

New insights revealed by research into the blood on the Shroud

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In July this year, a scientific paper was published outlining research recently conducted by Professor Giulio Fanti into the blood on the Shroud. This research paper, *New Insights on Blood Evidence from the Turin Shroud Consistent with Jesus Christ's Tortures*¹, reveals new findings obtained from both a detailed examination of the blood flows observed on the Shroud and a microscopic examination of minute samples of blood that were obtained in the 1970s during scientific examinations of the Shroud. The paper covers a range of evidence produced by this research, however this article will focus specifically upon the significant new information that it reveals about the physiological condition of the body immediately prior to death.

Background

There have been previous examinations of the blood found on the Shroud. In 1973, a Diocesan Commission of experts appointed by the Archbishop of Turin studied samples removed from the cloth and were the first to identify blood particles, however the Commission failed to reach a conclusion about whether or not blood was present in those samples. During the STURP examination of 1978, sticky tapes were applied to the surface of the Shroud and examinations of reddish particles found on those tapes gave positive results for blood. These examinations were conducted by STURP members John Heller and Alan Adler who also detected albumin, one of the constituents of blood plasma, in what appeared to be serum halos around many of the bloodstains. In 1982, Pierluigi Baima Ballone also concluded that blood was present on the Shroud after studying fibres taken from the Shroud.

No further specimens of Shroud material containing possible blood traces have been taken since the 1970s but there have been significant advances in the technology and techniques available to research scientists over that period. As a result, Giulio Fanti was able to obtain a considerable amount of new evidence from his recent study of minute traces of blood taken from the Shroud during those previous examinations, providing a much greater insight into the extensive injuries and physical trauma endured during the torture and crucifixion.

Microscopic Analysis of Bloodstain Evidence

The samples of blood analysed in this research came from sticky tapes that had been placed in contact with various areas of the Shroud during the 1978 STURP examination and dust which had been vacuumed from the back of the Shroud by Giovanni Riggi di

¹. Fanti Giulio. *New Insights on Blood Evidence from the Turin Shroud Consistent with Jesus Christ's Tortures*. Arch Hematol Case Rep Rev. 2024;9(1):001-015.
Available from: <https://dx.doi.org/10.17352/ahcrr.000044>

Numana. These samples were analysed using a variety of techniques and equipment ² and this analysis revealed some distinct differences in the microscopic appearance of blood particles. Giulio Fanti subdivided these blood particles into three separate categories, A, B and C, based upon their appearance characteristics.

It should be noted that these category labels were used to denote the blood particle appearance characteristics and are completely unrelated to the medical labels A, B and O used to identify blood groups.

Type A Blood: Microparticles

Type A blood particles were found on the sticky tapes placed in contact with the Shroud during the 1978 STURP examination. Most of these particles were adhered to fabric fibres that had been picked up by the sticky tape but some were dispersed in the tape adhesive. These tiny microparticles were orange-red in colour when viewed under an optical microscope, with sizes ranging between 0.3 and 2 micrometres in diameter. The shape of these particles was similar to that of red blood cells, or erythrocytes: disc-shaped with a concave centre, almost like a doughnut (Fig. 1).

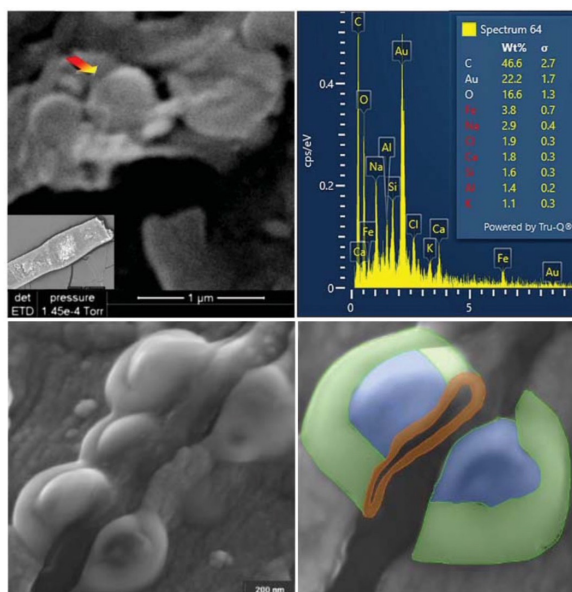


Figure 1: Top Left and Right: Sub-micrometric Type A blood particles with elemental analysis showing components compatible with blood. Bottom Left: A close-up of split Type A red blood particles caused by crack in the host fibre. Bottom Right: Detail of the lower blood particle coloured to show the sectioned structure typical of a red blood cell. © Giulio Fanti.

². These included the use of SEM (Scanning Electron Microscope), ESEM (Environmental Scanning Electron Microscope), SEM-FEG (Field Emission Gun) and Raman analysis. Element weight percentages were determined via XRF-EDS (Energy Dispersive X-ray Fluorescence Analysis).

The elemental composition was also compatible with that of human blood, with Carbon, Oxygen, Iron, Calcium, Chlorine, Nitrogen, Potassium and Phosphorus all detected. However, the diameter of red blood cells found in human blood is typically around 7 micrometres, much greater than the size of the microparticles found on these tapes. Other particles ranging in size from 50 to 200 nanometres and identified as creatinine were also found in some samples of type A blood.

If these Type A blood particles were red blood cells, then clearly something had caused them to shrink significantly. Fanti performed several experiments in which he mixed human blood with urea, aloe and myrrh, which reduced the size of the red blood cells. Indeed when mixed with a saturated solution of urea, these human red blood cells shrank to diameters of less than one micrometre, which is compatible with the size of the Shroud Type A blood particles. It's interesting to note that kidney failure can produce a clinical condition known as uraemia, which literally means 'urine in the blood'. This condition causes waste products such as urea and creatinine that are normally eliminated from the body as urine to remain in the bloodstream.

The scourge marks on the Shroud are evidence of an extremely brutal flagellation, particularly in the areas corresponding to the kidneys, and it is quite plausible that this could have caused kidney failure, which in turn would have led to a build-up of urea and creatinine in the blood. This condition would account for creatinine being detected in the Type A samples, as well as the much smaller than normal red blood cells caused by the presence of urea in the bloodstream. A consequence of the reduction in size of the red blood cells is that they are unable to carry as much oxygen, causing extreme breathing difficulties. The presence of urea in the blood would also inhibit the clotting process, causing the blood to remain in liquid form.

Type B Blood: Shards of Blood Crusts

Type B blood was mainly found in some of the dust vacuumed from the back of the Shroud. It consists of brittle shards of crusts which are up to a tenth of a millimetre in size and darker in colour than Type A blood. Its elemental composition is compatible with that of blood but it does not appear to contain particles with the structure of red blood cells as found in Type A blood. This suggests that this was from pre-mortem blood that coagulated on the body after being shed when Jesus was still alive and was not mixed with any aromatic substances that were used in the burial.

Type C Blood: Red blood cells with sizes from 2 to 5 micrometres

The Type C material was found in dust vacuumed from the back of the Shroud in the area corresponding to the face. It consists of doughnut-shaped particles with a structure similar to red blood cells (Fig. 2) but much larger than the Type A particles described above. Their larger size could be due to these blood particles being shed before Jesus was in the final stages of uraemia and so did not shrink significantly in size.

Unfortunately, very few Type C particles were found which made it impossible to determine the elemental composition and so these cannot be definitively identified as blood particles. However, they do have the appearance of red blood cells which have not coagulated to form clots, possibly due to a substance applied to the face of Jesus before it was wrapped in the Shroud.

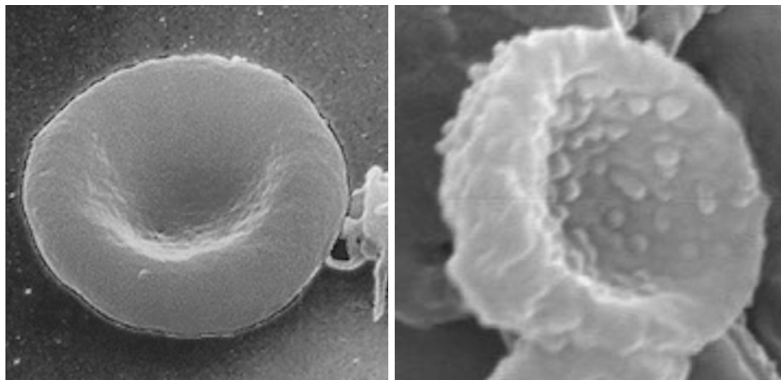


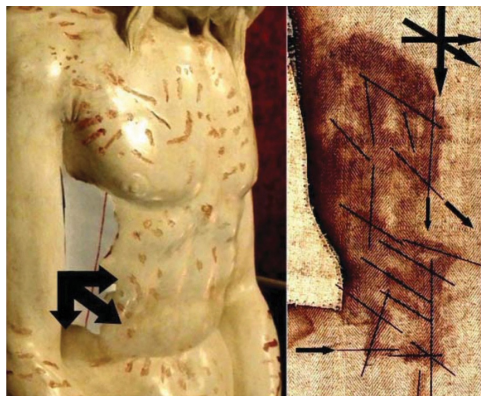
Figure 2. Left: SEM photograph of a red blood cell. Right: Type C blood particle believed to be a red blood cell. © Giulio Fanti.

Analysis of Observable Bloodstain Evidence

An examination of the bloodstains corresponding to the side wound on the frontal image of the Shroud (fig 3) shows that blood emanating from that wound had flowed across the body in three principal directions:

- vertically, consistent with the body having been in an upright position;
- 45 degrees from the vertical, and;
- horizontally, possibly the result of the body having been laid horizontally and resting on its side.

We know from gospel accounts of the crucifixion that Jesus' body was removed from the cross and taken to the sepulchre where it was hastily prepared for burial. It is possible that it would have been moved onto its side in the process of this preparation. It is therefore quite plausible that the movement of the body during transportation and burial preparation would have produced these three directions of blood flow.



An as yet unpublished study by Christian Privitera of the side wound bloodstains has also revealed the presence of an almost transparent substance in the gaps that are visible in the main side wound bloodstain. Researchers from the International Research Team of the *Centro Español de Sindonología* (EDICES) have found the same type of substance on the Sudarium of Oviedo and they believe that this could be fluid produced by a pulmonary oedema, which is an excessive accumulation of fluid in the lungs.

Figure 3: Three principal directions of blood flow from the wound in the side were detected. The white paper shown on the model of the body (left image) indicates the position of the large side wound bloodstain shown in the right image. © Giulio Fanti.

A colorimetric analysis of various points on a photo of this area of the Shroud fabric shows clear differences in the colour of the fabric (Fig 4). Points H-I-L-M-N-O correspond to bloodstained areas and are set well apart from points P-Q-R-S-T which relate to the fabric colour in areas where there are no bloodstains.

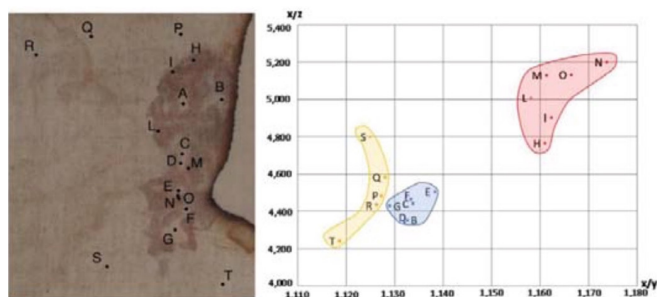


Figure 4: On the right, a colorimetric analysis of the points labelled in the photo of the side wound shown on the left. © Giulio Fanti.

Points B-C-D-E-F-G correspond to the gaps in between the bloodstained areas but the colorimetric analysis shows that the colour in these gaps is different to the background fabric colour. Clearly the fabric colour at these points has been altered by some virtually transparent substance, which supports the hypothesis that the discharge from the side wound contained both blood and a semi-transparent fluid produced by a pulmonary oedema.

Some of the bloodstains corresponding to the arms also have different observable characteristics and Figure 5 highlights three different types. The most prominent of these bloodstain marks are those indicated by the blue circles and these appear to be caused by blood leakage from the wounds, which occurred when the body was taken from the cross and moved to the tomb.

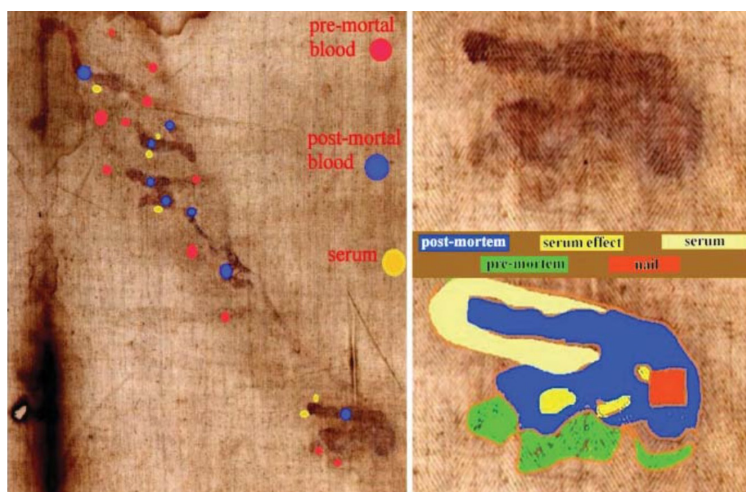


Figure 5: To the left is Giulio Fanti's proposed classification of bloodstain types visible on the left arm of the body image. To the right is a detailed characterisation of the different bloodstains in the area of the wrist. © Giulio Fanti.

This post-mortem blood that seeped from wounds after death would still have been liquid when in contact with the fabric of the Shroud due to the presence of urea in the bloodstream. This suggests that this post-mortem blood can be identified as Type A blood. The type A blood may also have been in contact with fluids rich in oils, aloe and myrrh that could have been applied to the body during its burial.

There are also a number of less prominent marks on Figure 5 which are indicated by red circles and these appear to be bloodstains produced by pre-mortem bleeding, which would have occurred when Jesus was still nailed to the cross. The pre-mortem blood would have clotted and dried but in the humid environment of the tomb, the blood clots could redissolve through fibrinolysis, creating less notable bloodstain markings when in contact with the Shroud. The yellow circles indicate areas which fluoresce under ultra-violet light and these show the stains left by blood serum.

The image to the right of figure 5 shows the stains produced by post-mortem blood and serum emanating from the nail-wound in the wrist.

Summary and Conclusions

According to Giulio Fanti, the remarkable evidence revealed by the microscopic examination of the blood on the Shroud, combined with gospel descriptions of the Passion and Crucifixion, makes it possible to produce a hypothesis of the physical condition of Jesus shortly before his death.

The microscopic examination of Type A blood samples revealed unusually small red blood cells and Fanti's laboratory experiments have shown that red blood cells shrink in size when exposed to a solution of urea. Creatinine was also detected in those Type A samples. The presence of both urea and creatinine in the bloodstream indicates that the body was suffering from a severe kidney malfunction shortly before death, which is a likely consequence of the severe, brutal punishment inflicted in the area of the kidneys during scourging.

The severe scourging would have caused various haemorrhages which would have led to a significant loss of blood and other body fluids. The shrunken red blood cells would have a significantly reduced capacity for moving oxygen from the lungs to the cells of the body and this, combined with the reduced volume of blood circulating in the body, would have forced Jesus to breathe more rapidly and with great difficulty. It also would have caused a significant increase in the heart rate as the heart tried in vain to pump sufficient oxygen around the body, before eventually suffering heart failure.

The process of removing the body of Jesus from the cross and transporting it to the tomb would have caused post-mortem blood to leak from the major wounds. The increased levels of urea in the bloodstream would have prevented the clotting of this blood. This lack of clotting would cause a relatively high level of blood to seep from these wounds. It would also account for this post-mortem blood remaining in liquid form when coming into contact with the Shroud, producing the more prominent bloodstain markings.

During the burial in the tomb, oily substances containing aloe and myrrh which could have been applied to the body of Jesus would have contributed to the shrinkage of the red blood cells in the post-mortem, Type A blood. It may also account for the possible presence of uncoagulated red blood cells found in Type C blood samples taken from the area of the Shroud corresponding to the face.

Finally, the Gospel of John, 19:34, states that “..*there came out blood and water*” and there is evidence on the Shroud of an almost transparent substance adjacent to the bloodstains. This would not only be serum but would probably have included fluid that had accumulated in the lungs from a pulmonary oedema.

The results of this research provide a great deal of new information about the physical injuries and severe trauma endured by the body that was wrapped in the Shroud, all of which are entirely consistent with the description of the torture suffered by Jesus as described in gospel accounts of the Passion and Crucifixion.



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