

32.7%), which is understandable if one considers the pressure felt by clinicians to ask for laboratory confirmation even for cases that they normally would not have tested.

Children were predominantly affected in 2002. More cases were identified in children (145 cases compared with a mean annual number of 57 cases from 1998-2001) and fewer cases in adults (34 compared with a mean annual number of 111 for the period 1998-2001). A smaller proportion of examined sera from adults tested positive in 2002 (5.3%) than in 1998-2001 (21.5%).

There was a statistically significant movement of the morbidity to younger children (3-5 years old) followed by reduced morbidity in the next age group (6-10 years old) in 2002.

Throughout the 1998-2002 period, seasonal distribution showed more cases in spring and in autumn, although in other countries enteroviruses circulate more frequently in summer [7]. No difference in the proportion of confirmed cases between the two groups studied was found. In 2002, there were peaks (March-April and November), and the three fatal cases occurred in April.

The comparison of clinical syndromes in cases of coxsackie B infections in both periods showed that respiratory infections, mainly pneumonia cases, predominated among children in 2002, while in adults the only remarkable change was a higher proportion of cases with myopericarditis although absolute numbers of myopericarditis cases were actually lower than in the period 1998-2001. Such cases do occur from time to time [8,9]. No fatal cases were reported in the years 1998-2001.

Therefore, the impression of a severe outbreak of coxsackie B infections in Greece in 2002 seems to have been the result of the combination of three different factors:

1. The increased proportion of myopericarditis cases, probably due to more cardiotropic strains of the circulating viruses in 2002,

2. The three fatal events which attracted the attention of the media,
3. The panic in the general public following headline news about the fatal cases in the media.

In conclusion, there is no evidence for a large outbreak of coxsackie B infections in Greece in 2002, though there was an increased number of cases in young children with more severe infections.

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ORIGINAL ARTICLES

Outbreak report

OUTBREAK OF TINEA CORPORIS GLADIATORUM, A FUNGAL SKIN INFECTION DUE TO *TRICHOPHYTON TONSURANS*, IN A FRENCH HIGH LEVEL JUDO TEAM

DM Poisson¹, D Rousseau², Defo Defo³, E Estève³

An outbreak of 49 cases of tinea corporis gladiatorum due to *Trichophyton tonsurans* infection occurred in a high level judo team of 131 members in Orléans, central France, between October 2004 and April 2005. The team was divided into 5 groups: cadet-junior boys (n=44), cadet-junior girls (n=33), male university students (n= 15), female university students (n=21), and a group called 'pôle technique' made up of high level judokas who have finished academic study (n=18). The outbreak involved 86% of the cadet-junior boys, but only 6 men in the 'pôle technique' (33%) and only 5 of the 69 other team members (7%) (cadet-junior girls and university students). We describe the outbreak and the results of a survey that found a known risk factor for the 'pôle technique': sharing an electric shaver. Personal hygiene practices were found to be very good among the cadet-junior boys. The high attack rate in this group

may be linked to the poor shower facilities in the gymnasium where they practiced that led them to have their showers several hours after the end of daily practice.

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Key words : Tinea, Trichophyton, judoka, wrestling, athlete.

Introduction

Tinea corporis gladiatorum is a fungal infection due to *Trichophyton tonsurans*, well known in wrestlers and widespread among wrestling teams worldwide [1,2]. Judokas were considered free of this fungal skin infection until Shiraki et al described cases in judokas at a university in Japan in 2004 [3].

We were involved in the treatment and the investigation of an outbreak of 49 cases of tinea corporis gladiatorum that took place between October 2004 and April 2005 among the 131 high level judokas who were members of the Pôle France Orléans, a sport-study

1. Unité de Microbiologie, CHR d'Orléans, Hôpital de la Source, Orléans, France

2. Fédération Française de Judo, Institut du Judo, Paris, France

3. Service de Dermatologie, CHR d'Orléans, Hôpital Porte Madeleine, Orléans, France

programme based in Orléans, a city of 113 000 inhabitants located in the centre of France [4]. This article describes the evolution of the outbreak, with the aim of raising awareness across Europe. This fungal infection is transmitted through close skin-to-skin contact, and the athletes involved in this outbreak, like those described by Shiraki et al, are involved in international competitions [3].

Methods

In France, mixed sport-study programmes known as 'pôles' are offered to high level athletes throughout the country. For judokas, one of the five such structures is located in Orléans (Pôle France Orléans) and divided in 5 groups (each one known as a 'pôle'): the cadet-junior boys (n=44; age 15-18), the cadet-junior girls (n=33, age 15-18), the male university students (n=15; age 18-24), the female university students (n=21), and a group called 'pôle technique' for high level judokas who have finished academic study and may be in employment (n=18; age 16-24). The programme members are coached by 7 adult trainers. For sport-related medical care, team members may consult a staff of 11, including physicians, masseurs, physiologists, school nurses and dieticians.

The judokas in the 'pôle technique' lived together in La Source, a suburb in the south of the city, and shared a bathroom. The cadet-junior boys and girls boarded at night in different schools in the city centre. Each group had its own practice facility where 3 hours of daily training took place: cadet-junior boys trained in the city centre, while cadet-junior girls and university students trained in La Source. All five groups practiced together for several hours each Wednesday.

Each team member participated in between five and seven national and international competitions a year, and several local challenges.

The team members travelled to their homes in other parts of France on the few weekends when they were not competing.

Case reports

Clinical examinations were carried out by a single dermatologist. A confirmed case of tinea corporis gladiatorum was defined as a team member presenting with clinically typical lesions. A suspect case was a transient definition for a team member with suspect skin lesions. Both confirmed and suspect cases were sampled and cultured for fungus. After a 30 day incubation, a suspect case growing the fungus *Trichophyton tonsurans* became a confirmed case, and a suspect case without fungal growth was discarded.

An episode was defined as a confirmed case of tinea corporis gladiatorum from symptom onset to healing of lesions and completion of treatment.

A new case was defined as the first episode in a given individual following our investigations.

Re-infection was defined as the occurrence of second or third episode in a given individual involving other anatomical sites than the previously known ones.

Throughout the period of the study, suspect cases were reported by team members and their coaches; and on two occasions by the dermatologist who examined the athletes in the gymnasium during a training session. When suspicious lesions were seen, hospital appointments were scheduled for the following day, where the lesions were mapped and samples were taken for microbiological testing.

The following data were collected for each case: date, sex, group, judo level, name, date of birth, address, number of visit, anatomical locations of lesions seen by patient, and of additional lesions discovered by clinician, anatomical location of sampled lesions, current self-medication, and prescribed treatment.

One of two treatments was offered: all cases received topical and oral terbinafine 250 mg/d for 1 month, and the case was withdrawn from judo practice for 7 days if 5 or fewer lesions were seen, and for 14 days if more than 5 lesions were seen.

Environmental and microbiological investigation

For the environmental investigation, five 20 cm x 20 cm squares of the practice mat (4 corners and 1 middle) were sampled on 6 January with wet cotton compresses cultured for fungi.

Mycological cultures were carried out on Sabouraud Chloramphenicol Gentamicin Agar, Sabouraud Chloramphenicol Actidion Agar and Dermatophyte Agar incubated at 30°C for at least 30 days. Staphylococci and enterococci were looked for on Chapman Agar and Bile Esculin Azid Agar incubated at 37°C for 2 days. (All media from BioMérieux – France).

Hygiene survey

A hygiene habits survey was conducted with a three page questionnaire distributed by the coaches to each team member on their personal hygiene habits.

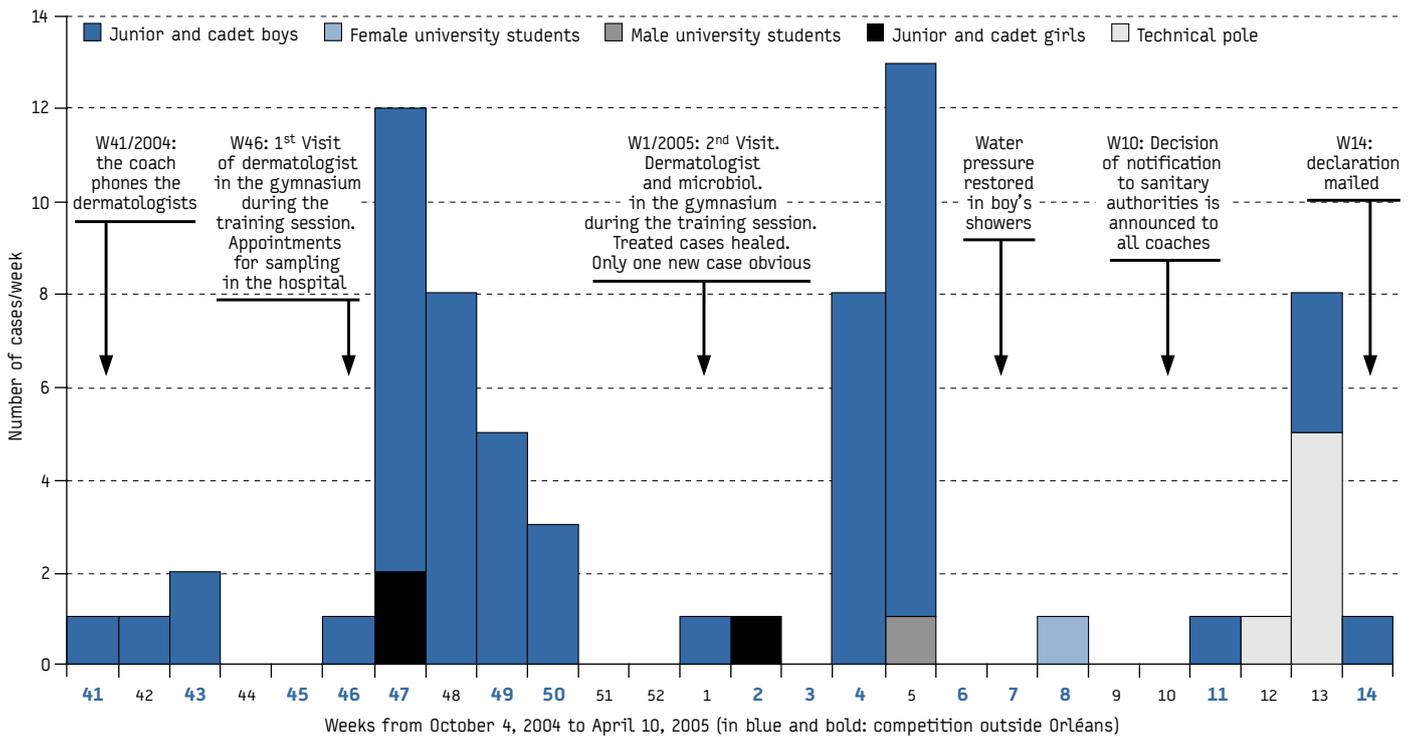
Results

Cases reports

The first case was identified at the beginning of term by the cadet-junior boys' coach, who recognised lesions he had seen during the season 2003-2004 and that each boy had presented with to his own physician when visiting his family. The coach decided to refer every team member to a single dermatologist in Orléans.

The outbreak then evolved in three phases [FIGURE 1]. The first phase was from 6 October 2004 (week. 41/2004) until 6 January 2005 (week.1/2005) and involved 29 boys in the cadet-juniors group (29/44) and two girlfriends of cadet-junior boys, who belonged to the cadet-junior girls. Two of the boys were infected twice. On 6 January 2005, all cases had fully recovered and only two new cases were discovered, in one boy and one girl (week 2). The second phase began in week 4. In weeks 4 and 5 there were 5 new cases and 15 re-infections among the cadet-junior boys, bringing the total number of cases to 35/44. At this point, no cases had been reported in members of the 'pôle technique' and there were only 3 new cases in the remaining groups. The third phase began in week 11: the 'pôle technique' reported 6 new cases (6/18), while the cadet-junior boy referred 3 more new cases (total cases 38/44, 86%) and 2 re-infections. In week 12 the Fédération Française de Judo sent a notification to the local health authorities (Direction Départementale de l'Action Sanitaire et Sociale du Loiret). The epidemic curve was calculated up to week 14. A few cases occurred after that time, including the only case in a person who did not belong to the programme, a girlfriend of one of the last team members to be infected. Although she did not belong to the programme, she practiced judo at a private club whose members had recently competed against the Pôle France Orléans.

Epidemic curve of *tinea corporis gladiatorum* outbreak among judo team, in Orléans, October 2004-April 2005



In total, 81 athletes were referred to the dermatologist and 68 episodes of tinea were observed: 49 new cases and 19 re-infections (eighteen second episodes and one third episode). Forty five of the infected athletes were male and 4 were female, and the mean age was 17.3 years (range 15.4 to 23.9).

The outbreak affected 86% of the cadet-junior boys (38/44), who practiced judo in Orléans city centre. In La Source, 6 cases occurred among the 18 athletes of the 'pôle technique'; whereas very few members of the other groups – cadet-junior girls and the university students - were involved (5/69, 7%).

Environmental and microbiological investigation

One sample taken from the practice mat used by the cadet-junior boys grew the fungus *Trichophyton tonsurans*. None grew *Enterococcus sp.* or *Staphylococcus aureus*.

The distribution of lesions on the body was as follows: 31 on forearm, 25 on anterior trunk, 24 on scalp, 23 on face and neck, 14 on arm, 12 on back, 2 on buttock, 9 on lower leg and thigh, and only 2 on feet. The mean number of lesions was 2.1 per person per episode (range 1-15). Mycological confirmation of the fungus was obtained by culture in 48/68 episodes (70%). Every 48 isolates were *T. tonsurans var sulfureum*.

Hygiene survey

The 18 judokas in the 'pôle technique' were not included in computations since their case histories revealed that all cases in this group were in men who shared an electric shaver : all presented with at least one scalp lesion, and 85% of lesions in this group were on the scalp.

For the 113 other athletes, 102 questionnaires were returned by the coaches (90%), and no problems with personal hygiene practice were identified. In fact, cases were significantly associated with preventive attitudes such as showering twice a day, daily hairwashing using shampoo, and using one's own towel. The only significant risk factor was one which concerned the cadet-junior boys, who all had showers several hours after the end of practice.

Discussion

Our study revealed an outbreak that began in 2003-2004, according to the cadet-junior boys, but each of them had consulted a physician when visiting his family: since the team members' families lived in many different locations across France, each physician saw only one case and the outbreak was unrecognised. The outbreak was only recognised when a single dermatologist was called in by a coach to deal with all cases.

High contact sports are a well known cause of transmission of viruses, bacteria, parasites, and fungi causing skin infections, and the best documented infection transmitted in this way is herpes simplex [5]. Fungi are considered a benign risk in comparison with herpes, though more widely spread : during the 1998-1999 season in the United States, Kohl et al found that 84% of wrestling teams had at least one case of tinea corporis gladiatorum. The causative agent is always the fungus *T. tonsurans* [6]. Until year 2004, reports of outbreaks of tinea corporis gladiatorum were seemingly restricted to wrestling teams [1,2,6].

The first cases among judokas were described by Shiraki et al from the Juntendo University School of Medicine in an unnamed university in Japan in 2004, a year in which a large number of high level judokas were brought together in one place by the Olympic Games [3]. This observation may have been made more acute because of the epidemic situation in the team at the authors' university, the Juntendo University School of Medicine. This paper was soon followed by others in early 2005, showing that the epidemic had already spread across Japan more quickly than expected. It was shown to have been present in judo teams since 2001, and in wrestlers since 1994 or 1995 [7,8,9]. Two genotypes of *T. tonsurans* have been isolated in wrestlers, and only one in judokas, which probably signifies a more recent introduction of the fungus among judokas [7].

Although the infection has been widespread among wrestlers for some time now, risk factors and prevention strategies are not yet well defined. Fomites were identified in previous studies of tinea capitis due to *T. tonsurans* in the elderly [10] and practice mats were statistically suspected by Kohl et al for wrestlers [6], but they probably do not play a major role in our study: neither faecal nor cutaneous contaminants were found, and lesions were rare on feet. Most lesions appeared on upper extremities, neck and head; these are the zones where judokas

hold on to their opponents. Therefore, prevention should address person-to-person contacts. Asymptomatic carriage may exist on the scalp or around healed lesions. The delay we identified between the end of practice time and having a shower may be an interesting risk factor. It could allow deeper colonisation of the skin by the fungus through small wounds that are usually self-healing.

The water supply in the gymnasium used by the cadet-junior boys lacked pressure, and it was impossible for all 44 athletes to use the showers at the same time. As a result, the boys used to practice until the last minute, then change out of their practice clothes, travel back to the dormitory for dinner, study for 1-2 hours, and then have their showers. The water pressure at the gymnasium has now been restored and showers are taken immediately after practice.

In our investigation, the clinical aspects of lesions raised two problems:

1. lesions can mimic mat-burns or skin grazes, frequent in team members above the protuberances of bones on wrists or elbows,
2. the number of lesions is frequently underestimated by the individual, and not only when they occur on the scalp or back.

This may be why skin lesions are considered to be benign problems, and may also explain the failure of self-medication with topical treatments: not all lesions receive the treatment. Oral treatment was therefore indicated. Itraconazole and fluconazole are always efficient [3,11,13,14]. Terbinafine worked well in our study.

T. tonsurans is highly contagious: 40% of Parisian cases of tinea in 1910 were due to *T. tonsurans* and temporary exclusion from school has long been a compulsory part of treatment. Despite this long history, treatment guidelines for tinea corporis have failed to produce the desired goals in the particular population of contact sports practitioners. Specific problems appear when dealing with such an outbreak in such a team [12]. First of all, cases must be withdrawn from practice, but discontinuation of practice disrupts individual and team goals and is therefore difficult to accept. Athletes can be tempted to hide their lesions until competitions are over. Second, these patients are minors, and prevention of infection requiring a daily screening of the entire skin surface raises ethical problems if this screening is to be carried out by a room mate or an adult coach.

These problems probably played a role in the sequencing of the outbreak: the first cases were referred to the dermatologist by one of the coaches. This coach made possible the recognition of the outbreak and the treatment of ongoing cases. The second phase began when teams had resumed their competition tours across France: it is likely that most of cadet-junior boys were re-contaminated when fighting at locations outside of Orléans, and we hypothesised a nationwide outbreak. However, it is also likely that some of the cadet-junior boys had lesions, but did not want to be withdrawn from practice and competitions, and so hid their lesions with adhesive wound coverings that are widely used for ordinary mechanical abrasions, and waited until the end of competitions to seek the help of a coach or the dermatologist. We hypothesise that this behaviour also led to the third phase: the 'pôle technique' only sought medical advice after the decision was made to officially notify the health authorities.

Recent results from Hirose et al suggest that discontinuation of practice is not required to prevent the spread of the fungus, provided that the asymptomatic carriers, detected by scalp sampling every two months, are treated with, according to these authors, one week pulse oral itraconazole 400mg and miconazole shampoo, and that

the whole group accepts the implementation of infection prevention measures. This procedure will be tested during the next term of our judo programme, although there are differences with the sports clubs in the study of Hirose et al, where training only occurred once a week and did not seem to include external competitions [14]. Our athletes train every day and participate in national and international competitions. There are sexual relationships between some of the athletes and the cadet-junior sleep in dormitories.

As mentioned by Kohl et al in year 2000, the majority of the literature has described outbreaks in isolated contact sport teams [12]. More recently, in Japan, a case of *T. tonsurans* infection was observed in a boy in a nursery school who was a member of judo club [7]. In our study, transmission could be observed between the different teams, and the case described outside the programme practiced judo in a club that had challenged the Pôle France Orléans during the season. From these results we may also consider the outbreak as limited to judo practice, but the contamination of the first two cadet-junior girls was also linked to sexual relationships. Therefore we consider this to be an artefact: cases must occur outside contact sport teams, but since they are not seen by the same physician, they remain outside the published descriptions.

The observations of both this and the Japanese study together suggest that the infection has been diffused through high level judo teams worldwide. Since contamination is specifically inter-human, eradication is achievable if the reservoirs are extensively investigated and treated simultaneously. This paper has been written with the aim of raising the alert.

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