

EVALUATION OF A VACCINATION CAMPAIGN OF DOGS AGAINST RABIES, INCLUDING ORAL VACCINATION, IN KUŞADASI, TURKEY

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KUŞADASI'NDA YÜRÜTÜLEN KÖPEKLERİN KUDUZA KARŞI ORAL YOLLA AŞILAMA DA DAHİL OLMAK ÜZERE YOĞUN AŞILAMA KAMPANYASININ DEĞERLENDİRİLMESİ

ÖZET

Bu çalışma 5 - 7 Nisan 1997 tarihleri arasında Kuşadası'nda yürütülen köpek aşılama kampanyası sonuçlarını bildirmektedir. İlk defa olarak parenteral ve oral aşılama kombinasyonu kullanılmıştır. SAD B19 aşısı virüsünü saklı olarak içeren kapsüllere sahip baltalar ev ev dolaşma süresince, parenteral aşılama için ulaşılamayan köpeklerle, direkt olarak verilmiştir. Bu kampanyanın organizasyonuna ve uygulanabilirliğine özel önem verilmiştir. Aşılama kampanyası öncesinde ev ev dolaşarak sahipli köpek popülasyonunun büyüklüğü ve bu popülasyonun kuduz aşılama düzeyinin saptanması için bir survey yürütülmüştür. Hane başına sahipli köpek oranı 1/12.4 idi. Sahipli köpek popülasyonunun en az % 40'ı son zamanlarda (1 yıldan öncesinde) aşılanmamıştı. Bu popülasyonun sadece % 20'sinde aşı sertifikası vardı. Yapılan çalışma göstermiştir ki bu iki tekniğin kombinasyonu aşılanabilir hayvan miktarını belirgin ölçüde artırabilecektir. Karşılaşılan bağlanamamış köpeklerin % 59'u parenteral olarak aşılanamamış ve bunlara hemen balt verilmiştir. Köpeklerin elle beslenmesi ve boş kapsüllerin toplanması ile, insanların aşısı virüsüne maruz kalma riski tamamen düşük idi. Bununla birlikte aşılama ekibinin deneyim azlığı ve aşırı yağışlar, aşılanan toplam köpek sayısı üzerinde negatif etki oluşturmuştur. Yani köpeklerin % 73.3 parenteral olarak, % 26.7'si de oral olarak aşılanmıştır.

SUMMARY

The present study reports results of a dog rabies vaccination campaign that took place in the coastal resort of Kuşadası, Turkey, 5-7 April 1997.

For the first time a combination of parenteral and oral vaccination was used. Baits, in which a capsule containing the SAD B19 vaccine virus was hidden, were offered directly to free-roaming and restricted dogs inaccessible for parenteral vaccination encountered during house-to-house visits. Particular attention was given to the organization and feasibility of such a campaign. Prior to the vaccination campaign, a survey (house-to-house visits) was conducted in Kuşadası to determine size and structure of the owned dog population and its level of rabies vaccination. An owned dog to household ratio of 1 : 12.4 was determined. At least 40% of the owned dog population was not vaccinated recently (<1 year ago) against rabies, only for 20% of the dogs a valid vaccination certificate was available. The study showed that a combination of the two techniques can increase the vaccination coverage considerably; 59% of the unrestricted dogs encountered could not be vaccinated by the parenteral route and were consequently offered a bait. By hand-feeding dogs and collecting the discarded capsules the risks of human exposure to the vaccine virus was extremely low. Lack of experience of the vaccination teams (staff and students of the Adnan Menderes University, School of Veterinary Medicine, Aydın) and weather conditions (rainfall) had a negative impact on the total number of dogs (n=258) vaccinated; 73.3% (n=189) of the dogs were vaccinated parenterally and 26.7% orally (n=69).

INTRODUCTION

During intensive field and laboratory trials, between 1994-1996, the feasibility of oral vaccination of dogs against rabies has been tested in Turkey. The efficacy and safety of the rabies virus vaccine SAD B19 was shown for target- and nontarget species (Aylan, 1998; Aylan & Vos, 1998; Güzel et al., 1998). A bait was selected that was extremely well accepted by the target population under all circumstances; the Köfte-bait, a mixture of local minced meat mixed with bread crumbs (Müller et al., 1998; Schuster et al., 1998). Successful oral vaccination of dogs against rabies depends among others on a bait delivery system that maximizes coverage of the target population. Several bait delivery systems have been suggested, for example bait distribution to dog owners (Linhart, 1993). This system is directed at owned dogs who are inaccessible to parenteral vaccination while the animals can not be restrained by their owner(s). However, in view of the potential residual pathogenicity of all attenuated rabies virus vaccines to immunocompromised individuals bait distribution to dog owners should be discouraged. Another system, bait distribution at selected sites directed at free-roaming ownerless and owned dogs was not very effective in urban areas of Turkey (Gleixner et al., 1998). It was therefore decided to organize a pilot-study in which hand-feeding of individual dogs inaccessible for parenteral vaccination encountered on the street and during house-to-house visits was investigated. Some experience with this system had

already been gathered during studies in İstanbul (Vos, unpublished data). For this pilot-study, the urban areas of the coastal resort Kuşadası were selected. The growing interest in this resort-area from a tourist point of view increases the importance of effective control programmes against rabies and stray dogs. The aim of the campaign was to vaccinate a sufficient number of dogs, in order to reach a vaccination coverage of 70-80% of the overall dog population, by oral and parenteral route. To obtain data concerning the owned dog population a questionnaire survey was conducted prior to the vaccination campaign.

STUDY-AREA

Kuşadası (Province of Aydın) is a seaside resort town on the Aegean coast with a population of approximately 50.000, 95 km south of İzmir. This once small fishing village, is nowadays littered with apartment - and hotel blocks. The old town centre is all shops and restaurants. Around this tourist centre there are still some old neighbourhoods with narrow winding roads. Close to the centre, on one of the slopes of Kesetepe, there is a so-called 'geçekondu'; a low income area with no paved roads, etc. Further away from the city-centre the holiday-villages mushroom everywhere, most of these houses are only occupied by their owners during the summer months. Since 1995, no rabies case has been reported from the Province of Aydın. However, tourists from all over Turkey, including rabies infected areas, bring their dog(s) along during the holiday season. Every year a number of these dogs are left behind. Some of these abandoned animals are brought to the dog-shelter of the Turkish Society for the Protection of Animals (THKD).

METHOD AND MATERIAL

Permission for this pilot study was obtained from the General Directorate for Protection and Control of the Ministry of Agriculture and Rural Affairs in Ankara. A detailed plan was set up by the authors and every partner was allocated his responsibilities. The Municipality of Kuşadası provided a room with phone that was used as a kind of 'head-quarters' during the survey and vaccination campaign. They also provided several cars plus drivers that were used during the vaccination campaign. The authors were responsible for the promotion campaign, organization of material and recruitment of personnel (staff and students of the Adnan Menderes University, Faculty of Veterinary Medicine, Aydın [AMU]). The survey was planned for 16 Nov 1996 and the two-day vaccination campaign in the weekend two weeks later. Unfortunately, due to external factors, the vaccination campaign had to be adjourned till 5 April 1997.

Survey

A survey (house-to-house coverage) was conducted on 16 November 1996. It was assumed that a survey would facilitate the actual vaccination campaign, since the exact location and vaccination status of the owned dog population would be known. This way the vaccination teams could work more efficiently and a better estimation of the number of vaccine doses needed for oral and parenteral vaccination could be made. Additional information was gathered on the following subjects; owned dog to household ratio, level of supervision, age and sex of dogs.

Kuşadası was divided into 19 sections of more or less equal size, for every section a team of 3-4 students of the AMU was responsible. Every house within each section was to be visited. A back-up team stayed behind at the office of the municipality veterinary office, to answer any questions of the survey-teams. Two days before the survey was conducted, a programme concerning our project was broadcasted on local television. All teams received prior to the survey a short training and the material needed; forms to report information on owned dogs (vaccination-status, age, gender, level of restriction), a form to mark households with or without a dog to estimate the ratio of owned dogs to households, a map of Kuşadası and a map of their 'own' section to mark the households with owned dogs.

Vaccination Campaign

The city was divided in seven sections. For six sections a vaccination team from the AMU was responsible (University-teams, I - VI). Every team consisted of a veterinarian, technical assistant and two students. The seventh team (İstanbul-team, VII) consisted of two persons with adequate experience with both vaccination techniques. The teams were transported by car. The University-teams vaccinated only on Saturday, 5 April. The following two days, the İstanbul-team continued vaccination, it covered partly the areas that were not finished by the University teams. Two days before the campaign all schools (n=12) were visited and the students were informed about the campaign. An important aspect of these meetings was to inform the students about oral vaccination; they should not pick up any capsule that they would come across, also they should not touch dogs vaccinated orally. Posters were distributed all around the city at e.g. supermarkets and pharmacies. Furthermore, information was broadcasted on several occasions by the local television and radio-stations prior to the vaccination-campaign.

One day before the campaign the teams were informed about the purpose of the campaign and how to implement the programme. The first choice of vaccination was to be by the parenteral route, only if the dog was inaccessible for parenteral vaccination a bait containing a vaccine container would be offered. Also, the importance of recollecting discarded capsules

Table 1. Some results of the survey, Kuşadası (x: incomplete set of data).

Area	Number of households		number of owned dogs	Vaccination status of dogs*				
	visited	with dog(s)		I	II	III	IV	V
1	118	16	23	7	7	3	6	-
2	548	33	38	9	6	2	12	9
3	238	32	42	4	7	3	9	19
4	353	18	26	3	9	-	10	4
5	427	11	14	1	-	2	7	4
6	286	25	32	7	11	3	8	3
7	316	22	22	2	6	-	14	-
8	191	10	13	-	7	1	2	3
9	236	16	19	1	9	5	3	1
10	915	30	37	4	5	3	21	4
11	272	13	17	5	5	-	5	2
12	344	33	46	4	18	1	17	6
13	280	17	21	9	5	3	4	-
14	x	x	42	15	23	-	4	-
15	x	x	21	7	11	1	-	2
16	177	21	29	5	7	2	3	12
17	x	x	5	1	-	1	1	2
18	x	x	2	-	-	-	2	-
19	x	x	32	-	26	-	6	-
Total	4701	297	481	84	162	30	134	71

*: I - owner claimed that dog was vaccinated recently (<1 year) against rabies and could present a valid vaccination certificate

II - owner claimed that the dog was vaccinated recently, but could not show a valid vaccination certificate

III - owner claimed that the dog was vaccinated, however the vaccination certificate showed that the last vaccination date was more than one year ago

IV - owner claimed that the dog was not vaccinated recently against rabies

V - vaccination status of dog unknown (e.g. owner not home)

was stressed. Baits were only to be offered directly to a dog, this to decrease the chances of human contact with the vaccine containers. Restricted dogs had to be tagged with a blue neck-collar and unrestricted dogs, if possible, with a green neck-collar. Every team received a coolbox containing the following material; a dog leash, a muzzle, garbage bags, examination gloves, disposable syringes and needles, vaccination certificates, vaccine for parenteral (Feducan™, bottles á 10ml) and oral vaccination (SAD B19, vaccine-containers), bait-material (minced meat mixed with breadcrumbs), green - and blue neckcollars. In case the material provided was not sufficient, extra bottles with vaccine, vaccine-containers, bait-material and neck-collars were kept at the Municipality-building. The teams also received forms to report all attempts to vaccinate dogs, the completed survey-forms of households with dogs situated in their section. Furthermore, if available, a map on which the households with dogs were marked and an alphabetical list of dog owners, based on the data obtained during the survey, was provided.

RESULTS

Survey

A total of 481 owned dogs was counted (Table 1). However, in some of the 19 sections the data recorded could not be used for further analysis while it was incomplete (Section 14-15, 17-19). In 14 sections, 4701 households were visited; in 4404 households (93.7%) no dog was present and in 297 households (6.3%) one or more dogs were present. The ratio of owned dogs to households was 1 : 12.4. Using all data, 358 households with dogs were reported: 288 households (80.4%) with one dog, 50 households (14.0%) with two dogs and 20 households (5.4%) with three or more dogs. The data obtained on the age-distribution was incomplete; no further data analysis was conducted.

Data on the level of supervision was obtained for 423 dogs: 176 dogs (41.6%) were always restricted, 121 dogs (28.6%) were sometimes restricted, 20 dogs (4.7%) were only restricted during the day, 11 dogs (2.6%) were only restricted during the night and 58 dogs (22.5%) were never restricted. In contrast with surveys conducted in İstanbul (Vos & Turan, 1998), the sex ratio of owned dogs in Kuşadası was not biased towards male dogs; 233 males vs. 196 females (χ -Test, n.s.). For only 20% of all owned dogs, it was proven that they were recently (<1 year) vaccinated against rabies (Table 1 - Category I), at least 40% of the dogs were (recently) not vaccinated against rabies (Categories III & IV). In table 2 the relationship between level of supervision and vaccination-status is shown. The observed difference was significant (χ -Test, $\chi^2= 8.07$ df=2 P<0.05); the rate of vaccination for unrestricted owned dogs was lower than for restricted owned dogs.

Table 2. The relationship between vaccination-status and level of supervision of owned dogs

		Restricted	Sometimes restricted	Never restricted
Vaccinated	n	35	30	13
	%	44.9	38.5	16.6
Not vaccinated	n	51	56	54
	%	31.7	34.8	33.5

Vaccination campaign

During the campaign (5-7 April 1997) 258 dogs were vaccinated, 73.3% (n=189) of the dogs were vaccinated parenterally and 26.7% orally (n=69). A further 15 attempts to vaccinate dogs orally failed while on two occasions a free-roaming dog ran away after a bait was offered and 13 dogs did not puncture the capsule or swallowed it. The vaccination-report of five dogs offered a bait was incomplete. Of 82 dogs that were offered a bait and discarded the capsule 7.3% (n=6) of the capsules were not retrieved by the vaccination teams. In most cases this was a result of the aggressive behaviour of restricted dogs. On 5 April 163 dogs were vaccinated by the seven teams (Table 3), and 8 dogs were vaccinated parenterally at the municipality-building. Due to heavy rainfall on 5 April, most teams had to stop their activities in the early afternoon. As mentioned before, on 6-7 April

Table 3. Number of vaccination attempts by the different teams during the vaccination campaign on 5 April 1997 (team I - VI: staff and students from AMU, team VII: vaccinators from İstanbul).

Vaccination team	Parenteral	Oral	Total
I	12	5	17
II	10	7	17
III	10	7	17
IV	27	-	27
V	9	4	13
VI	7	5	12
VII	46	14	61
Total	121	42*	163

* - include five incomplete forms and the two dogs that ran away

only the team from İstanbul worked, 82 and 20 dogs were vaccinated on these days, respectively. Of 117 unrestricted dogs 69 (59%) were offered a bait, while the animals were inaccessible for parenteral vaccination. Only 5 (6.8%) out of 74 restricted dogs were offered a bait; animals vaccinated at the Municipality-building (n=8) and at the THKD dog shelter (n=21) are not included in this figure.

Table 4. The relationship between gender and vaccination technique used.

	Parenteral	Oral	Total
Male	87	30	117
Female	90	33	123
Unknown	12	21	33
Total	189	84	273

Table 5. The relationship between the level of supervision of the dogs vaccinated by the İstanbul-team and the vaccination-technique used

	Parenteral	Oral	Total
Unrestricted	39	51	90
Restricted	45	4	49
Total	84	55	139

No significant difference (χ^2 -Test) was observed between male and female dogs in comparison to the two vaccination techniques used; oral and parenteral vaccination (Table 4). The data concerning the level of supervision was analysed for the İstanbul-team only, while it was sometimes difficult to interpret the forms filled out by the University-teams on this matter (Table 5). The observed difference was highly significant; χ^2 -Test, $\chi^2= 31.2$ $P<0.001$. Unrestricted dogs were vaccinated orally more often than restricted animals. Using the data of all teams, oral vaccination was significantly more often used for ownerless dogs than for owned dogs; χ^2 -Test, $\chi^2= 76.9$ $P<0.001$ (Table 6).

It was astonishing that only a few dogs registered during the survey were relocated during the vaccination campaign. Only 44 dogs registered during the survey were vaccinated during the campaign. Although, during the survey 164 owned dogs were reported 'not-vaccinated'. For 8 sections (Section 2-4, 8-9, 15-17 & 19) visited during the survey and vaccination campaign detailed information was available:

Table 6. The relationship between the ownership status of dogs vaccinated and the vaccination technique used.

	Parenteral	Oral	Total
Owned *	142	20	162
Ownerless	14	40	54
Unknown	12	24	36
Total	168	84	252

* - without the dogs at the THKD dog shelter

165 households were visited on both occasions (survey and vaccination-campaign)

- I dog(s) were vaccinated during campaign
13 households (7.9%)
- II dog(s) were not present at household (relocated, moved, died etc.)
17 households (10.3%)
- III households could not be relocated
54 households (33.3%)
- IV dog(s) were (recently) vaccinated against rabies
44 households (26.7%)
- V dog owner(s) could not be located
15 households (9.1%)
- VI dog(s) present but owner did not want vaccination
7 households (4.2%)
- VII unknown (not visited / not found?)
15 households (9.1%)

With other words, of 79 households where the owner or dog(s) was relocated during the vaccination campaign (Category I, IV, V & VI), 55.7% of the dogs were recently vaccinated against rabies and only 16.5% were vaccinated during the campaign; indicating an overall vaccination coverage of the owned dog population of 72.2% in these areas. From these results, it became clear that during the survey the forms were filled out inaccurately, while many households could not be relocated during the vaccination campaign.

Although the University-teams were without any doubt motivated, they lacked the practical experience of the İstanbul-team. Therefore, the results obtained by the (pooled) University - and İstanbul-team are compared in detail here to investigate the effect of experience on the different parameters (e.g.: time-efficiency, vaccination technique).

On 5 April the University-teams vaccinated on average 17.1 dogs (12.5 dogs parenterally and 4.7 dogs orally), the İstanbul-team vaccinated 61 dogs (47 parenterally and 14 orally). These figures show clearly that the İstanbul-team was much more efficient than the University-teams. However, the former team had several households with many dogs, e.g. the vaccination of 21 dogs at the THKD dog-shelter took only 20 minutes. Therefore, to compare efficiency it is better to use the number of households, or locations in case of free-roaming dogs. Unfortunately only one University-team recorded the requested data on this issue. Team II vaccinated 17 dogs at 15 different locations between 10:20 - 15:30; 3.39 dogs per hour or 2.90 vaccination location per hour. Team VII (İstanbul-team) vaccinated on 6 April on foot 29 dogs at 28 locations between 9:30 - 12:05; 11.45 dogs per hour or 11.05 vaccination locations per hour. In the afternoon of the same day, other areas that were not covered or finished by the other teams the day before were visited by car by Team VII. Between 13:00 - 18:50 42 dogs were vaccinated at 33 locations; 7.2 dogs per hour or 5.66 vaccination locations per hour. The time-efficiency was negatively influenced by moving around from one area to the other and encountering dogs that were already vaccinated the day before. In the afternoon of 7 April, the influence of the bad weather (heavy rainfall) was clearly demonstrated by the low number of dogs encountered and vaccinated. In the afternoon, the İstanbul-team vaccinated only 7 dogs during two hours.

No significant difference was observed between the (pooled) University and İstanbul-team concerning the two vaccination techniques used; χ^2 -Test, $\chi^2 = 1.59$, n.s. (Table 7). However, a significant difference was observed between the ownership-status of the dogs vaccinated by the (pooled) University - and İstanbul-teams; χ^2 -Test, $\chi^2 = 11.25$, df=2, $P < 0.01$ (Table 8). The İstanbul-team vaccinated significantly more ownerless dogs than the University-teams. Also, the İstanbul-team vaccinated significantly more unrestricted dogs than the University-teams; χ^2 -Test, $\chi^2 = 9.10$, df=1, $P < 0.01$ (Table 9).

DISCUSSION

Although, 258 dogs were vaccinated, the overall assessment of the campaign can be described as disappointing. The goal to achieve an overall vaccination coverage of 70-80% of the dog population was probably not accomplished. Two factors can account for this poor result; the weather and the lack of experience of the vaccination-teams.

It was clear from the beginning that the campaign should take place during a weekend, so most dog owners would be home. For example, on Monday, 7 April, many restricted dogs were seen but the owners could not be located. A vaccination campaign as suggested here, needs much planning. Therefore, the date of the actual campaign was set weeks in advance. It was agreed on with the local authorities that the campaign would have to

Table 7. Relationship between the number of dogs vaccinated by the University-teams and the İstanbul-team and the vaccination technique used.

Teams		Parenteral	Oral	Total
University	n	75	28	103
	%	72.8	27.3	
İstanbul	n	106	56	162
	%	65.4	34.6	
Total		181	84	265

Table 8. The relationship between the number of dogs vaccinated by the University-teams and the İstanbul-team and the ownership-status of the dogs vaccinated.

Teams		Ownerless	Owned	Unknown	Total
University	n	14	67	22	103
	%	13.6	65.0	21.4	
İstanbul	n	40	87	14	141
	%	28.4	61.7	9.9	
Total		54	154	36	244*

*- not included 21 dogs at THKD dog shelter

Table 9. The relationship between the number of dogs vaccinated by the University-teams and the İstanbul-team and the level of supervision of the dogs vaccinated

Teams		Restricted	Unrestricted	Total
University	n	24	27	51
	%	47.1	52.9	
İstanbul	n	28	90	118
	%	23.7	76.3	
Total		52	117	169*

* - not included 21 dogs at THKD dog shelter

take place before the tourist season started, which means for Kuşadası unpredictable weather. Most vaccination-teams stopped after just four to five hours working due to heavy rainfall in the afternoon on 5 April. Only one team kept on working in spite of the rain. Rainfall has also a negative effect on the number of free-roaming dogs encountered; they tend to seek shelter and can not be observed by driving around. On Sunday, 6 April, with sunny weather many dogs were seen walking or lying on the streets or sidewalks, while the following day with heavy rainfall hardly any free-roaming dogs were observed. While the vaccination campaign had to be postponed, the University-teams were only able to work on one day, instead of the initially planned two-days.

The second factor, lack of experience, covers many aspects; e.g. how to approach and vaccinate a dog, how to cover an area house-to-house efficiently, how to adapt to unexpected circumstances. Although every University-team was explained in detail how to approach and vaccinated a dog by the parenteral and oral route, they lacked the practical experience. The difference in the number of dogs vaccinated by the University-teams and the experienced İstanbul-team showed this clearly. Although the İstanbul-team consisted only out of two people, in contrast to four people per University-team, the amount of time needed to vaccinate a dog was considerably less. The İstanbul-team vaccinated significantly more ownerless and unrestricted (ownerless or owned) dogs than the University-teams. This is without any doubt a result of having adequate experience in approaching and vaccinating these dogs.

The poor reporting during the survey diminished the expected advantages. Not only was it difficult to relocate the listed households with dogs, also many households with dogs were 'overlooked' during the survey. The İstanbul-team was also confronted with the problem of not being able to relocate the households with dogs based on the results of the survey. Instead of trying to locate these households, the strategy was changed. Children were asked to help locate and show all households with dogs. Using this method in one area more dogs were actually vaccinated ($n=30$) here than reported during the survey ($n=26$). Some University-teams lost valuable time trying to relocate the households with dogs reported during the survey instead of looking for dogs. The positive effects of the survey on the vaccination campaign were of course also affected by the (unplanned) long period between survey and vaccination campaign. Shortly after the survey was conducted, a new private veterinary clinic opened in Kuşadası, during house-to-house visits the new veterinarian had vaccinated many owned dogs.

Another major obstacle in the evaluation of the results of this vaccination campaign was the incomplete, and even inaccurate, reporting. Although, it was explained in detail how to fill out the forms, only few teams filled out the forms as required. One team even claimed to have vaccinated more dogs

than reported, apparently forms were missing or forgotten to be filled out.

This inconsistent 'execution' of the guidelines given was partly the reason why one of the most important aims of this vaccination campaign could not be examined: the estimation of the vaccination-coverage of the overall dog population. For this purpose, it was necessary to tag (neck-collars) dogs vaccinated to be able to estimate the overall dog population size by means of the capture-recapture-method (reobservation). Unfortunately, many dogs were not collared or some teams tagged the dogs not according to the agreed system. Hence, it was impossible to give an estimation of the number of dogs and, consequently, of the achieved vaccination coverage.

Although the goals set were not met, the campaign showed clearly that a combination of oral and parenteral vaccination as applied in Kuşadası has a future. As was shown during the survey, the vaccination rate of the free-roaming owned dogs was significantly lower than the vaccination rate of restricted dogs. Especially the former group of dogs play an important role in the transmission of rabies. By using only parenteral vaccination, these and ownerless dogs are usually not vaccinated. During the vaccination campaign in Kuşadası oral vaccination was significantly more often applied than parenteral vaccination in case of unrestricted dogs. No less than 59% of free-roaming dogs were inaccessible for parenteral vaccination and were therefore vaccinated orally. Hence, oral vaccination can increase the vaccination coverage of the for rabies-transmission important subpopulation of unrestricted dogs significantly. The fear of possible human exposure to the oral rabies vaccine virus was shown to be idle. By offering baits directly to dogs and collecting the discarded capsules the chance of exposure of the vaccine virus to nontarget species, especially humans, was minimized.

To avoid the problems that occurred during this vaccination campaign, it is recommended not to use vaccinators without adequate experience in handling dogs. For most of staff members and students of AMU, it was the first time they participated actively in such a campaign. Only few people had adequate experience in vaccinating dogs. Although, the teams from AMU were motivated, the drawbacks by using 'volunteers' do not compensate for the lack of experience. The experienced team from İstanbul showed that in a relatively short time a large number of dogs can be vaccinated by using a combination of oral and parenteral vaccination resulting in a high homogenous vaccination coverage of the dog population in the area visited. If local experienced vaccination teams could be recruited, many problems could be solved. In case of poor weather, the campaign could be postponed without problems, also a prolongation of the campaign would not cause many difficulties. However, as has been observed during previous field-trials in İstanbul, it is often very difficult to motivate the local appointed officials to participate actively.

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