

## **Identification through Genetic Typing of the victims of the Sect of the Solar Temple (Cheiry/Salvan, Switzerland)**

**C. Brandt-Casadevall, N. Dimo-Simonin, T. Krompecher**

**Institut universitaire de Médecine légale, Bugnon 21, 1005 Lausanne  
Switzerland**

On October 5 1994, at approximately 1:00 a.m., a fire alarm was given in the village of Cheiry (Canton of Fribourg, Switzerland), at a farm lying just outside the village. The lifeless body of the owner was found in the living quarters. The fire had reached the upper parts of both the inhabited and the uninhabited part. While searching for a vehicle in a space thought to be a garage, the police discovered a room that had been fitted for reunions. A concealed door led to other premises transformed into a chapel. Twenty two corpses were found scattered among the different rooms.

On the same fifth day of October 1994, at around 3:00 a.m., an alarm was raised in response to fires of chalets in the heights of Salvan (Canton of Valais, Switzerland). Inside one of the chalets, that was only slightly damaged by fire, fifteen corpses were discovered. Inside a second chalet, severely damaged by the flames, ten bodies were found. In a third chalet, that was completely destroyed by fire, no victims were present.

Our institute was commissioned to remove the corpses, to identify the victims, to determine the cause of the death and to help establish the surrounding circumstances of the tragedy.

It was later determined that the farm in Cheiry and the chalets in Salvan were owned or rented by members of the Sect of the Order of the Solar Temple.

In Cheiry, the 23 bodies had not been directly exposed to fire and could hence be identified visually by relatives, or through dactiloscopic or odontological examinations.

In Salvan, however, some of the corpses had been significantly damaged by fire, making their identification very difficult. In some cases, visual identification or identification through finger-prints was not possible; in other cases, odontological methods were useless (indeed, these were cases of either complete destruction by fire or complete lack of dentition). In these cases and as a last resort, it became necessary to search for available medical or radiological records or perform genetic typing. Importantly, four children were found among these victims. For these children, there were no odontological or radiological records of any nature prior to death.

We thus proceeded to determine the VNTR polymorphism on thirteen corpses, for which it was the only method that could lead to identification. The VNTR polymorphism was also determined in the case of several leading members of the Sect in addition to others means of identification.

This forensic investigation was carried out in close collaboration with the police which even occupied some office space in our institute for the occasion. Throughout the course of our work, we were able to request any and all material that was needed. This approach turned out to be quite advantageous : indeed, thanks to the collaboration between the police, family members and the institute, all medical records and samples were obtained on a very short notice, even in the case of foreign nationals (French people, Belgians and Canadians). It was equally simple to establish the family ties of the presumed victims.

With the exception of the removal of corpses on October fifth, the actual forensic investigation of the corpses from Salvan started only in October tenth. This delay made it possible for the

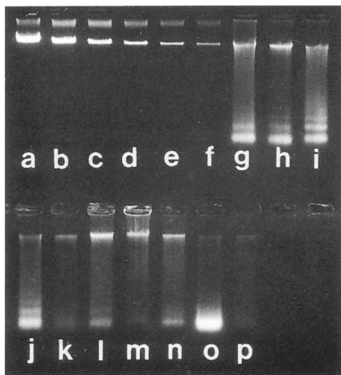
police team to investigate the cases of the missing persons and establish the ties that existed between them. This, in turn, allowed to assign a presumed identity to most corpses in relation to their localization at the time of discovery. This presumed identity was eventually confirmed for each corpse from Salvan, thus greatly facilitating laboratory analyses, none of which having to be repeated.

The material taken from the victims and made available to us consisted of either a blood sample in EDTA or muscle tissue. The genetic profile was determined on the basis of VNTR polymorphism at the following loci : D12S11, D7S21, D16S309, D2S44 and in some cases D1S7 and D5S43. The probes consisted of MS43a, MS31, MS205, YNH24, MS1 and MS8.

For each victim, the polymorphism was compared with that of one or several other persons with an established identity, either victims or individuals without any connection to the tragedy.

The following method [1] was used :

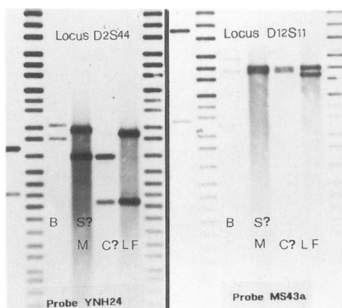
- A saline extraction of fresh blood samples was performed. In the case of the victims, a phenol-chloroform extraction of the material was done. Controls carried out with our first extractions were troubling, since part of the DNA appeared degraded (Fig. 1).



**Fig. 1.** Agarose gel electrophoresis with ethidium bromide :

- a to f : quantitation standard (from left : 500, 250, 125, 63, 31 and 15 ng)  
- g to p : phenol-chloroform extracts from muscle tissues from victims of Salvan.

Our fears turned out to be unjustified. The quantity of high molecular weight DNA samples was sufficient to allow Southern technique. Indeed, as you can see in some of our analyses (Fig. 2 and 3), the bands were well-defined and sharp, in spite of occasional background.



**Fig. 2.** VNTR polymorphisms determined with the probes YNH24 and MS43a



**Fig. 3.** VNTR polymorphisms determined with the probes MS31 and MS43a

- The probes used were labeled with alkaline phosphatase and revealed by chemiluminescence.
- The results were analyzed visually and with the help of computerized equipment.

Every scenario of relatedness was encountered in the course of this work :

- Children identified relative to their mother and father
- Children identified relative to their mother
- Children identified relative to their mother and sibling(s)
- Individuals identified relative to their children and siblings
- Individual identified relative to her child
- Individual identified relative to his brother
- Individual identified relative her children and their father

Probabilities were calculated according to the method of Essen-Möller [2], using band frequencies found in the Swiss population.

All calculated probabilities were above 99.8%, the threshold accepted by the Swiss Federal Court above which a paternity is considered practically proven.

An exemple is given by the case of a woman whose fraternity tie with her legal brother was estimated to be 99.98%. The corpse of the child was identified thanks to the determined maternity tie with the corpse of the legal mother (99.996%) and the paternity tie with the corpse of the legal father (99.993%).

In cases of multiple relatives, the calculation was performed solely for the main family tie, and the others were ignored. While we did consider that the presence of the other common bands increased the probability of relatedness, we did not calculate any specific value.

An exemple is given by the case of a woman whose maternity tie with two legal children were respectively : 99.84 and 99.83%. She presented also some bands in common with two legal sisters.

Whenever a child was identified relative to one or both parents, the probability was calculated as in the other cases, but we always specified that the child was the offspring of a particular individual or couple, without excluding the possibility that the corpse actually was that of another child of similar age whose parents were the same individuals.

The same issue was important when a victim was identified relative to a brother only. While the corpse may indeed be that of the person presumed dead, it may also belong to another brother in the same group of siblings. This is especially true since it is more difficult to precisely evaluate the age of an adult.

The identification process through genetic typing of the victims of Salvan was completed in a period of three weeks. On Friday, November 4 1994 all the victims of the tragedy Cheiry/Salvan were formally identified.

### **Acknowledgements**

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### **References**

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