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Questionnaire survey on the use of different e-collar types in France in everyday life with a view to providing recommendations for possible future regulations

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ABSTRACT

Training with electronic collars/e-collars (e-stim, shock) is controversial, and regulations concerning electric collars vary from absence to bans across European countries. The main goal of this study was to characterize the everyday use of e-collars by dog owners, in France where there are currently no regulations on their use. A sample (n = 1,251) of dog owners were recruited using an online questionnaire. Data were collected using Google Forms. Factors associated with the use of e-collars were determined using a Chi-squared test. Twenty-six percent (n = 330) of the owners enrolled in this survey did use such devices; 11.9% (n = 149) of the owners reported the use of bark-activated collars, 4.5% (n = 56) reported the use of electronic boundary fence collars, and 14.2% (n = 178) reported the use of remote-controlled collars. E-collar use was found to be significantly associated with 3 factors: dogs weighing over 40 kg, non-neutered status, and dogs used for hunting or security activities. In addition, the data collected showed that e-collars were mainly used on young dogs (<2 years). The vast majority of e-collar users (71.8%) used the collar without professional advice, and 75% of e-collar users tried 2 or fewer other solutions before using the collar. Seven percent of the dogs on which the collar was used presented with physical wounds (n = 23). The efficacy reported was lower than that in many previous studies where conditions of use as specified were designed to be ideal as part of the experimental design (qualified trainer, perfect timing). All collar types were not equal: bark-activated collars appeared to be the least efficient and the most injurious type, whereas remote-controlled collars were mainly used for owner's convenience. In conclusion, this survey highlights a high ratio of e-collar use in a country without regulations. It also shows that real-life conditions are far from the idealized conditions in which experimental studies were undertaken, thereby putting dog welfare at higher risk than what is presented in scientific literature. In addition, this study reveals differences between collar types in terms of efficacy and effects on welfare. These factors should be taken into account to determine a precise regulation. Furthermore, this study shows the urgency to regulate this tool in Europe because dangers of use, which were already known, are proven to be aggravated in real-life situations.

Introduction

Canine training methods are in constant evolution. In the last decades, nonaversive training methods based on positive reinforcement and negative punishment started to appear in France. However, while such methods are expanding, traditional methods based on positive punishment and negative reinforcement are still commonly used.

The electric collar (EC) is an aversive training tool that follows operant conditioning rules, which is subject to controversy. It can act as a positive punishment, where the electric shock follows an undesirable dog behavior, reducing the probability for this behavior to reoccur, or, as negative reinforcement where the shock ends upon desired dog behavior, thereby increasing the probability for the behavior that stopped the shock to reappear. Three different types of electric training devices exist (Polsky, 1994): the

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"bark-activated collar" (BAC) that is automatically activated by the barking of the dog, the "electronic boundary fence" (EBF) that is activated at a boundary line to keep the dog within a specific area, and the "remote-controlled collar" (RCC) that is activated manually via a remote control. In all cases, the dog is wearing a collar including a box with two electrodes that are in contact with the ventral surface of the dog's neck. The shock is delivered by the electrodes and can vary in duration and intensity.

Over the years, due to the possible deterioration of dog welfare, several European countries decided to ban ECs. In 2010, the Public Federal Service in Belgium established a scientific report in which the current legislation in European countries was edited. This document showed the variability that existed across Europe: for example, some countries like Denmark decided to ban the sale and use, others like Germany banned use but not sale, and others like the Czech Republic restricted the use to collars in accordance with Electronic Collars Manufacturers Association standards. In Sweden, the restriction of use did not apply to electric fences (Scientific report of the Belgian Animal Welfare Council, 2010).

In France, even if Decree n° 2008-871 of 28 August 2008 related to companion animal protection, modifying the rural code (French Rural Code Article 214-24) states that « *Art.R. 214-24.*-Educational and training activities of a pet animal under conditions that inflict unnecessary injury or suffering are forbidden », EC are still allowed for both sale and use.

In England, Blackwell et al. (2012) reported that a fairly low proportion of dog owners chose to use electronic training devices. This study was published just after the EC (Anon, n.d.a) ban in Wales in 2010.

Several experimental studies tried to assess the consequences of using EC (Schilder and van der Borg, 2004; Cooper et al, 2014). Their experimental protocol included qualified trainers, low number of shocks, and no external stimuli. Schilder and van der Borg, (2004) reported a painful experience for the shocked dogs and a long-term association with the presence of the trainer even outside of the normal training context. Schalke et al. (2007) highlighted how the inappropriate timing of the shock increased the fear, insecurity, and anxiety of the dog. Salgirli et al. (2012) also showed that EC training induced less stress and had stronger learning effects when done by a qualified (proven proficiency) dog trainer compared to pinch collars or quitting signal applied by dog handlers. Hence, this article points out the importance of the handler's qualifications when assessing the effectiveness of training methods.

In 2014, Cooper et al. concluded that the routine use of EC, even in accordance with best practices (as suggested by collar manufacturers), presented a risk for the well-being of pet dogs. An increase in the level of this risk could be expected when use falls outside of this ideal. Thus, it seemed appropriate to assess the real conditions of use of EC and to compare the feedback from their use to already published data.

In France, there are no data available on the use of these devices; therefore, the main aim of this questionnaire survey was to collect a first set of information regarding ECs and their use.

Materials and methods

Questionnaire

A questionnaire was developed to collect data. It was divided into several sections: owner demographics, dog demographics, reasons for using or not an EC, training methods used by owners, dog behavior as perceived by owners, source of the collar, frequency of use, efficacy, and finally, perception of the current French legislation concerning the EC. Owners who had several dogs were asked to answer only once for their youngest dog. The questionnaire was available online for 3 months (from 23rd June 2015 to 14th September 2015). It was sent via e-mails to veterinarians practicing behavioral medicine through a private mailing list (Zoopsy). The veterinarians were asked to share it with their clients through social networks. The questionnaire was also sent to local dog training clubs, asking them to disseminate it. We tried to minimize a potential negative of the title of the survey by explaining in the e-mail that the questionnaire could be completed by every dog owner and was not specifically dedicated to owners who already used an EC on their dog.

The detail of the questionnaire is provided in Table 1.

Data analysis

Data were collected directly from Google Forms and imported in an Excel File.

Data were checked for errors, duplicates, and impossible answers. The age of the dogs was normalized by log transformation. Dog breeds were checked for spelling and homogenization.

We received 1,256 complete questionnaires. Three were excluded because they had been submitted twice; one was excluded because it was received after the end date, and one was considered nonvalid because the owner's answers were very implausible. Hence 1,251 questionnaires were kept for analysis.

Each possible factor associated with the EC was tested using a Chi-squared test of independence for all ECs and then for each EC type (e.g., BAC, EBF, RCC). A significance level of 0.05 was applied for all Chi-squared tests. Fisher exact test was applied when the use of chi-squared test was not valid (theoretical calculated data under five). All the tests were run using the online BiostaTGV software (https://marne.u707.jussieu.fr/biostatgv/?module=tests).

Sample characteristics

Owners' characteristics

Eighty-five percent of the completed questionnaires were obtained via social networks (Facebook) and 9% via owner's veterinarian. The remaining 6% came from e-mail (3%), other (2%), and canine training clubs (1%).

France is divided into 101 geographic areas called departments and classified with numbers. Those numbers were used to collect our geographic data, and results showed that the geographic origin of the respondents spread throughout the whole country. Three departments received no respondents and 2 (e.g., Isere and Rhône) received over fifty. Seven other departments had between 31 and 50 respondents and all others, 1 to 30 respondents.

In the study sample, 45% of owners were between the ages of 25-40, 28% were between the ages of 41-55, 17% between the ages of 15-24 and 10% were over 55 years of age. The number of owners above 70 years (5) was too low to be taken into account, so it was added to the 55-70 years age range, becoming the >55 years old category.

Dogs' characteristics

Fifty-four percent of the dogs were males and 46% were females. Among males, 37% were neutered, compared to 62% of females. Fifteen percent of owners reported a cross-breed. Other dogs (85%) were either pure bred with official documentation (50%) or coming from a single breed according to owners (35%), but without documentation.

All the "Société Centrale Canine" (SCC) breed groups were represented in the sample: 48 breeds with 5 dogs or more and 87 dogs were other breeds (e.g., 4 of them or less).

Half of the dogs (50%) had an official pedigree recognized by the French SCC.

The dogs included in the survey ranged in age from 1 to 14 years.

Table 1
Online questionnaire

Number	Question
1	In which French Department do you live? (answer with the department number)
2	How did you hear about this questionnaire? ○ Facebook ○ My veterinarian ○ My canine club ○ An e-mail link from someone I know
3	What is your age? ○ 15-25 years old ○ 25-40 years old ○ 40-55 years old ○ 55-70 years old ○ Over 70 years old
4	What is the sexual status of your dog? ○ Entire male ○ Neutered male ○ Entire female ○ Spayed female
5	What breed is your dog? *Give the breed name or write "cross" if your dog is a cross of several breeds*
6	Is your dog registered in the "Livre des Origines Francaises" (French Pedigree Register)? *Only answer yes if you possess the genealogic document for your dog* ○ Yes ○ No
7	How much did you pay for your dog? ○ < 150 € ○ 151 to 500 € ○ 501 to 1000 € ○ > 1000 €
8	What is your dog's birth date? (MM/YYYY)
9	What is your dog's weight in kg? ○ < 6 ○ 6 to 10 ○ 11 to 20 ○ 21 to 30 ○ 31 to 40 ○ 41 to 50 ○ 51 to 60 ○ > 60
10	You are living in: ○ An apartment or a townhouse without garden ○ A house with a nonfenced garden ○ A house with a fenced garden
11	Why did you acquire a dog? For which activity? (several possible answers) ○ Companionship ○ To prevent intruders in the house ○ Security dog (for work) ○ Obedience ○ Agility ○ Hunting ○ Competition: French ring sport ○ Breeding ○ Other: please specify
12	Have you already used an e-collar on your dog? *This means collars delivering an electric shock (not spray collars).* *It can be antibark, electronic boundary fence, or remote-controlled collars* ○ Yes ○ No
If owner answered no to 12	
13	What are the reasons for never using one? (several possible answers) ○ My dog does not exhibit any undesirable behavior ○ I am against e-collars for ethical reasons ○ They are too expensive ○ I did not know about their existence ○ I preferred other methods
14	What training methods did you use for your dog? (several possible answers) ○ Group training in a canine club ○ Group training with a professional trainer ○ Individual lessons with a professional trainer ○ Individual lessons at home with a professional trainer ○ Veterinarian advice ○ Veterinarian behaviorist ○ Nonveterinarian behaviorist ○ Training books ○ Internet ○ Nothing, I managed on my own

Table 1 (*continued*)

Number	Question
15	What kind of learning techniques was used during your dog training? ○ Mostly punishment when it was showing unwanted behaviors ○ Mostly rewards when it was showing wanted behaviors ○ Mix of both
16	Do you think that it is possible for you to use e-collar in the future? ○ Yes ○ No
17	Do you think that your dog is exhibiting: (several possible answers) ○ Normal behaviors ○ Abnormal: excessive excitement ○ Abnormal: aggressive behaviors ○ Abnormal: fear
If owner answered yes to 12	
18	When did you acquire the e-collar? (YYYY) *If you acquired several collars, please answer for the first one*
19	When did you use the collar(s) for the first time? ○ Before 1990 ○ Between 1991 and 2000 ○ Between 2001 and 2010 ○ Between 2011 and 2015
20	What training methods did you use for your dog? (several possible answers) ○ Group training in a canine club ○ Group training with a professional trainer ○ Individual lessons with a professional trainer ○ Individual lessons at home with a professional trainer ○ Veterinarian advice ○ Veterinarian behaviorist ○ Nonveterinarian behaviorist ○ Training books ○ Internet ○ Nothing, I managed on my own
21	What kind of learning techniques was used during your dog's training? ○ Mostly punishment when it was exhibiting undesirable behaviors ○ Mostly rewards when it was exhibiting desired behaviors ○ Mix of both
22	Where did you buy the collar? ○ Pet or gardening store ○ Veterinary practice ○ Trainer ○ Internet ○ I did not buy it; someone lent it to me
23	Did you try other methods before using e-collar? ○ Yes ○ No
24	If yes, which ones: ○ Group training in a canine club ○ Group training with a professional trainer ○ Individual lessons with a professional trainer ○ Individual lessons at home with a professional trainer ○ Veterinarian advice ○ Behaviorist veterinarian ○ Nonveterinarian behaviorist ○ Training books ○ Internet
25	Besides the instruction manual, did you receive advice to learn how to use the collar? (several possible answers) ○ No, I managed on my own ○ Yes, the shop salesperson ○ Yes, my veterinarian ○ Yes, a dog trainer ○ Yes, someone who already used it on his/her dog ○ Yes, I searched on the internet
26	Among all collar types, did you use a bark-activated collar? ○ Yes ○ No
27	If yes, what was the main reason for using the bark-activated collar? ○ Neighborhood complaint ○ I prefer to anticipate to avoid possible neighborhood complaints ○ My dog's barking annoys me ○ My dog was barking during walks (on people or items)
28	If yes, for how long did you use it? ○ A few hours ○ A few days ○ A few weeks ○ A few months ○ A few years

(*continued on next page*)

Table 1 (*continued*)

Number	Question
29	If yes, how many shocks do you think your dog has received throughout its life? *Please only report electric shocks and not the beep* ○ Between 1 and 5 ○ Between 6 and 10 ○ Between 11 and 50 ○ Over 50
30	If yes, after using it you would say that: ○ It is highly efficient and the dog is not barking anymore even if not wearing the collar ○ It is efficient if the dog is wearing the collar, but as soon as we remove it, he barks again ○ It is rather random and sometimes my dog barks even when wearing the collar ○ It is highly inefficient: the dog is barking as if he had no collar
31	If yes, when wearing the collar, you would say that your dog's behavior is? (several possible answers) ○ As usual ○ Calmer ○ More excited ○ Sadder ○ Anxious ○ My dog already got wounded by the collar: skin burn
32	Among all collar types, did you use an electronic boundary fence collar? ○ Yes ○ No
33	If yes, what was the main reason for using an electronic boundary fence collar? ○ I have a fence but the dog was going over/under it ○ I do not have a fence ○ I use it to prevent the dog from going in specific areas of the garden
34	If yes, for how long did you use it? ○ A few hours ○ A few days ○ A few weeks ○ A few months ○ A few years
35	If yes, how many shocks do you think your dog has received throughout its life? *Please only report electric shocks and not the beep* ○ Between 1 and 5 ○ Between 6 and 10 ○ Between 11 and 50 ○ Over 50
36	If yes, after using it you would say that: ○ It is highly efficient and the dog has stopped running away even if not wearing the collar ○ It is efficient but the dog needs to wear the collar all the time ○ It is quite efficient, but on some rare occasions, the dog escaped even with the collar ○ It is highly inefficient: the dog goes away as if he had no collar
37	If yes, when wearing the collar, you would say that your dog behavior is? (several possible answers) ○ As usual ○ Calmer ○ More excited ○ Sadder ○ Anxious ○ My dog already got wounded by the collar: skin burn
38	Among all collar types, did you use a remote-controlled collar? ○ Yes ○ No
39	If yes, what was the main reason for using a remote-controlled collar? ○ My dog had a poor recall cue ○ I wanted to achieve a high level of training (competition) ○ I wanted to train my dog for hunting ○ My dog was aggressive toward other dogs ○ My dog was aggressive toward humans ○ My dog was running away to chase wild animals ○ My dog was running after joggers ○ My dog was running after cars and/or bikes ○ My dog was eating unwanted things during the walk (cow dung…)
40	If yes, for how long did you use it? ○ A few hours ○ A few days ○ A few weeks ○ A few months ○ A few years
41	If yes, how many shocks do you think your dog has received throughout its life? *Please only report electric shocks and not the beep* ○ Between 1 and 5 ○ Between 6 and 10 ○ Between 11 and 50 ○ Over 50

Table 1 (*continued*)

Number	Question
42	If yes, after using it you would say that: ○ It is highly efficient and solved the issue permanently ○ It is efficient only when the dog is wearing the collar ○ It did not solve the problem ○ It is now worse than before using the collar
43	If yes, when wearing the collar, you would say that your dog behavior is? (several possible answers) ○ As usual ○ Calmer ○ More excited ○ Sadder ○ Anxious ○ My dog already got wounded by the collar: skin burn
44	Before using e-collar, do you think your dog was exhibiting: (several possible answers) ○ Normal behaviors ○ Abnormal: excessive excitement ○ Abnormal: aggressive behaviors ○ Abnormal: fearful
45	After using e-collar, do you think your dog is exhibiting: (several possible answers) ○ Normal behaviors ○ Abnormal: excessive excitement ○ Abnormal: aggressive behaviors ○ Abnormal: fearful
46	After using e-collars: ○ I would recommend their use to my friends ○ I would not recommend their use to my friends
For everyone (users and nonusers)	
47	In France, e-collars are accessible without any restrictions in various places (garden and pet stores, internet, veterinary practice). Do you think that their distribution should be regulated? ○ No, they need to remain easily accessible for everyone ○ Yes, their distribution should be restricted to specific professionals like veterinarians or trainers
48	E-collars are banned in a few European countries. What is your opinion concerning their use in France? ○ They should be banned and other methods should be used instead ○ Their use needs to be maintained because they are very efficient ○ Their use needs to be maintained only for extreme situations because they prevent euthanasia or relinquishment of some dogs that are particularly difficult to handle. (They can solve behavior problems better than other training tools)

Dogs' acquisition price was divided as follows: 23% of the dogs cost under 150 Euros, 24% ranged between 151 and 500 Euros, 40% between 501 to 1000 Euros, and the remaining 13% over 1000 Euros.

Dogs' weight ranged from 1 to over 61 kg, split as follows: 5% in the 1-5 kg category, 12% in 6-10, 24% in 11-20, 33% in 21-30, 19% in 31-40, 5% in 41-50, 2% in 51-60, and 1% over 61.

Results

Estimate of EC use in France

Twenty-six percent (n = 330) of the owners reported having used an EC on their dog. Looking at which EC type was used, it appeared that 11.9% (n = 149) of the owners reported using BAC, 4.5% (n = 56) EBF, and 14.2% (n = 178) RCC.

One percent (n = 3) of the owners used all 3 types, 16% (n = 53) used 2, while the remaining 83% used only one kind of e-collar.

Before interpreting the collected data and measuring the scope of our survey, it was important to question our sample representativeness. The survey sample (1251) was quite large. Nevertheless, some biases may have had consequences on the prevalence obtained:

- A very large majority (85%) of data were collected via social network (Facebook).
- People from the local region of the first author were overrepresented.

Therefore, the questionnaire sample was compared to general values of the French dog population. General population data were obtained from the French polling organization TNS SOFRES 2014 for dog's weight, 2011, for dog's sex, and the percentage of pure breed dogs was taken from the French Canine Breed Society (SCC).

Dogs over 10 kg (83.4% in our study; 56.7% in the French population) and pure breed dogs (50% in our study; 28% in the French population) were over-represented in the study sample. The estimated prevalence coming from this questionnaire could therefore not be extended to the entire dog population.

Factors associated with EC use

Several factors were tested using Chi-squared tests to check the possible dependency in the distribution of the data with EC use: questionnaire origin, dog's weight, dog's sex, dog's price, owner's age, living conditions, dog's use, dog's breed.

The first significant factor was the dog's weight (χ^2 [7, N = 1251] = 18.5, $P < 0.001$). Dogs over 40 kilos had far more chances to get shocked than other dogs, whereas dogs under 10 kilos wore significantly less EC.

The second significant factor was the dog's sexual status. There was no significant difference between males versus females or between the 4 groups (i.e., entire male, neutered male, entire female, and neutered female). But, an additional Chi-squared test was run and showed that entire dogs had significantly more chances to be fitted with an EC than neutered ones (χ^2 [1, N = 1251] = 6.05, P = 0.014).

Another significant difference was found concerning the purpose for which owners adopted their dog (question 11 in Table 1). Dogs that were not acquired for companionship were significantly more likely to be fitted with an EC (i.e. 8.3% of the dogs in the survey) (χ^2 [1, N = 1251] = 3.96, P = 0.047).

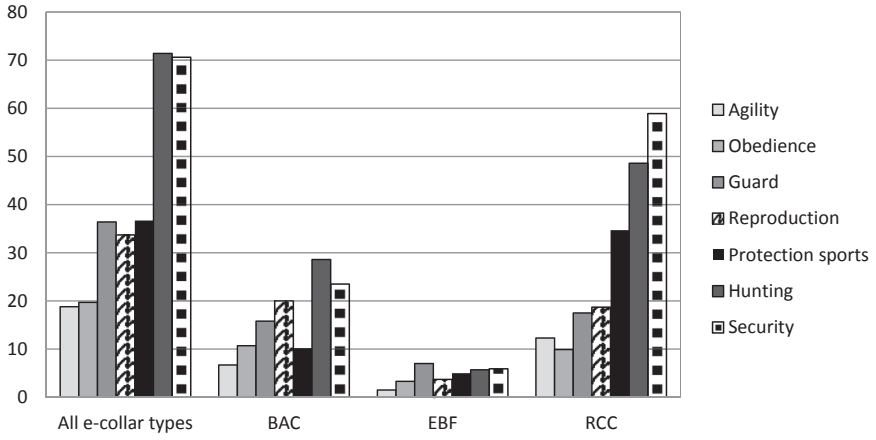

Figure 1. Percentage of EC use (in general and by EC type) in different categories of canine activities. The breeds found to be correlated to a higher EC use were those used the most in hunting and security disciplines; therefore, the breed analysis interacts with other factors like function and weight.

Additional analysis was conducted by excluding the "companionship" criteria to check if ECs were more used in some disciplines than others. The results are shown in Figure 1 (left side of the figure), indicating that owners practicing hunting and security with their dog were more likely to use an EC (χ^2 [6, N = 1251] = 81.9, $P <$ 0.001). On the contrary, agility training and obedience were less associated with ECs than other training disciplines.

Characterization of the EC use

Purchase source and advice delivered when buying EC

Our survey indicated that a very large majority (75%) of owners got their EC from the internet (40%) or a pet/gardening store (35%). Veterinarians and trainers represented only 9.2% of the EC purchase sources.

Most of the owners (62.8%) considered receiving advice at purchase. But on closer examination, by looking only for delivery of professional information (i.e., veterinarians and trainers), it appeared that only 28.2% of owners received professional advice (Figure 2).

Training methods

Seventy-one percent of EC nonusers reported to use mostly nonaversive training methods compared to 46% of EC users. In contrast, 5% of EC users reported to use mostly aversive methods when training their dog compared with 2% of EC nonusers. Forty-nine percent of owners using EC reported a combined use of aversive and nonaversive methods when training their dog compared to 27% of the owners not using ECs.

In question 14 (Table 1), owners were asked to describe more precisely the training choices they made; Figure 3 summarizes the answers.

Age when EC first used and other alternatives tried

To analyze the data and determine the age of the dog when the EC was first used, the collar purchase date was compared with the dog's date of birth and age was noted 0 when the collar had been bought before the dog was born. Regardless of the collar type, the results showed that EC were mainly used on young dogs with 63% being $\leq$2 years.

In addition, 75% of EC users tried a maximum of 2 other training options before using the EC on their dog, as shown in Tables 2 and 3.

Dog behavior perceived by owners before and after EC use

With respect to the effect of dog behavior on EC use, owners using EC reported significantly less normal behaviors (51.8%) for their dog than owners who did not (79.2%) (χ^2 [1, N = 1251] = 54, $P <$ 0.001).

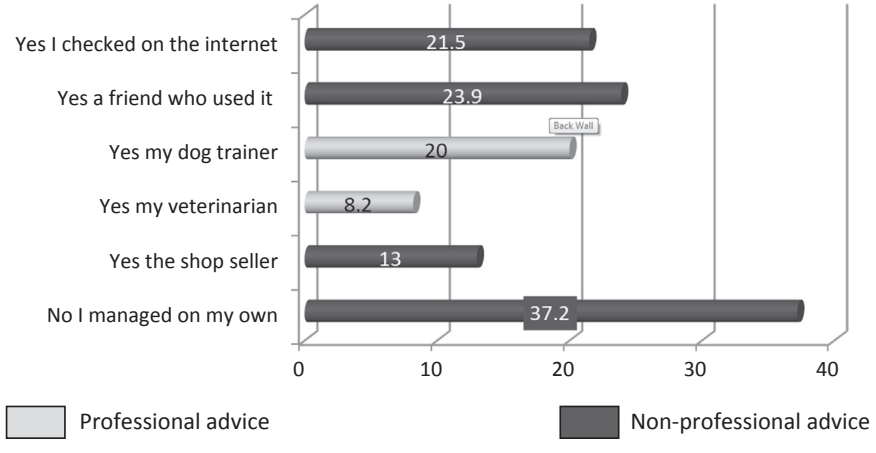

Figure 2. Percentage of owners who received advice when acquiring an EC.

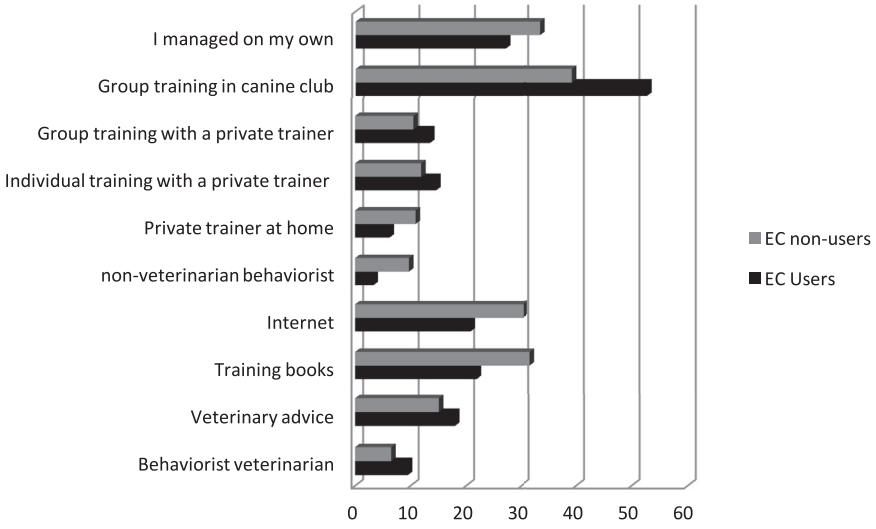

Figure 3. Training methods used by owners with their dog. EC nonusers tend to use more internet (30.4%) and training books (31.7%) but less group training in canine clubs (39.3%) than EC users with 20.8%, 21.9%, and 52.8%, respectively (χ^2 [2, N = 1251] = 25.9, $P < 0.001$).

Owners using ECs also reported much more excitement (27% of dogs) (χ^2 (4, N = 1251) = 96.08, $P < 0.001$) and aggressive behaviors (9.4% of dogs) (χ^2 [4, N = 1251] = 27.64, $P < 0.001$) in comparison to owners who did not use ECs, with 7.6% excitement and 3.7% of dogs with aggressive behavior before the choice to buy the EC.

Thus, it appeared that dog behavior before EC use had an influence on the choice to use an EC or not: if the dog showed aggressive or excitement behaviors, there was more risk that an EC would be used.

Owners (76.4%) who used an EC on their dog reported normal behaviors after using the collar, which was a significant improvement compared to the situation before (51.8%). Excessive excitement was reported at much lower rate after using the EC (7.6%) than before (27%) (χ^2 [3, N = 330] = 16.63, $P < 0.001$), as shown in Figure 4.

Characterization of EC by type

Reasons for EC use

For each collar type, there was a main reason given by respondents for using an EC as shown in Table 4. To analyze the data from the RCC group, some answers were grouped into 3 categories: recall issues, aggressive behavior, and specific sport training.

Number of electric shocks and EC duration of use

The results obtained concerning the number of shocks that the dog received throughout its life showed that for a majority (57.8%) of the owners, their dog received less than 5 shocks in total. However, only reliable numbers concerned the RCC (50.8% of users) because for other EC types, owners could not constantly watch the dog and could therefore only make a guess.

With regard to the EC duration of use, there were too few answers in each category to identify any significant trend, so data were collated as follows: short duration for few hours and few days, medium duration for few weeks, and long duration for few months and few years. This showed that EBF was predominantly (59% of users) used for long durations (χ^2 [2, N = 330] = 13, $P = 0.011$).

Efficacy estimated by EC users

Fifty-eight percent of respondents who used EC said they would recommend it to others.

To measure the efficacy of EC use, success was taken into account only for owners who reported having their issue solved without having to put the EC on the dog anymore.

Based on this definition, RCC showed the best success rate with 51%; BAC appeared to be the least efficient showing only 25.5% of reported success and 35.9% of failures or worsening, as shown in Figure 5.

Dog behavior reported by owners

According to owners, the dog was either as usual, calmer, sadder, or more stressed, but excitement was nearly never reported when the EC was on the dog (<4%), as shown in Table 5. Of course, this reflected the owner's perception of his dog, not necessarily what a professional observer would have reported.

Summary of results by collar type

BAC

- In small dogs under 10 kg, BAC was the most used collar (Fisher's exact test $P = 0.00012$) with 28.8% prevalence (1.3% for EBF; 12.2% for RCC).
- BAC was the most injurious collar with 10.7% of burning (witnessed by owner).
- Owners reporting abnormal behaviors on their dog used more BAC than other collar types (χ^2 [1, N = 1073] = 38.5, $P < 0.001$).
- When wearing BAC, dogs were significantly described as "not as usual" (χ^2 [1, N = 1073] = 5.8, $P < 0.001$) and more precisely sadder or calmer (χ^2 [2, N = 1251] = 16.7, $P < 0.001$) compared to other collar types.

Table 2
List of alternatives tried before using EC (N = 330)

None	42
Group training in a club	128
Internet	105
Books	94
Veterinarian advice	79
Individual training with a private trainer	44
Group training with a private trainer	36
Behaviorist veterinarian	35
Private trainer at home	22
Behaviorist nonveterinarian	20

EC, electric collar.

Table 3
Number of alternatives tried before using EC (N = 330)

0	42
1	134
2	70
3	58
4	19
5	5
6	1
7	1

RCC

- Owners reporting abnormal behaviors on their dog used more RCC than other collar types (χ^2 [1, N = 1102] = 20.8, $P < 0.001$).
- Owners practicing specific disciplines with their dog used significantly more RCC (χ^2 (1, N = 1102) = 11.8, $P < 0.001$).

EBF

- EBF was far less commonly used than were other collars (4.5%).
- EBF was dependant on housing conditions: it was more used in houses without a fence.
- The dog's behavior before using the EC was not described as more abnormal compared to the nonusers group (χ^2 (1, N = 977) = 0.01, $P = 0.9$).
- Disciplines and EBF use were independent.

French legislation: use and sale

Of respondents not using the EC, 95.2% would have liked to see a regulation for the distribution of the devices. Even those who used EC mostly thought (77.9%) that a regulation was needed. As a whole, 90.7% of respondents were favorable to the implementation of a regulation for EC distribution.

Concerning the use of electronic devices (question 48, Table 1), 58% of users wanted a restricted use, and 14% asked for a ban, whereas 37% of nonusers wanted a restricted use and 60% asked for a ban.

One result which needs to be highlighted is that 42.8% of all owners (57.9% of EC users and 37.4% of EC nonusers) considered that EC could better solve undesirable behavioral issues than any other training method.

Discussion

Estimation of EC use in France

Although questionnaires were widely distributed, the sample was not random, which might have led to some biases. For example, the fact that the questionnaire was initially mainly sent to behaviorist veterinarians could have led to owners who received more advice concerning risks of using aversive training. Also, those veterinarians might have had more clients, whose dogs presented undesirable behaviors, hence, on whom many methods had been tried before, including ECs.

Blackwell et al. (2012) conducted a survey on the EC use in the UK and concluded that the prevalence in England was low, with 1.4 % owners reporting the use of BAC, 0.9 % the use of EBF, and 3.3% the use of RCC. France seems to be in a very different situation, as EC use appears to be a widespread practice with 11.9 % (n = 149) of owners reporting the use of BAC, 4.5 % (n = 56) for EBF, and 14.2 % (n = 178) for RCC.

To the authors' knowledge, there is no other published work assessing the prevalence in other countries. However, several elements could explain the differences: Blackwell et al. (2012) collected their data from owners attending dog shows, walking their dog, or bringing them to the veterinarian, whereas our sample concerned a wider range of owners. They also conducted the study right after the ban of EC in Wales in 2010, which may have had an influence on owners in England because of the EC training subject being brought up in the local media.

Factors associated with EC use

Blackwell et al. (2012) suggested that male owners and people who did not attend training classes used more EC than others. In our study, the determinant factors were dog's weight, dog's sexual status, and dog's training discipline (e.g., hunting, security, et cetera). We did not investigate the gender of the owner because the respondent could be a different person than the one who is mainly caring for the dog. In our survey, the results suggested that people attending group training in clubs used more EC. This could come from the fact that in France, canine club trainers are not always professionals and may receive very little education before becoming trainers. It could also be that training in the UK is less aversive than in France, which could be interesting to assess in future works.

Our results showed that dogs that weigh over 40 kilograms were fitted more with EC, which could be explained by the fact that at a same level of undesirable behavior, the heavier the dog, the harder it is for the owner to control it, hence the possibility of using forceful methods sooner. Dogs that weigh under 10 kilograms were mostly fitted with BAC, which could be explained by the fact that they might have less recall and runaway issues than larger dogs, but the barking even if they are small could be very difficult to manage. Arhant et al. (2010) reported that punishment increased anxiety and fear in smaller dogs (<20 kg) more than it did in larger dogs.

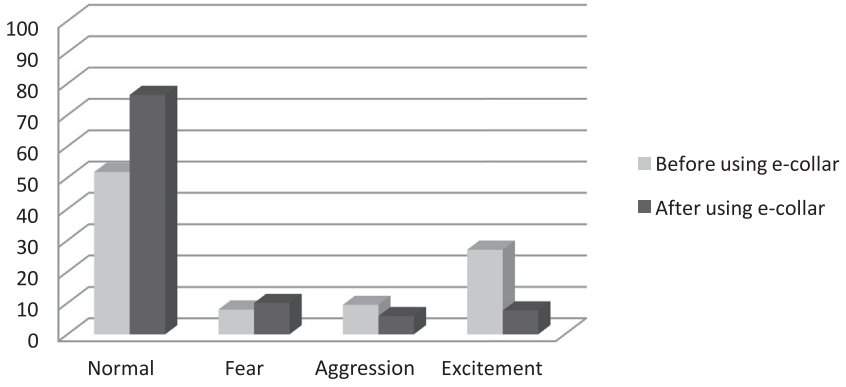

Figure 4. Dog behavior as perceived by owners who used EC (N = 330) before and after its use (in %).

Table 4
Categorization of EC use reasons

EC type	Reason for using	Percentage of owners giving this reason
BAC	Neighborhood complaints	**68**
	I anticipate to avoid bothering anyone	16
	Barking annoys me	12
	My dog was barking during walks (at people or items)	4
EBF	I have a fence, but the dog was going over/under	**62**
	I do not have any fence	25
	This prevents my dog from going in certain areas of my garden	13
RCC	Recall issues (77% of RCC)	
	My dog had a poor recall cue	31
	My dog was running away to chase wild animals	20
	My dog was running after joggers	8
	My dog was running after cars and/or bikes	9
	My dog was eating unwanted things (cow dung)	9
	Specific sport training (11% of RCC)	
	I want to achieve a high level of training (competition)	6
	Hunting training	5
	Aggressive behaviors (13% of RCC)	
	My dog was aggressive with other dogs	9
	My dog was aggressive with people	4

EC, electric collar; BAC, bark-activated collar; EBF, electronic boundary fence; RCC, remote-controlled collar.
Neighborhood complaints revealed to be what led to the use of BAC for 68% of the respondents, not having a proper fence for EBF (87%), and recall issues for RCC (77%).

Hence, this lower usage of EC on small dogs could also be due to the fact that owners already witnessed fear-induced reactions from their dog when punishing them, even if not with an EC, and were less willing to try stronger punishments.

Our results concerning dog's sexual status need to be analyzed further to see if a link can be established between dog's sexual status, in this case entire status, and a higher occurrence of undesirable behaviors. In that case, the dog's behavior would be the initial cause of EC use, or it could just be a side effect coming from the owner anticipating his non-neutered dog's behavior as "disobedient." However, if being entire is really a reason for using ECs, other more ethical options such as deslorelin acetate implant (i.e., a synthetic of gonadotropin-releasing hormone agonist licensed in several countries for the temporary [6 to 12 months] suppression of fertility in adult male dogs) should be chosen instead.

Our results concerning dog training disciplines (e.g., hunting, agility) could be explained by a different evolution of training methods in each discipline. Thus, it would be interesting to validate those results by checking which methods are mainly used in each discipline to confirm that hunting and security work trainers are more likely to use aversive methods than agility trainers.

Comparison with the data collected

One major point concerning scientific work produced on the EC is that in most cases, the experimental conditions led to an ideal use of the EC, meaning the shocks were administered by qualified trainers, without external stimuli and with perfect timing. This setting follows the operant conditioning rules of positive punishment (Blackwell and Casey, 2006): shock is delivered right after the undesired behavior starts, each time this behavior is produced, and it is aversive enough to suppress the behavior (Polsky, 1994) or at least reduce its frequency and/or intensity.

Our study showed that the main purchase sources of the EC were internet (40%) and gardening stores (35%) and professional advice was given to only 28.2% of the owners. This increases the risk of having unqualified users, which could result in possible bad timing at least for the RCC. According to Schalke et al. (2007), this impaired timing leads to a high risk of very stressful events correlated to the heart rate and saliva cortisol elevation.

In our survey, more owners reported abnormal behaviors in the EC group (48.2%) compared to the nonuser group (20.8%). In several studies (Schalke et al., 2007; Steiss et al., 2007; Cooper et al., 2014), dogs that had possible underlying anxiety were not included. There is no study to acknowledge the possible effect of anxiety combined with EC use, but many aggressive behaviors are reported to be linked with punishment associated to an underlying fear or anxiety condition (Luescher and Reisner, 2008; Herron et al., 2009). So, we could expect fear or anxiety-related aggression as a possible outcome.

Another point reported by owners in our survey is the increase of normal behaviors along with a diminution of excitement when using EC: this could be interpreted as a success due to EC training but could also be explained by learned helplessness [i.e. typical behavior of a dog that gives up trying, which occurs after enduring repeated painful stimuli, that it is unable to avoid (Maier and Seligman, 1976)]. This situation is very likely to happen when EC training is done by unqualified handlers, which is the case under real conditions. This represents a major welfare

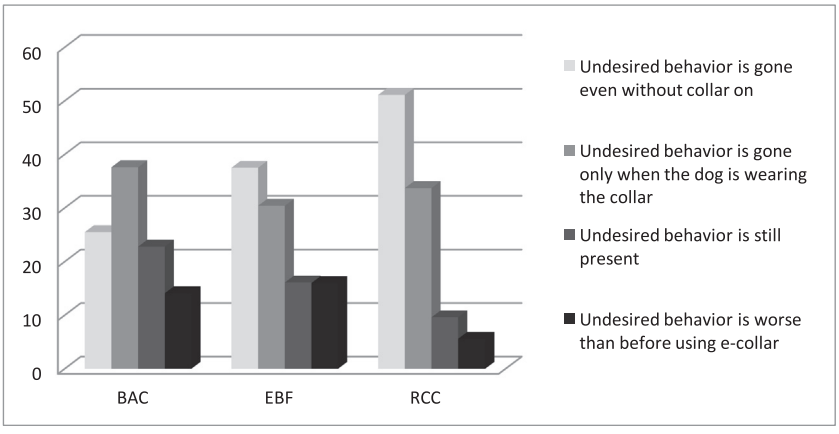

Figure 5. Efficacy of EC use estimated by owners (%).

Table 5
Dog behavior reported by owner when wearing EC

EC type	Dog behavior when wearing EC	Percentage of owners
BAC	As usual	40.3
	Calmer	31.5
	More excited	3.4
	Sad	18.1
	Stressed	21.5
	Physical injuries (burns)	10.7
EBF	As usual	64.3
	Calmer	16.1
	More excited	3.6
	Sad	7.1
	Stressed	23.2
	Physical injuries (burns)	1.8
RCC	As usual	60.7
	Calmer	27
	More excited	2.2
	Sad	6.7
	Stressed	15.2
	Physical injuries (burns)	3.4

EC, electric collar; BAC, bark-activated collar; EBF, electronic boundary fence; RCC, remote-controlled collar.
Normal attitude was significantly less described when using BAC compared to the other collars (χ^2 [1, N = 330] = 17.6, $P < 0.001$). Injuries caused by electrode burns were also more frequently described with BAC, by 10.7% of owners (Fisher's exact count $P = 0.0033$).

issue and should be a good reason for avoiding the use of positive punishment training.

Our results showed that for RCC, 30.3% of the dogs receive 11 shocks or more throughout their life. For the other collar types, we have no possibility of assessing the number of shocks received. Nevertheless, 34-59% (51/149 for BAC to 33/56 for EBF) of owners reported a use of the EC over several months. This is a very different setting compared to the protocols used in previous studies where dogs received a few shocks during a short period: less than 4 from the study by Christiansen et al. (2001), 4 per day for a maximum of 2 days from the study by Steiss et al. (2007), and one per day for 5 days from the study by Schalke et al. (2007). The high number (23/330) of physical wounds reported (7% of dogs wearing any EC, combined: 16/149 [BAC], 1/56 [EBF], 6/178 [RCC]) concurs with the idea that the number of shocks administered in everyday life is not as low as it can be in controlled experimental conditions.

Moreover, everyday life settings are confronted with many external stimuli that could be associated with the shock when it occurs (Polsky, 1994; Schielder and van der Borg, 2004). It would be logical to think that if the dog is barking or trying to jump over a fence, it may be responding to a stimulus, such as other dogs or a human being, which therefore risks to be associated with the shock.

This said, efficacy is an important subject to discuss when studying ECs because it is often the first reason given by users to justify their training choice.

In our questionnaire survey, real behavior modifications with the possibility to remove the collar after training were respectively 25.5% (38/149) for BAC, 37.5% (21/56) for EBF, and 51.1% (91/178) for RCC. This is far from the results observed in several previous experimental studies that show an efficacy between 80 and 100% (Juarbe-Diaz et al., 1996; Christiansen et al., 2001; Schalke et al., 2007; Steiss et al., 2007; Cooper et al., 2014). Similarly, in our survey, 42% (139/330) of the respondents were not satisfied after trying the EC on their dog, when experimental studies reported a satisfaction rate as high as 90% (Blackwell et al., 2012; Cooper and Mills, 2014). Differences may again be explained by the experimental conditions versus real-life conditions collected in our questionnaire.

If we consider only the efficacy score related to dogs wearing the EC constantly, it leads to a much higher efficacy, 63.1% (94/149; BAC), 67.9% (38/56; EBF), and 84.4% (150/178; RCC), but it seems that if an EC has to be worn by the dog its whole life to modify a behavior, the damage to its welfare might be so great that it is really not an acceptable option.

This leads to the conclusion that EC ability to modify behaviors under real-life settings is limited.

To completely discuss the benefit-risk associated with EC usage, the side effects need to be included. They have been largely reported in the literature sometimes associated directly with EC and sometimes associated with aversive training in general. For example, Beerda et al. (1998) describes the salivary cortisol raise and very low postures associated with the acute stress created by EC use. Another well-documented subject is the link between the use of punishment and the increase of aggressive behaviors (Herron et al. 2009) as well as other undesirable behaviors (Polsky, 1994; Hiby et al. 2004; Blackwell et al. 2008). The high number of physical wounds observed in our work (7%) attests to the reality of the direct adverse reactions described previously.

Moreover, several authors report a better efficacy associated with less stress when using nonaversive training: better human-dog team's performance (Haverbeke et al., 2008), more attentiveness toward owner (Deldalle and Gaunet, 2014), and lower number of potentially undesirable behaviors (Blackwell et al., 2008). A recent review concluded that positive punishment and negative reinforcement should be avoided on dogs as much as possible (Ziv, 2017).

Finally, the European Convention for the Protection of Pet Animals (Strasbourg, 13.XI.1987) states in the European Treaty Series n° 125 Chapter 2, Article 7 that *"No pet animal shall be trained in a way that is detrimental to its health and welfare, especially by forcing it to exceed its natural capacities or strength or by employing artificial aids which cause injury or unnecessary pain, suffering or distress."* (Anon, n.d.b) (https://rm.coe.int/168007a684).

If we wish to follow this principle, it seems impossible to use ECs in everyday life.

Collar types

In our survey, BAC appears to be the least efficient and the most injurious collar (10.7% [16/149] of dogs were burned), and equipped dogs exhibited significantly more abnormal behaviors. This poor result could be explained by the fact that collars do not treat the underlying behavior problem. For example, if used on a dog that suffers from separation anxiety, it may be efficient for the barking issue when the dog is fitted with the collar, but it will most likely be inefficient or worsen the underlying anxiety. Therefore, this collar appears to be particularly harmful and should not be used. Likewise, citronella spray collars, even if efficient (Juarb Diaz and Houpt, 1996; Steiss, 2007), do not treat the cause of the barking and should be avoided. It has even been suggested that spray collars can be harmful too (Moffat et al., 2003). Hence, the only available option to address barking issues should be humane, reward-based behavior modification by a certified trainer or behaviorist.

RCC could be called "convenience collar." Indeed, it is used in specific training disciplines (e.g., hunting, agility) as a first-line aid in sport training. Thus, it is used in situations where there is no emergency or strong reason to use it but just a will from the owner to choose this kind of training method because it is traditionally used in those disciplines. It can also be used to try and fix undesirable behaviors, and in this case, it should not be done without regulations.

EBF, on the other hand, is far less used than other collars and is not related to disciplines or undesirable behaviors, but more to environmental conditions (absence of fence). Thus, EBF appears to be less harmful for dogs than the other ECs. However, EBF is not risk free. For example, if the dog runs to greet people outside the perimeter and is shocked every time he is near people, a possible outcome could be an association of pain with new people, thereby resulting in a possible aggressive behavior toward humans. As a matter of fact, it has been reported by Polsky (1994, 2000) that EBF can trigger aggression in these conditions. This risk could be decreased by replacing EBF with real fences. Starinsky (2017) reported that dogs confined by an electronic fence were also more likely to have escaped than dogs confined by regular fences.

Conclusion

The results of this questionnaire survey suggest that the estimated prevalence of EC use in France is higher than expected. Some factors appear to increase the probability of using electronic devices: entire dogs, over 40 kg, used in specific disciplines such as hunting and security work.

A new light brought by this survey is that all collar types are not equal.

BAC and RCC are used on dogs initially showing abnormal behaviors. That is most likely why BAC is the most injurious collar, while being the least efficient. These 2 collar types should be banned because there are no data to suggest that they are better than other methods and there are data that suggest that they risk the dogs' welfare. In addition, RCC is used a lot in sports as a convenience tool: this is just not justifiable in a world where other options exist.

Prevalence of EBF use is quite low and its use is often related to the absence of fence; it could be banned and replaced by regular fences and reward-based training, but it appears to be the less harmful collar among the 3 types.

EC efficacy was shown in some studies, but it cannot be proven to be higher than nonaversive training. It is also known that for this efficacy to be optimal, perfect experimental conditions are required. These conditions are not observed in real life.

Indeed, based on this survey, it appears that in a real-life setting, ECs' ability to modify behaviors is limited. Thus, and as expected, the risks associated with their use are increased. Consequently, EC should not be used in everyday life without regulation.

However, answers in this questionnaire show that some owners still think that EC can solve behavioral issues better than any other existing method. Considering the high use revealed by our results, a huge communication work toward the public has to be done. In the current survey, 78% of questioned owners ask for a better regulation of ECs. This seems to be a much needed and achievable goal that would restrict the access to devices (e.g. through the internet).

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Ethical considerations

No approval was required.

Conflict of interest

The authors declare no conflict of interest.

Authorship statement

The idea of the article was conceived by Sylvia Masson and Isabelle Nigron. The experiments were designed by Sylvia Masson and Isabelle Nigron. The experiments were performed by Sylvia Masson and Isabelle Nigron. The data were analyzed by Sylvia Masson and Emmanuel Gaultier. The article was written by Sylvia Masson, Isabelle Nigron, and Emmanuel Gaultier. All authors have approved the final article.

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