

burgh, Pa., during July and August 1958. The incidence of bites per 10,000 human population was 19.46 for males and 8.84 for females; 76 percent of the victims were less than 20 years of age. The rate of bites was higher for non-whites than for whites.

High-risk groups identified were: school children, preschool children, persons coming to the dog owner's house in the line of work, newspaper boys, mailmen, and veterinarians.

Seventy-six percent of the bites were inflicted on the extremities, 16 percent on the head, face, and neck, and 8 percent on the trunk. Only about 10 percent of the bites were moderately severe or severe. There were no fatal dog bites. A high percentage of facial wounds required subsequent plastic surgery.

About one-third of the bite accidents resulted from dogs biting maliciously without human provocation, one-third happened while the victims were petting or playing with dogs, and one-third were attributed to human activities which caused the dogs to bite.

The following environmental factors were identified: the incidence of bites was higher in residential than in business or industrial areas of the city; 65 percent of the bites happened near the dog owner's home, 18 percent in the neighborhood near the owner's home, 9 percent near the victim's home, and the remaining 8 percent occurred elsewhere in the city; most dog bites happened during the spring and summer months; and 79 percent of the bite accidents occurred between noon and midnight.

Characteristics of Biting Dogs

PRACTICALLY NOTHING is known about the characteristics of dogs which bite man. The question of how the dogs involved in dog bite accidents differ from other dogs is as important to the veterinary epidemiologist studying dog bites as determining the classification, type, and strain of a bacterial agent is to a microbiologist.

In an epidemiological study of 947 dog bite accidents which occurred during July and August 1958 in Pittsburgh, Pa., we tried to determine what breeds of dogs are most likely to bite people, to elicit other characteristics, such as age and sex, of the dogs associated with accidents, and to find the pertinent animal factors which are necessary for planning an adequate dog bite and rabies control program.

In this study the name and address of the owner of the dog were obtained from the dog bite report forms sent in by hospitals and physicians treating bites. When this information was not available from the report form, the Allegheny County Health Department and the Pittsburgh Police Department traced the dog owners. They were requested to complete a questionnaire supplying the following information: the name and address of the owner;

the age, sex, and breed of the dog; number of times the dog had bitten other people within the past year; vaccination against rabies and date; possession of a 1958 dog license and the number of the license; involvement in frequent dog fights; the circumstances of the bite accident as the owner understood it; and whether the owner witnessed the bite accident.

One serious limitation to all dog population estimates is the unknown number of stray dogs. This statistical problem was circumvented by limiting the study to licensed dogs.

According to the records of the Pittsburgh Dog Licensing Bureau, 19,334 dog licenses were issued as of September 1, 1958, 15,579 for male dogs and 3,755 for female dogs. The rates of bites inflicted by licensed dogs were computed using 19,334 as the population base. Information about the age, sex, and breed was obtained by studying a 2 percent random sample of the total licensed dog population.

Incidence

Of the 947 dogs inflicting bites, 767, or 81 percent, were traced to owners, and 180, or 19 percent, could not be traced. Presumably, a

large proportion of the dogs which could not be traced were strays. Of those traced to owners, 571, or 74 percent, were licensed, and 196, or 26 percent, were not. This study was concerned primarily with the 571 dogs which were traced to owners and had dog licenses, but many of the findings apply to the unlicensed dogs with owners.

Sex. Of the licensed dogs inflicting bites, 416 were males and only 155 were females (table 1). If the licensed dog population at risk were unknown, it would be easy to assume that males are more likely to bite people than females. This was not true. Licensed female dogs had a bite rate of 4.1 per 100 dogs, whereas males had a bite rate of only 2.7 per 100 dogs. Contrary to popular opinion, this sex difference in bite rates was not related to the females caring for newborn pups as only 11, or 7 percent, of the 155 bites happened while the victim was playing with a pup. Only one bite by a female dog was reported to have occurred while the dog was in its oestrous cycle. Apparently city dwellers prefer owning male dogs, since 15,579 licenses were issued for male dogs and only 3,755 for female dogs. There is no evidence to suggest that a dog owner is more likely to obtain a license for a male dog.

Age. Dogs less than 6 months of age do not require a license in Pittsburgh. It is interesting that more than 50 percent of the licensed dogs were less than 5 years old (table

1). A vast majority (80 to 85 percent) of the licensed dogs of both sexes were from 1 to 9 years of age, and only about 10 percent were 10 years of age or over. A striking finding is that younger dogs are more likely to bite people than older dogs. This was particularly true for dogs between 6 and 11 months of age. A smaller proportion of dogs 5 years of age or over bite humans than would be expected. Perhaps younger dogs experience difficulty in adjusting to their domestic status. In effect, they have not been trained how to behave toward people. Young dogs in intimate association with young children would seem to invite frequent dog bite accidents.

Breeds. One of the most important hypotheses tested is that certain breeds of dogs are more likely to bite people than other breeds. Veterinarians from time to time have expressed clinical impressions about the temperament of certain breeds of dogs, but, as far as we know, there have been no previous studies to confirm these impressions in relation to dog bites.

The recognized breeds of dogs were arranged into six groups, a modification of the American Kennel Club classification (13). Mixed breeds and unrecognized breeds were listed as additional groups. Grouping the many breeds of dogs in these large categories was the only practical way to handle the data, and thousands of dog bite cases would have been required to demonstrate significant differences in

Table 1. Age and sex of licensed dogs inflicting bites, Pittsburgh, Pa., July and August 1958

Age of dog	Males			Females		
	Dogs inflicting bites		Percent in total licensed dog population	Dogs inflicting bites		Percent in total licensed dog population
	Number	Percent		Number	Percent	
0-5 months.....	¹ 18	4.3	(²)	¹ 12	7.7	(²)
6-11 months.....	54	13.0	4.2	21	13.6	7.3
1-4 years.....	200	48.1	49.0	77	49.7	47.3
5-9 years.....	114	27.4	36.8	38	24.5	34.3
10-14 years.....	20	4.8	9.0	5	3.2	11.1
15-19 years.....	3	.7	.5	0	-----	-----
Unknown.....	7	1.7	.5	2	1.3	-----
Total.....	416	100.0	100.0	155	100.0	100.0

¹ Unlicensed dogs less than 6 months old traced through bite report forms.

² Licenses not required for dogs less than 6 months old.

bites among the individual breeds. Owing to the larger number of breeds in each group, the following levels of confidence were set: probably significant when $P = < 0.05$; significant when $P = < 0.01$; highly significant when $P = < 0.001$.

Most people in Pittsburgh own dogs of mixed breeds (table 2). Hounds, terriers, and sporting dogs ranked next in popularity. The large number of mixed breeds with licenses would seem to suggest that people obtain licenses for these dogs about as often as they do for dogs of recognized breeds. The data in table 2 indicate that working dogs are much more likely to bite people than any other group. The working dog group includes the following well-known breeds: boxers, collies, Eskimo dogs, German shepherd dogs, great Danes, Saint Bernards, and Doberman pinschers. For this group 48 bites were expected, but 90 were reported, indicating a highly significant difference.

Sporting dogs inflicted more bites than were expected (59 expected, 75 reported). This difference is probably significant ($P = < 0.05$). The sporting dog group includes various breeds of pointers, setters, retrievers, and spaniels. On the other hand, hounds bite fewer people than would be expected (82 expected, but only 34 reported). These findings indicate that hounds are relatively safe dogs to own. No significant differences in the frequency of bites could be demonstrated for mixed breeds, terriers, toys, nonsporting dogs, and unrecognized

breeds. It was not possible to single out an individual breed as being particularly vicious. This preliminary study, however, suggests that such breeds probably do exist and that additional studies along this line of inquiry may prove fruitful.

Behavior. To determine whether a pet was a chronic offender, a history of the previous biting experience of dogs involved in bite accidents was sought from owners. Victims were also asked about the animal's history because owners can be unaware that their pets have inflicted a bite, and a victim may know of others bitten by the same dog.

The dog owners volunteered the following information about the number of bites their dogs had inflicted during the past year. Forty-seven dogs inflicted 2 bites; 16 dogs inflicted 3 bites; 1 dog, 4 bites; and 4 dogs, 5 bites. Most of the dog owners expressed considerable concern about what to do with dogs that were chronic biters. On the other hand, the victims stated the dog which bit them had bitten the following number of persons (including the victim) in the last year: 83 dogs bit 2 people; 2 dogs bit 3 people; and 1 dog bit 8 people. Fifteen percent of the dog owners did not agree with the victims' statements. However, it was apparent that some dogs are notorious for biting people.

Only 15 of the owners stated that their dogs were involved frequently in dog fights. If these impressions of dogs' pugnacious behavior toward other dogs are correct, then there is no

Table 2. Distribution of bites inflicted by various groups of licensed dogs, Pittsburgh, Pa., July and August 1958

Groups of breeds ¹	Estimated licensed dog population ²	Number bites reported	Number bites expected	Test for significance— <i>P</i>
Mixed.....	9,376	271	277	<0.70 but >0.50
Sporting.....	2,011	75	59	<0.05 but >0.02
Hounds.....	2,765	34	82	<0.001
Working.....	1,624	90	48	<0.001
Terriers.....	2,243	57	66	<0.30 but >0.20
Toys.....	677	19	20	<0.90 but >0.80
Nonsporting.....	464	18	14	<0.30 but >0.20
Unrecognized.....	174	7	5	<0.50 but >0.30
Total.....	19,334	571	571	

¹ Classification of groups of breeds according to reference 13.

² Based on a 2 percent random sample of 19,334 licensed dogs in Pittsburgh, 1958.

relationship between dogs' behavior toward other dogs and their behavior toward people.

As mentioned previously in this study, approximately one-third of the bite accidents resulted from dogs biting maliciously without human provocation, one-third were incurred while the victims were playing with or petting dogs, and one-third resulted from human activities which goaded dogs to bite. These findings would seem to suggest that an interaction of overt behavior on the part of people and dogs figures in most (probably well over two-thirds) of the bite accidents.

Licenses and Immunity

Only 767 dogs, or 81 percent, could be traced to owners. The remaining 180, or 19 percent, either were strays or could not be traced. This finding would seem to indicate that Pittsburgh has a relatively large stray dog population. Only 74 percent of the dogs which could be traced to owners had dog licenses. A more active campaign of dog licensing and dog catching is needed to control the stray and unlicensed dogs.

Only 264, or 34 percent, of the animals traced to owners had been vaccinated against rabies. Of these, 57, or 22 percent, had not been given booster injections within the past 3 years. Most dogs (468 or 61 percent) had not been vaccinated against rabies, and 35, or 5 percent, of the owners did not know the status of their dog's immunity. As one might expect, a higher proportion of dogs with licenses had been vaccinated than dogs without licenses. Probably a high proportion of the 180 dogs which could not be traced have not been vaccinated.

Improved vaccines are available for active immunization (14,15). Adequate control measures plus mass rabies vaccination of the canine population has been shown an effective means of eliminating canine rabies from a community (16). Although no human rabies and only one case of animal rabies have been reported in Pittsburgh or Allegheny County during the past 3 years, numerous cases have been reported from adjacent counties. At the present time, the canine population of Pittsburgh is largely susceptible to rabies and the soil is ripe for a rabies epidemic. On the basis of these findings,

a mass rabies immunization program is indicated, and legislation is needed to make rabies immunization a requirement for dog licensure. These recommendations are in accordance with those of the Expert Committee on Rabies of the World Health Organization (17).

Discussion

A study of the epidemiology of dog bites in the United States would seem important for the following reasons: between 600,000 and 1 million people are bitten by dogs every year (1); about 10 percent of all dog bites produce serious injuries although few result directly in human deaths; dogs are the primary source of human exposure to rabies; although only 10 to 20 people die of rabies in this country every year, about 50,000 individuals receive antirabies treatment (18); other diseases are transmissible from dogs to man through dog bites; and an immeasurable amount of anxiety and fear is experienced by parents when their child is bitten by a dog. On the other hand, dogs will probably continue to provide people with much pleasure and companionship. It seems reasonable to believe that many dog bites can be prevented when the facts about how they take place are known.

Inferences about the age, sex, and breed of the dogs were made by comparing the licensed dogs which bit people with the total licensed dog population of Pittsburgh (19,334 dogs). However, among the dogs which were traced there were no significant differences in the age, sex, and breed distributions of the 196 unlicensed dogs compared with the 571 licensed dogs. Therefore, there is reason to believe that the findings in this study may pertain to 767, or 81 percent, of the dogs which bit people. This observation would seem to increase the reliability of the data and support the validity of the findings. Poor reporting did not seem to be a major source of error, as it was felt that most dog bite accidents were reported. Biases in reporting a number of the items were corrected by comparing the victim's statements with the owner's statements. There was a surprisingly high degree of agreement in most instances.

Dog factors would seem to rank along with

human factors in the ecology of dog bites. Environmental factors occupied a relatively minor role. Female dogs inflicted a higher rate of bites per 100 (4.1) than male dogs (2.7). This difference could not be attributed to the oestrous cycle or nursing pups. Unfortunately, the question of spayed versus nonspayed females was not investigated. Young dogs were found more likely to bite people than were older dogs.

Perhaps the most striking finding is that certain breeds of dogs are more likely to bite people than other breeds. In this study, to facilitate analysis of the data, individual breeds were combined into groups of breeds, although there is a danger that the individual breed with a high rate of bites may be obscured by the rates of the other breeds in the group. Working dogs and sporting dogs clearly were reported to bite more people than would be expected. The differences between the expected and reported number of bites for these groups is probably significant. They did not result from age and sex variations within groups, and the circumstances of the bites did not account for these differences. There was not an unusually large proportion of bite accidents involving these breeds in which human acts provoked the dogs to bite. A random check of the records showed that improper classification of dogs by breeds was not a major source of bias. At this time, we are not able to single out individual breeds within the groups which are especially vicious. However, this preliminary study would seem to indicate that such breeds exist.

On the basis of the findings in this study, the following recommendations are suggested to dog owners.

- Try to avoid the combination of young dogs (less than a year old) around young children (less than 5 years old).
- When obtaining pets for children consider the fact that female dogs inflict more bites than male dogs.
- Restrain or dispose of dogs which consistently bite people.
- Immunize dogs against rabies, consulting a veterinarian for the proper schedule.
- Consult a physician in case of a dog bite.
- Obtain a license for each dog.
- Affix an identification tag to each animal's

collar, listing the dog's name and the owner's name and address.

- Don't permit dogs to roam at large in a heavily populated area.

Summary

Dog factors associated with dog bites in Pittsburgh, Pa., were studied by comparing the licensed dogs which bit people with the total licensed dog population of the city. Of 19,334 licensed dogs, 571, or 3 percent, bit people during July and August 1958.

Female dogs had a higher bite rate per 100 dogs than male dogs (4.1 and 2.7). The higher rate among female dogs could not be attributed to the oestrous cycle or to nursing pups.

Young dogs, 6-11 months of age, were found more likely to bite people than older dogs. Perhaps this finding is related to young dogs' lack of training and poor adjustment toward people.

Certain groups of dogs were found more likely to bite people than other groups. Working dogs were the chief offenders, with 48 bites expected and 90 bites observed. Also, sporting dogs bite people more often than would be expected. No individual breed could be singled out as especially vicious, but such breeds probably exist.

Some dogs are repeatedly involved in dog bite accidents. According to the owners and the victims, during 1 year between 47 and 83 dogs bit 2 people; at least 16 dogs bit 3 people; 1 dog bit 4 people; 1 dog bit 5 people; and 1 dog bit 8 people.

The findings in this epidemiological study of dog bites provided a factual basis for making recommendations to prevent and control dog bites.

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Florence Rena Sabin

A pioneer in physiology and public health has been selected by the State of her birth, Colorado, as one of its two representatives in National Statuary Hall of the Capitol of the United States (see frontispiece).

Florence Rena Sabin, born in Central City, Colo., November 9, 1871, was the first woman intern to be accepted by Johns Hopkins University, in 1900, after earning a doctorate in science at Smith College; the first woman to be professor in a medical school (histology at Hopkins); and the first woman to be president of the American Association of Anatomists (1924).

Renowned for contributions to the dynamic study of functional physiology, Dr. Sabin was also the first woman to be invited to join the staff of the Rockefeller Institute of Medical Research, where she served 13 years until her "retirement" at 67 in 1938. Then she began one of the most vigorous periods of her career.

As chairman of the health section of Colorado's postwar planning committee and city manager of health and charities in Denver, she led a successful campaign for "Health To Match Our Mountains," which culminated in 1947 with legislative and financial support of a new department of public health, construction of new hospitals, a widened medical school program, increased facilities for tuberculosis management, and a strengthened system of milk sanitation.

Signs

and

Symptoms

of trends in public health

A full program of progressive patient care has been established at Grant Hospital in Chicago with the opening of a new wing. The hospital now has three 6-bed wards for intensive care and one 18-bed wing for ambulatory self-care. Intermediate care is provided in the remaining wards.

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Trachoma in Mexicans in Southern California is under investigation by scientists assigned by the Communicable Disease Center of the Public Health Service.

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Properly designed and adequately fitted mouth protectors are urged for all youths engaged in contact sports by Dr. Gerard H. Schoen of the American School Health Association. He quoted a recent survey which showed that among a group of high school football players, 11 percent not wearing mouth protectors suffered dental injury while those with protectors escaped harm.

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The world's population is increasing at the rate of 45 million a year, according to the annual report of the United Nations Department of Economic and Social Affairs. The computation is based generally on an estimated annual birth rate of 34 per 1,000 and death rate of 18 per 1,000. Highest life expectancy was found in Norway where girls born now may expect to live to the age of 75, and boys may reach 71.

These and other statistics supplied by member governments are considered by the report's editors to be correct within a range of 75 to 98 percent.

The Declaration of Geneva rather than the Hippocratic Oath was taken at the first commencement exercises at Albert Einstein College of Medicine, Yeshiva University, New York City. Fifty graduating students pledged "not to use their medical knowledge contrary to the laws of humanity" or to "permit considerations of religion, nationality, race, party politics, or social standing to intervene between duty and patient."

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The virus laboratory of the division of laboratories, New Jersey Department of Health, is now housed in new quarters at the Madden Building, Donnelly Memorial Hospital, Trenton.

Complete equipment for virus isolation and serologic studies of virus diseases has been installed during the past year, including housing for large and small animals. In addition to diagnostic virology, laboratory areas have been set aside for research tied in with the department's epidemiological services.

E. L. Shaffer, Ph.D., is director of the division of laboratories, and Martin Goldfield, M.D., assistant director.

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Public opinion favors spending for medical research, according to a University of Michigan survey. Interviews of 1,500 Americans showed that, given a choice, 54 percent preferred medical research; 32 percent, efforts to combat juvenile delinquency; 7 percent, basic research in the sciences such as physics and chemistry; and only 3 percent, a program to put the first man on the moon.

A cooperative program of medical care for people on public assistance has resulted from joint action by practicing physicians, the department of public welfare, and the county health department in Russell County, Va., Dr. J. W. Jessee of Norton reports.

Three steps initiated the action. A screening facility was set up to determine the medical eligibility of welfare applicants. A medical advisory committee was formed to serve the department of public welfare. And the local health department arranged to coordinate medical services to the indigent sick.

A general medical clinic was opened in 1956 with local funds. State support was added after the clinic was designated as part of a statewide pilot study of coordinated medical care for the indigent sick.

Observations after 3 years of operation indicate there has been definite improvement of interworking relationships, opportunity for control and coordination of medical services to welfare patients, increased use of established health department programs, success in casefinding, and savings in costs both to the patient and to the community.

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A comprehensive water pollution abatement plan for New York's Finger Lakes Drainage Basin has been approved by the State water pollution control board. It calls for specific steps by 95 industries and 42 municipalities to bring waters of the basin up to established standards.

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Staff nurses are trained in epidemiology and communicable disease control in Butte County, Calif., through a series of lecture meetings featuring the work of the local department of health in a recent outbreak of *Salmonella* infections.

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In the absence of equipment or help from a second person, the American Red Cross endorses the mouth-to-mouth technique as the most practical method of artificial respiration regardless of age and cause of cessation of breathing.