	440	Vineland (1)	243	63
Cayuga (1)	517	67	Kingsville (2)	577	22	Pictou (1)	250	125	Walkerton (1)	128	0
Chatham (3)	1974	383	Kirkland Lake (1)	26	0	Port Carling (1)	96	24	Wallaceburg (1)	435	11
Chelmsford (2)	803	57	Kirkton (1)	75	15	Port Colborne (1)	578	18	Waterdown (2)	2143	233
Chesley (1)	30	0	Kitchener (10)	3320	475	Port Dover (1)	774	225	Waterloo (6)	3154	607
Clarksburg (1)	250	50	Kleinburg (1)	250	50	Port Elgin (1)	194	12	Welland (3)	2346	267
Clinton (1)	370	19	Komoka (1)	1010	210	Port Hope (1)	459	138	Westport (1)	63	13
Cobourg (3)	974	297	Lakefield (1)	421	85	Port Perry (1)	286	86	Wheatley (1)	162	0
Cochrane (1)	30	10	Lanark (1)	294	245	Prescott (1)	282	169	Whitby (7)	2800	443
Coldwater (1)	86	28	Leamington (2)	2530	2	Puslinch (1)	40	10	Wiarton (1)	155	8
Collingwood (3)	1983	328	Lindsay (3)	649	174	Queensville (2)	262	22	Wileville (1)	85	45
Cornwall (1)	1034	532	Listowel (1)	220	81	Renfrew (1)	95	48	Williamstown (1)	310	31
Courtice (3)	1444	45	London (20)	14989	2363	Rexdale (2)	515	75	Willowdale (1)	979	197
Delhi (1)	252	52	Lynden (1)	1105	255	Richmond Hill (5)	1460	212	Winchester (1)	24	24
Desbarats (1)	45	35	Manotick (2)	925	219	Ripley (1)	63	8	Windsor (8)	4691	178
Drayton (1)	30	2	Markham (5)	3116	554	Rockland (1)	1033	0	Wingham (1)	120	40
Drumbo (1)	475	20	Maxville (1)	43	17	Roxboro (1)	651	98	Winona (1)	525	5
Dryden (2)	376	76	Meaford (1)	166	36	Russell (2)	741	0	Woodbridge (4)	1588	106
Dundas (2)	1191	71	Merrickville (1)	45	45	Sarnia (5)	4376	207	Woodstock (2)	836	131
Dunnville (1)	1418	142	Midhurst (1)	627	29	Sauble Beach (2)	510	41	Wyoming (2)	1060	178
									Zurich (1)	431	46

Table 5. Number of heartworm dogs by travel history from the 2002 and 2010 surveys for a defined region of Ontario.

Category	2002	2010	Difference
Katrina dogs		40	
Other imports – other USA states & countries		22	
Canadian dogs visiting outside Canada	6*	6	
	6	6	62
Dogs that never left the area	67	127	60
Dogs with travel history unknown	28	39	

*Total for all three categories; imports and Canadian dogs

Figure 2. Areas with dogs with heartworm in 2010.



Ajax
Alliston
Amherstburg
Ancaster
Aurora
Aylmer
Barrie
Beamsville
Belleville
Bowmanville
Bracebridge
Brampton
Brantford
Burlington
Caledonia
Cambridge
Carleton Place
Chatham
Cobourg
Cornwall
Drumbo
Dryden
Dundas
Dunnville

Durham
Elmira
Embrun
Etobicoke
Forest
Fort Erie
Fort Frances
Grimsby
Guelph
Hagersville
Hamilton
Harriston
Ingersoll
Kemptville
Kingston
Kingsville
Kitchener
Komoka
Lanark
Leamington
London
Markham
Maxville
Milton

Mississauga
Mount Brydges
Napanee
Navan
Nepean
Niagara Falls
North Bay
Norwich
Oakville
Orangeville
Orillia
Orleans
Oshawa
Ottawa
Paris
Parry Sound
Perth
Port Colborne
Port Dover
Prescott
Richmon Hill
Rockland
Sarnia
Scarborough

Sharon
Simcoe
Smith Falls
Southampton
St. Catharines
St. Thomas
Stayner
Stoney Creek
Stratford
Strahroy
Surgeon Falls
Thornhill
Tillsonburg
Toronto
Trenton
Unionville
Uxbridge
Vineland
Wallaceburg
Waterdown
Welland
Whitby
Windsor
Winona
Zurich