**2016 Rabies Summary**

**Massachusetts Department of Public Health**

The following summarizes data collected on animal specimens from Massachusetts sent to the Massachusetts State Public Health Laboratory (MASPHL) for rabies testing from January to December 2016. A cumulative report summarizing rabies testing from 1992-2002, and annual reports from 2003 to 2015 are available on the MDPH website at [www.mass.gov/dph/rabies](http://www.mass.gov/dph/rabies).

#### Number of Submissions and Positive Results by Year

The number and percentage of terrestrial animals that tested positive in 2016 was higher than that of the previous year (see **Table 1 and Figure 1**). The number and percentage of bats that tested positive in 2016 was less than that of the previous year.

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| **Table 1. Number of Submissions, Positive Results and Percent\* Positive by Year and Type of Animal** |
|  | **TERRESTRIAL ANIMALS** | **BATS** |
| **Year** | **Number Submitted** | **Number Positive** | **% Positive** | **Number Submitted** | **Number Positive** | **% Positive** |
| 1992 | 926 | 42 | 5% | 143 | 15 | 10% |
| 1993 | 3660 | 698 | 19% | 289 | 22 | 8% |
| 1994 | 4119 | 700 | 17% | 391 | 34 | 9% |
| 1995 | 3175 | 383 | 12% | 241 | 17 | 7% |
| 1996 | 2701 | 103 | 4% | 277 | 12 | 4% |
| 1997 | 2771 | 264 | 10% | 334 | 17 | 5% |
| 1998 | 3483 | 480 | 14% | 439 | 18 | 4% |
| 1999 | 2643 | 205 | 8% | 595 | 21 | 4% |
| 2000 | 2666 | 247 | 9% | 611 | 29 | 5% |
| 2001 | 2615 | 248 | 9% | 710 | 32 | 4% |
| 2002 | 2505 | 267 | 11% | 613 | 36 | 6% |
| 2003 | 2358 | 193 | 8% | 602 | 23 | 4% |
| 2004 | 2842 | 291 | 10% | 600 | 34 | 6% |
| 2005 | 2653 | 296 | 11% | 708 | 33 | 5% |
| 2006 | 2122 | 197 | 9% | 756 | 34 | 5% |
| 2007 | 1988 | 123 | 6% | 787 | 29 | 4% |
| 2008 | 2298 | 135 | 6% | 748 | 19 | 3% |
| 2009 | 1747 | 106 | 6% | 696 | 21 | 3% |
| 2010 | 1740 | 117 | 7% | 678 | 14 | 2% |
| 2011 | 1700 | 90 | 5% | 753 | 20 | 3% |
| 2012 | 1594 | 73 | 5% | 1196 | 38 | 3% |
| 2013 | 1644 | 79 | 5% | 1045 | 18 | 2% |
| 2014 | 1644 | 108 | 7% | 1175 | 40 | 3% |
| 2015 | 1642 | 103 | 6% | 1073 | 39 | 4% |
| **2016** | **1700** | **120** | **7%** | **833** | **21** | **3%** |
| **Total** | **58,936** | **5,668** | **10%** | **16,293** | **636** | **4%** |

 \* Calculated to nearest percent

**Notable Rabies Situations**

In 2016, 2,533 specimens were submitted to the MASPHL for rabies testing. Of these specimens, 141 (6%) tested positive for rabies. **Table 2** shows data on positive animals for 2016. In 2016, five domestic animals tested positive; all were cats. The circumstances surrounding two of them are described below.

In Berkshire County, a 6 month old, unvaccinated, indoor cat developed neurologic symptoms. The cat was euthanized and tested positive for rabies. The owner sustained a scratch from the positive cat on the day it was brought to the veterinarian, prior to it being euthanized and received post-exposure rabies prophylaxis. The owner’s two young daughters were also exposed to the cat and significant exposure could not be ruled out by the mother. Both children and the owner’s boyfriend received post-exposure rabies prophylaxis. The owner reported receiving the cat from another Berkshire County resident who had brought two litters of kittens in to Massachusetts from New York State. The Department of Agricultural Resources became involved, notified New York State, and continued to follow up on the status of the other kittens that were brought into Massachusetts.

In Worcester County, a feral cat was euthanized and tested positive for rabies. The cat was found injured and dehydrated by a family in their yard. The family took the cat into their home and cared for it before dropping it off with the veterinarian. Post-exposure rabies prophylaxis was recommended for three individuals in the household. One individual was scratched by the cat and the two others had put their fingers in the cat’s mouth to give it water. Two additional household members sought post-exposure rabies prophylaxis out of anxiety as they had also interacted with the cat, although no saliva contact was reported. The town’s animal inspector was notified and reported that there was a cat colony in the area. Fifteen employees at the veterinary clinic were identified as having cared for the cat before it was euthanized. There were no bites or scratches reported by any of the employees, but three employees received post-exposure rabies prophylaxis as they performed an oral exam on the cat without gloves. There is a possibility that mucous membrane exposure may have occurred during the oral exam.

**Number of Submissions and Positive Results by Species**

Raccoons, skunks and bats accounted for the large majority of rabies positive animals in Massachusetts, although their proportion of all rabies positive animals varied by quarter (**Figure 2**).

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| **Table 2. Number of Animals Positive for Rabies/Animals Submitted (%), 2016** |
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|  | **1st Quarter** | **2nd Quarter** | **3rd Quarter** | **4th Quarter** | **Total** |
| Animal | Number Positive | Number Submitted | % | Number Positive | Number Submitted | % | Number Positive | Number Submitted | % | Number Positive | Number Submitted | % | Number Positive | Number Submitted | % |
| Raccoon | 12 | 23 | 52.2% | 17 | 60 | 28.3% | 17 | 39 | 43.6% | 9 | 23 | 39.1% | 55 | 145 | 37.9% |
| Skunk | 10 | 19 | 52.6% | 1 | 23 | 4.3% | 23 | 80 | 28.8% | 10 | 16 | 62.5% | 44 | 138 | 31.9% |
| Cat | 1 | 149 | 0.7% | 1 | 177 | 0.6% | 2 | 224 | 0.9% | 1 | 136 | 0.7% | 5 | 686 | 0.7% |
| Fox | 1 | 5 | 20.0% | 3 | 8 | 37.5% | 7 | 12 | 58.3% | 0 | 5 | 0% | 11 | 30 | 36.6% |
| Woodchuck | 0 | 4 | 0% | 3 | 36 | 8.3% | 2 | 48 | 4.2% | 0 | 4 | 0% | 5 | 92 | 5.4% |
| Bat | 2 | 78 | 2.6% | 4 | 208 | 1.9% | 13 | 485 | 2.7% | 2 | 62 | 3.2% | 21 | 833 | 2.5% |
| Cow | 0 | 1 | 0% | 0 | 1 | 0% | 0 | 0 | 0% | 0 | 0 | 0% | 0 | 2 | 0% |
| Coyote | 0 | 0 | 0% | 0 | 1 | 0% | 0 | 1 | 0% | 0 | 1 | 0% | 0 | 3 | 0% |
| Dog | 0 | 104 | 0% | 0 | 137 | 0% | 0 | 123 | 0% | 0 | 139 | 0% | 0 | 503 | 0% |
| Other\* | 0 | 17 | 0% | 0 | 33 | 0% | 0 | 30 | 0% | 0 | 21 | 0% | 0 | 101 | 0% |
| Total | 26 | 400 | 6.5% | 29 | 684 | 4.2% | 64 | 1042 | 6.1% | 22 | 407 | 5.4% | 141 | 2533 | 5.6% |

\* Includes squirrels, rabbits, sheep, pig, goats, horses, chipmunks, muskrats, rats, deer, mice, bears, ferrets, fishers, and opossums

**Figure 2. Proportion of All Positive Results Represented by Each Animal, by Quarter, 2016**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Raccoon |  | Skunk |  | Cat |  | Fox |  | Woodchuck |  | Bat |
|  | Other |  |  |  |  |  |  |  |  |  |  |

\*Other: Coyote

**Cumulative Submissions and Results by Month**

Animal submission numbers fluctuated throughout the year. As might be expected, the highest number of submissions for both terrestrial animals and bats occurred during June, July and August (see **Table 3**). This same trend is seen annually and is due to the greater activity of wildlife species during the spring and summer months, coinciding with the time that humans increase outdoor activity. These simultaneous events result in more frequent contact between humans and wildlife, and lead to more animal rabies testing.

The proportion of animals testing positive and unsatisfactory for rabies also varies throughout the year, generally showing a consistent pattern from year-to-year (see **Table 3 and Figure 3**). The change in the percent positive is normally small between years during the same month and significant departures from this seasonal pattern can be used to detect alterations in the intensity of virus circulation in an area. Of note, the number of bats submitted for testing decreased significantly between 2015 and 2016. The percent of unsatisfactory bats in January and March increased from 0% and 3% in 2015, to 24% and 23% in 2016, likely as a result of unusually warm weather.

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| **Table 3. Submissions, Number Positive for Rabies, and Percent Positive by Month and Animal Type: 2015 and 2016** |
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|  | **TERRESTRIAL ANIMALS** |  |  | **BATS** |
| **Month** | **Submitted 2015** | **Positive 2015** | **Unsatisfactory 2015** | **Submitted 2016** | **Positive 2016** | **Unsatisfactory 2016** | **Submitted 2015** | **Positive 2015** | **Unsatisfactory 2015** | **Submitted 2016** | **Positive 2016** | **Unsatisfactory 2016** |
| January | 84 | 3 | 4% | 1 | 1% | 106 | 5 | 5% | 1 | 1% | 41 | 0 | 0% | 0 | 0% | 29 | 1 | 3% | 7 | 24% |
| February | 97 | 4 | 4% | 1 | 1% | 99 | 7 | 7% | 1 | 1% | 25 | 0 | 0% | 5 | 20% | 23 | 0 | 0% | 3 | 13% |
| March | 99 | 7 | 7% | 4 | 4% | 117 | 12 | 10% | 2 | 2% | 37 | 1 | 3% | 1 | 3% | 26 | 1 | 4% | 6 | 23% |
| April | 118 | 12 | 10% | 2 | 2% | 124 | 7 | 6% | 1 | 1% | 41 | 1 | 2% | 3 | 7% | 18 | 0 | 0% | 1 | 6% |
| May | 131 | 14 | 11% | 3 | 2% | 151 | 10 | 7% | 2 | 1% | 98 | 6 | 6% | 15 | 15% | 37 | 2 | 5% | 4 | 11% |
| June | 193 | 12 | 6% | 10 | 5% | 201 | 8 | 4% | 6 | 3% | 140 | 5 | 4% | 8 | 6% | 153 | 2 | 1% | 24 | 16% |
| July | 242 | 12 | 5% | 13 | 5% | 170 | 14 | 8% | 11 | 6% | 192 | 4 | 2% | 24 | 13% | 112 | 3 | 3% | 15 | 13% |
| August | 165 | 6 | 4% | 17 | 10% | 207 | 22 | 11% | 14 | 7% | 428 | 11 | 3% | 49 | 11% | 348 | 6 | 2% | 42 | 12% |
| September | 171 | 9 | 5% | 10 | 6% | 180 | 15 | 8% | 8 | 4% | 23 | 5 | 22% | 5 | 22% | 25 | 4 | 16% | 3 | 12% |
| October | 128 | 4 | 3% | 2 | 2% | 111 | 10 | 9% | 5 | 5% | 19 | 3 | 16% | 1 | 5% | 13 | 2 | 15% | 1 | 8% |
| November | 109 | 16 | 15% | 1 | 1% | 120 | 5 | 4% | 0 | 0% | 10 | 0 | 0% | 2 | 20% | 14 | 0 | 0% | 2 | 14% |
| December | 105 | 4 | 4% | 2 | 2% | 114 | 5 | 4% | 0 | 0% | 19 | 3 | 16% | 1 | 5% | 35 | 0 | 0% | 3 | 9% |
| **TOTAL** | **1642** | **103** | **6%** | **66** | **4%** | **1700** | **120** | **7%** | **51** | **3%** | **1073** | **39** | **4%** | **114** | **11%** | **833** | **21** | **3%** | **111** | **13%** |

\* Calculated to nearest percent

The distribution of results of rabies testing results that were positive and of specimens unsatisfactory for testing varies throughout the year and by animal type (terrestrial versus bats) (**Figure 3**). In every quarter, more bats are unsatisfactory for testing than test positive for rabies. In contrast, positive terrestrial animals outnumbered the unsatisfactory samples in all quarters. Over the course of the year, nearly twice as many terrestrial animals were positive than were unsatisfactory while there were three or four times as many unsatisfactory bats as positive ones.

Because samples that are unsuitable for testing (reported out as “unsatisfactory”) require the same public health response as positive animals, it is critical to reduce the number of unsatisfactory specimens as much as possible. Ensuring the proper handling, storage and shipping as well as prompt submission of animals are important for improving specimen quality.

**Submissions and Positive Results by County**

In 2016, all counties in Massachusetts submitted at least one animal for rabies testing, and all counties, except Barnstable, Dukes and Nantucket, had at least one animal that tested positive (see **Table 4 and Figure 4**). Middlesex, Worcester, and Essex counties submitted the highest number of animals (n = 528, n = 395, n = 298, respectively). Worcester, Middlesex, Hampden, and Norfolk County had the highest number of animals that tested positive (n=30, n=23, n=17, n=17) and Berkshire County had the highest percentage of submitted animals that tested positive (18%).

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| **Table 4. Rabies Testing Data by County- Number of Animals Positive for****Rabies/Number of Animals Submitted (%)** |
| **County** | **1st Quarter** | **2nd Quarter** | **3rd Quarter** | **4th Quarter** | **Cumulative** |
| Barnstable | 0/7  | (--%) | 0/28  | (--%) | 0/40  | (--%) | 0/11 | (--%) | 0/86  | (--%) |
| Berkshire | 1/11  | (9%) | 4/23  | (17%) | 8/35  | (23%) | 2/13  | (15%) | 15/82  | (18%) |
| Bristol | 0/43  | (--%) | 1/45  | (2%) | 1/77  | (1%) | 2/35  | (6%) | 4/200  | (2%) |
| Dukes | 0/1  | (--%) | 0/1  | (--%) | 0/3  | (--%) | 0/0  | (--%) | 0/5  | (--%) |
| Essex | 3/47  | (6%) | 2/84  | (2%) | 4/119  | (3%) | 1/48  | (2%) | 10/298  | (3%) |
| Franklin | 0/6  | (--%) | 0/9  | (--%) | 7/24  | (29%) | 1/7  | (14%) | 8/46  | (17%) |
| Hampden | 7/35  | (20%) | 5/41  | (12%) | 3/56  | (5%) | 2/22  | (9%) | 17/154  | (7%) |
| Hampshire | 1/10  | (10%) | 1/23  | (4%) | 2/27  | (7%) | 0/4 | (--%) | 4/64  | (6%) |
| Middlesex | 4/78  | (5%) | 5/137  | (4%) | 11/233  | (5%) | 3/80  | (4%) | 23/528  | (4%) |
| Nantucket | 0/0  | (--%) | 0/2 | (--%) | 0/1 | (--%) | 0/1  | (--%) | 0/4  | (--%) |
| Norfolk | 4/45  | (9%) | 3/73  | (4%) | 7/123  | (6%) | 3/54  | (5%) | 17/295  | (6%) |
| Plymouth | 1/22  | (5%) | 1/48  | (2%) | 4/73  | (5%) | 5/35  | (14%) | 11/178  | (6%) |
| Suffolk | 0/32  | (--%) | 0/63 | (--%) | 2/71 | (3%) | 0/32 | (--%) | 2/198  | (1%) |
| Worcester | 5/63  | (8%) | 7/107  | (7%) | 15/160  | (9%) | 3/65  | (5%) | 30/395  | (8%) |

**Mapping**

MDPH produces a “heat map” of rabies-positive terrestrial animals on an annual basis (see **Figure 5**).

 **Figure 5.**

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