

# Dog bites in Bosnia

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## SUMMARY

**Background.** Rabies is a zoonosis that remains endemic in most parts of the world. Primary care physicians are in the first line of defence against the disease. An increasing number of British practitioners and medical students are being exposed to the dangers of rabies through humanitarian work on overseas attachments. Rabies is enzootic throughout Bosnia-Herzegovina and presents a hazard to the multinational troops currently deployed there.

**Aim.** To describe the British Army's experience of animal bites and rabies prevention in Bosnia during the first six months of its current peace enforcement mission, and to make general recommendations on the good management of any rabies hazard at primary care level and under field conditions.

**Method.** Routine data from the Army's epidemiological database (ARRC 97) were reviewed, and theatre issues of rabies vaccine and immune globulin were used as a proxy measure for administered post-exposure prophylaxis.

**Results.** A total of 62 animal bites were reported in British troops between December 1995 and May 1996, of which 28 were unprovoked bites and resulted in the administration of a course of rabies vaccine. Ten of these were severe bites and rabies immune globulin (RIG) was administered in addition. The total cost of rabies post-exposure prophylaxis was US\$6914.00.

**Conclusion.** The prevention of rabies has major human and resource implications, and primary care staff involved in rabies post-exposure management need to be well supported in their clinical decision-making. Rabies protocols should be clear and unambiguous. The effective medical surveillance of military or humanitarian missions in rabies-enzootic areas must include the prompt reporting of animal bites. The predeployment training of medical teams should include an up-to-date assessment of the local rabies threat.

**Keywords:** rabies; war; immunization.

## Introduction

DURING December and January 1995–96, some 10 000 British troops deployed into western Bosnia as part of the NATO-commanded peace implementation force, or Ifor. Britain's contribution to this mission was known as Operation Resolute. Figure 1 shows the principal locations of British troops.

The four-year civil war in Bosnia-Herzegovina had ended with the intentional depopulation of large tracts of the countryside. Stray dogs roamed in packs in many areas.<sup>1</sup> Rabies was known to be enzootic throughout the Balkan region, with dogs and foxes constituting the principal animal reservoir.<sup>2</sup> Medical intelligence acquired locally indicated that there had been two cases in the

area of operations in 1995 (L Emmott and M Kannewischer, personal communications, 1995).

Before the start of Operation Resolute, a planning decision was taken that the large-scale pre-exposure vaccination of troops against rabies was inappropriate. In keeping with current guidelines of best clinical practice, each case of unprovoked animal bite to a British soldier was to be assessed critically.<sup>3</sup> Factors to be taken into account would include the pattern of rabies in the locality, the species of the animal, whether or not the animal was ill at the time of the bite (or immediately after), and the site and severity of the wound.

All primary care facilities had deployed to Bosnia with a full complement of drugs, including the recommended therapies for rabies post-exposure prophylaxis. During the second week of the operation, a written policy on rabies prevention was issued to all British commanders and to all medical facilities. The importance of minimizing contact with local animals was stressed, and detailed guidance was given on the procedures to be followed in the event of any animal bite.

In cases of moderate exposure, the promulgated in-theatre policy was that, after immediate and thorough cleansing of the wound, the victim was to be offered a course of human diploid cell rabies vaccine (HDCV) on days 0, 3, 7, 14, 30, and 90. Moderate exposure was defined as licks of the skin by a possible virus excretor, scratches or abrasions to the skin, and minor bites to covered areas of arms, trunk and legs. Where it proved possible to impound the animal, and it remained healthy for 10 days, treatment would be discontinued.

In cases of severe exposure, the in-theatre British policy was to offer the victim an immediate course of vaccine after wound cleansing, and at the same time to infiltrate human RIG around the bite wound, as well as administering it intramuscularly to either deltoid muscle. Severe exposure was defined as contamination of the victim's mucous membrane by animal saliva and the occurrence of major or multiple bites, particularly to uncovered areas of face, head, fingers or neck. Again, where the animal remained healthy for 10 days, the vaccine course would be discontinued.

The choice of antibiotic to be given concurrently with any dog bite was left to the clinical judgement of the medical staff. Although co-amoxiclav has been shown to have a broader spectrum of activity than penicillin against the organisms that commonly infect dog bite wounds,<sup>4</sup> this particular antibiotic was not available to the deployed British force at this time.

At the six-month point of Operation Resolute, during June 1996, we carried out a retrospective analysis of the prevalence and estimated severity of animal bites to British troops deployed in Bosnia-Herzegovina and Croatia.

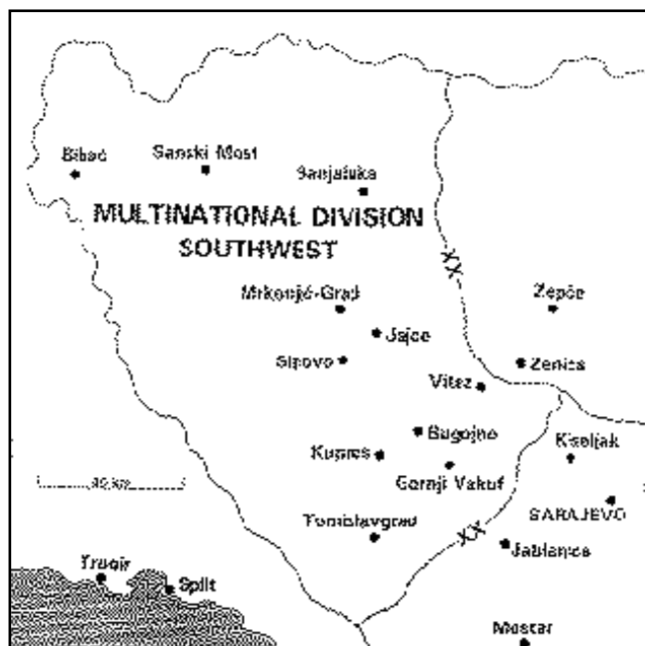
## Method

A simple but effective medical surveillance system known as ARRC 97, based on the daily notification of major disease groups, had been implemented at the start of Operation Resolute. It was in use in all British primary care facilities in Bosnia-Herzegovina. Any animal bite was reported as an 'extraordinary occurrence' in the free text section of the daily report. No further clinical details were supplied routinely, and the resulting database thus gave a broad indication only of the overall size of the animal bite problem in theatre. Bite severity and presumed rabies

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**Figure 1.** British troop locations in Bosnia-Herzegovina during Operation Resolute. Multinational Division Southwest is the British-led IFOR division.

status of the animal were not routinely reported.

To estimate the proportion of animal bites that had been judged clinically to carry some risk of rabies, we analysed theatre issues of rabies vaccine and RIG between December 1995 and May 1996. All new issues of rabies vaccine and RIG were made in response to individual practice demands to the British Army's Medical Provisioning Point at Split in Croatia. The number of these new issues served as a simple proxy measure for the number of incident rabies exposures each month.

Cost data for the rabies prophylaxis therapies were based on costs charged by the manufacturers to the Medical Supplies Agency, which procures all medical consumables on behalf of the Ministry of Defence. We calculated these as follows:

- HDCV. Cost of a single six-dose course of rabies vaccine: US\$139.80.
- Human RIG. Cost of a single 150-unit dose of RIG: US\$300.00.

We did not attempt to include other marginal costs or staff costs or productivity losses related to rabies post-exposure prophylaxis.

## Results

There were no clinical cases of rabies in British troops deployed in Bosnia during the period of this study (December 1995–May 1996).

The AARC 97 medical surveillance database yielded 62 reported animal bites to British troops during this six-month period. Fifty-nine of these were recorded as 'dog bite'. The remainder were caused by other animals (one fox, one cat), or were unspecified.

Table 1 shows the issues of HDCV and human RIG to British primary care facilities in Bosnia up to May 1996. A steep increase in the use of rabies post-exposure prophylaxis can be seen from April onwards. This coincided with the stabilization of the military mission and with the onset of warmer weather. Both of these factors led to more British troops leaving their camps for team runs and other organized sports.<sup>5</sup> This increased the likeli-

**Table 1.** Issues of rabies vaccine/immune globulin: December 1995 – May 1996.

Month	Vaccine issues	Human RIG issues
3		
January 1996	3	0
February 1996	2	0
March 1996	2	0
April 1996	12	2
May 1996	8	6

hood of the troops being bitten, particularly by sheepdogs and strays.

Twenty-eight courses of HDCV were issued, indicating that about 50% of all animal bites were judged to be unprovoked, and hence to carry some risk of rabies. Ten doses of human RIG were issued, suggesting that the incidence of severe rabies exposure in British troops, judged purely on clinical grounds, was approximately two cases per month. The deployed British force during this period amounted to 10 000 troops, indicating a rate of one threatened case of rabies per 5000 deployed troops per month.

The cost of rabies vaccine issued was US\$3914.00 and the cost of RIG was US\$3000.00. The total cost of rabies post-exposure prophylaxis in the six-month period was thus US\$6914.00.

## Discussion

Rabies is a zoonosis that remains endemic in most parts of the world. In England and Wales, the last case of indigenous rabies was reported in 1902.<sup>6</sup> Although primarily an infection of wild mammals, domestic dogs and cats are responsible for more than 90% of human cases worldwide.<sup>7</sup> In India alone, 30 000–50 000 people may die of rabies each year.<sup>8</sup> During 1994, cases of rabies were reported from every state in the United States (US), except for Hawaii and Nebraska.<sup>9</sup>

Rabies is caused by a rhabdovirus that penetrates broken skin and intact mucosae, and is highly neurotropic. Once disease symptoms occur, rabies has the highest case fatality rate (approaching 100%) of any known human infection.<sup>10</sup> Prevention is thus essential.

Deciding when and when not to administer rabies post-exposure prophylaxis involves a complex and multifactorial risk assessment. A clinical underestimate of the risk can be disastrous; two US Army soldiers died of rabies during the Vietnam War, despite the ready availability of human vaccine and despite extensive veterinary and laboratory support during that campaign.<sup>11</sup> Set against this is the fact that few adverse events are associated with the use of modern rabies vaccines, and that as far as we are aware the vaccine-associated mortality is nil. On the other hand, to 'play safe' and administer post-exposure treatment indiscriminately is wasteful in terms of resources.

A course of HDCV exposes the patient to a small but appreciable risk of immunization-related complications. Adverse reactions to HDCV include occasional urticarial and other immediate allergic reactions.<sup>12,13</sup> There have been four reports of neuromuscular illness temporarily associated with administration of the vaccine.<sup>14–17</sup> The infiltration of human RIG around bite wounds appears to be entirely safe, although equine RIG is associated with an incidence of serum sickness that varies between 1% and 6%.<sup>18,19</sup>

The policy of impounding a suspected rabies excretor and observing it for 10 days is based on a recommendation from the World Health Organization (WHO).<sup>20</sup> Some authorities consider

this period to be insufficiently long, since the prolonged excretion of virus by asymptomatic dogs has been reported in some countries.<sup>21,22</sup> A complicating factor in environments where the civil infrastructure has broken down is that stray dogs often escape after biting, or else are killed by their victims who are unaware that the animal should be traced and impounded. We are aware of only seven cases in Bosnia where British troops were successfully able to impound dogs suspected of being rabid. None of these animals developed signs of the disease.

One last area of controversy concerns the optimum duration of a course of cell culture vaccine. Unlike neural tissue vaccines, these agents are expensive, but are so efficacious that vaccination on days 0, 3, 7, and 10 would probably suffice, even if the animal was a virus excretor.<sup>3</sup> On the other hand, cell culture vaccines such as HDCV are sufficiently safe that it would probably not matter greatly if the vaccine were given beyond the 10-day observation period, even if the animal was a non-excretor.<sup>23,24</sup>

Primary care physicians require the best possible support in their clinical decision-making when managing bites from dogs and other animals in rabies-enzootic areas.<sup>25,26</sup> Computer-based clinical decision support systems are known both to enhance doctors' performance and to improve patient outcomes<sup>27,28</sup> but may not always be practicable in a field environment. Dog bites to humans are responsible for up to 3% of all severe injuries in developing countries.<sup>29</sup> A recent study of the post-exposure management of Swiss and German expatriates after potential rabies exposure in the tropics found that only 24–30% of treatments were correct according to WHO recommendations.<sup>30</sup> Although operational difficulties prevented us from conducting a more detailed audit of the British Army's post-exposure management of rabies during this period, we estimate that as few as 50% of threatened rabies cases may have been treated entirely correctly.

We feel that there are several important lessons to be drawn from the British Army's experience in addressing the rabies threat in Bosnia during 1995–96. Protocols for the immediate management of potential rabies exposure need to be clear, unambiguous, and available to all personnel. A robust medical surveillance system, which incorporates the continuous reporting of animal bites, is a prerequisite of evidence-based primary care during military or humanitarian missions where there is any rabies risk. So also is the predeployment training of medical staff, which must draw on the most up-to-date medical intelligence available on rabies, and be specific to the area where the rabies hazard will be encountered.

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