# CASE REPORT

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# Phosphoglucomutase (PGM) Grouping of Bloodstains on Silver

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**ABSTRACT:** This paper describes a case involving alteration of phosphoglucomutase (PGM) isoenzyme patterns in bloodstains present on silver. The effect could be produced by treating blood samples with silver nitrate solution.

**KEYWORDS:** forensic science, phosphoglucomutase, blood, silver, genetic typing

In a case of possible suicide by shooting, the weapon used was an old Martini-Henri rifle which had been embellished with ornamental silver bands, probably using locally worked silver. Weapons of this type are fairly common in Oman (Fig. 1).

One of these silver bands bore a small stain of human blood, which was typed by starch gel electrophoresis as a phosphoglucomutase (PGM) 2 type. The victim was a PGM 2.1, and circumstances did not suggest the involvement of any other person.

## Experimental Procedure

Samples of the victim's blood and also of fresh control PGM 2.1 blood were smeared on silver bands present on the rifle and also on similar areas of two other Martini-Henri rifles from the Royal Oman Police Forensic Science Laboratory's own collection. Blood was also smeared on metal and wooden areas of the rifles.

These stains were allowed to air dry overnight at room temperature, and the blood was then removed on to clean cotton threads dampened with distilled water. One half of each thread was then subjected to starch gel electrophoresis [*1,2*].

In the cases where the blood had been removed from silver areas, the cathodal band stained at or near the *b* position, producing a pattern which could be confused with that characteristic of PGM 2. Blood from the non-silver areas of the rifles grouped normally as PGM 2.1 (Fig. 2).

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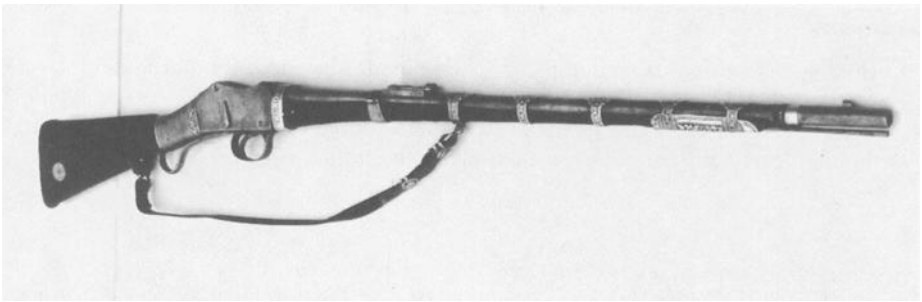

FIG. 1—*Rifle used in the shooting.*

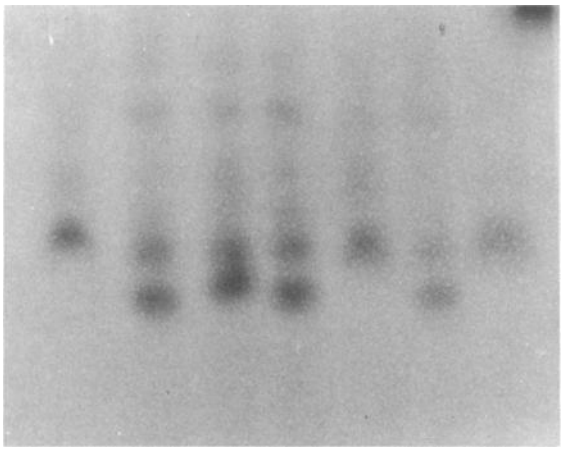

FIG. 2—*Gel electrophoresis results for bloodstains on various portions of the rifles (reading from left to right): Lane 1, Rifle A silver; Lane 2, Rifle A gunmetal; Lane 3, Rifle A silver; Lane 4, PGM 2.1 stain control; Lane 5, Rifle B silver; Lane 6, Rifle B wooden stock; and Lane 7, rifle case. In Lane 3, only slightly increased anodal movement occurred; note that the stains in Lanes 1 and 3 are from different areas of silver on Rifle A.*

Treatment of the remaining half of each thread from the silver areas with freshly prepared 0.05 *M* dithiothreitol (Cleland's reagent) for 30 min prior to electrophoresis "restored" a normal PGM 2.1 pattern.

It may be that silver reacts in some way with the –SH group from the PGM enzymes. We attempted to simulate the effect by diluting fresh, whole PGM 2.1 blood 1:1 with aqueous solutions of silver nitrate (0.06 to 0.000 06*M*) at 4°C overnight.

At higher concentrations of silver nitrate (0.06 and 0.006*M*), no PGM activity was detected; furthermore, this effect could not be reversed with 0.05*M* Cleland's reagent.

At lower concentrations (0.0006 and 0.000 06*M*), however, we found the cathodal band appearing at or near the *b* position, as before, producing a pattern similar to that of PGM 2. Treatment with Cleland's reagent could reverse this effect, but it was noticeable that other bands associated with PGM 2. 1 (Bands *b*, *c*, and *d*) were considerably weaker than the "restored" band in the *a* position.

## Conclusions

It would appear from our limited survey, that bloodstains present on articles of silver may have their PGM isoenzymes markedly affected, which could lead to incorrect typing. We suggest that results of PGM typing of such stains should be interpreted with caution.

We hope to carry out a more detailed study in the future using isoelectric focusing.

## References

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