

Comparison of washing powders: blood on clothes



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Within violent crimes, evidence needs to be gathered to provide expert witness testimony often when the perpetrator may have tried to conceal or remove evidence. The aim of this project is to investigate whether blood would be present after laundering blood soaked clothing. The materials used for this project are man-made e. g. polyester and nylon, and also natural fibres including cotton and silk. Blood will be placed on each sample of the materials and then the blood will be left to dry on the materials for varied time lengths e. g. wet blood, blood left to dry for three days and blood left to dry for one week. For this experiment two different detergents are being used, Persil™ non biological and Ariel™ biological, these were selected as they are popular brands of washing powder and also to determine whether there would be a difference with a non biological and biological powder. Each of the materials will be washed at a low temperature of 40°C and debating what the results of this would be the second sample of materials where then to be washed at 60°C. The materials will be left to air dry and then the presence of blood will be detected visually and also using the (Leucomalachite Green (LMG) presumptive blood test). At the time of writing this the research is still ongoing and whether or not blood stains will be successfully removed during the laundering process investigated here, has yet to be determined.

Chapter 1: Introduction

What is crime?

A crime is when rules or laws which are in place are broken; it can also be used to describe a conviction.

When a crime has been committed or more importantly an assault or murder, the assailant would leave the scene with traces of the victims DNA on items of clothing and also the victim would have some type of trace evidence from the assailant, this is based on Locards Law on trace evidence. DNA contains all the information which makes us who we are, it is found in the nucleus of cells and also the mitochondria, however with the exception of certain specialised cells which lack these organelles, such as mature red blood cells, every cell in the human body contains DNA which is unique to an individual however identical twins have the same DNA. A crime scene examiner will come across many types of body fluids at a scene of crime e. g. blood, saliva, sputum etc. It is important to establish what the nature of the fluid is however the assailant will almost certainly try to rid of the evidence either by destroying the clothes or by washing them. Forensic scientists can perform a test on clothes that have an apparent blood staining present.

1. 2 The composition of blood

Blood is a liquid which contains cells, so is therefore known as a liquid tissue.

Blood is made up of platelets, these are fragments of cells, and if someone has an open bleeding wound the platelets gather at the wound and clot together this is done when the platelets are exposed to the air. If a person has a low platelet level they would be more prone to bleeding and bruising. The body has more platelets in a drop of blood than white blood cells but fewer than red ones. They are formed in the bone marrow and have a life span of five to eight days.

The plasma is the liquid, this carries important substances around the body and makes up approximately 55% of the total blood volume, it is mostly water approximately 90% by volume and contains thousands of different substances, including proteins, glucose, antibodies mineral ions, hormones and waste. It is because of the plasma that blood flows freely and distributing materials to all of the body for nourishment and protection.

The red blood cells continually travel through the body delivering oxygen and removing waste, the body would die without this. Red blood cells are also important in the transport of carbon dioxide, the gas that is produced by the breakdown of nutrients. The red colour comes from the haemoglobin which contains iron. The redness of any blood sample depends on the amount of oxygen it is carrying.

White blood cells are used to fight infection in the body, and are part of the body's defence system. If a person has a very high white blood count this can show infection and certain leukaemia etc. White blood cells have different ways of fighting infection, some by producing antibodies and others to surround the germ and devour the bacteria. The white blood cells are where the DNA is as it contains a nucleus whereas the red blood cell does not. The life span of white blood cells depends on the different challenges it encounters as they travel through the blood stream to the areas they are needed.

1. 3 Blood Grouping

Blood groups are determined by the protein antigen, human blood is classified in four types: A, B, AB, and O. if you have blood group A then you

have the A antigen and the same goes if you have group B, you have the B antigen, if you are AB then your blood carries both antigens, if you are group O then you have neither A or B antigen, it can make up anti A and anti B antibodies if they are exposed to these antigens. This blood is known as universal so can be donated to either group A or B. Another blood group is the RhD factor which if a person has Rhesus positive then their blood has the D antigen if a person has Rhesus negative blood then the D antigen is missing.

1. 4 Different methods to identify Blood

There are several presumptive tests available to identify blood; polilight is a versatile light source which contains a range of wavelengths which can even show blood staining which has been painted over. The use of the light must be used with caution as some ultra violet wavelengths can damage DNA evidence. Similar products to the polilight are the crime-light A crime scene investigator would normally use Luminol at first instance at a scene, it is said to be the most sensitive of the presumptive tests. LMG (leuco-malachite green) is also a popular presumptive test for blood and is also the choice for this research, the test will only show that the sample is blood, but it cannot show whether it is human (Virkler, 2009).

This research was done to find if the same test could be conducted with the same results for clothes that have been laundered to try to locate any traces of blood (DNA) the test that can be used is called a presumptive test utilising LMG (leuco-malachite green) this test is completed using a small filter paper folded into a triangle it is the point of the triangle which has been rubbed across the apparent blood stain, the filter paper is then opened and a drop of <https://assignbuster.com/comparison-of-washing-powders-blood-on-clothes/>

LMG with a drop of Hydrogen peroxide, if there is blood present then the paper will turn green, this type of application is called non destructive to the stain. LMG can be applied directly to the material but this can cause disadvantages such as, not too useful on dark or light coloured backgrounds because the colour changes are masked, and the solutions can interfere with some of the subsequent tests such as species tests and typing and due to this application of the test is classed as destructive, however the test is cheap, quick and simple with the colour change being immediate. False positives can and may happen (Cox, 1991). This can come from plant enzymes, egg and other protein food types. Presumptive tests are based on the principle that they react to the haemoglobin or more so the heme of the haemoglobin no other material except blood contains haemoglobin , so if haemoglobin is present then it is safe to say that the material is blood. However it cannot detect whether the blood is human or animal, further tests would have to be completed to discover its origin. (Deforest et al 1983).

Calaytic colour tests LMG KM benzidene how done specificity

Chemiluminescent tests (will include luminol and Blue Star and an explanation that these will be used where we believe things have been washed

Fluorescence tests e. g. fluorescene

Aim

You will also need a separate section for your project aim to define exactly what you are going to do.

The presumptive tests are very sensitive, they can detect 1 part blood in 1 million parts water. Matsuda et al., (2004) described a highly specific PCR-based protocol that uses primers for the human mitochondrial cytochrome b gene. They state that following the agarose electrophoresis step of the PCR process, human DNA produces a single band whilst blood from other vertebrates fails to produce any bands at all.

The amount of blood on a suspects clothing can help determine their involvement in the crime and place them at the scene, the direction and amount of blood spatter can also show how near to the victim and can also show what type of weapons where used. (Eliopoulos L. N. 2003).

Due to the Human Tissue Act 2004 the researcher was unable to utilise human blood for this experiment however for the purpose of this research horse blood was used. The Human Tissue Act came into place to regulate the removal, storage, use and the disposal of human tissue.

The researcher decided to utilise different washing powders to see if a variation could be established in the removal of blood. Stains are made up of different types of molecules, a range of enzymes are needed to break these down, proteins are broken down by proteases, this would include egg, blood and other protein stains. Starches are broken down by Amylases, grease and oils are broken down by lipases. Enzymes are biological molecules that speed up chemical reaction; they only work on particular molecules.

Biological washing power contains the enzymes for the removal of stains, however washing powders usually only contain one enzyme but some

powders can contain all three. Whereas no enzymes are included in the non biological powder, this can potentially make stain removal more difficult.

Literature Review

To help with this research project of The Persistence of Blood after Domestic Washing the researcher used various sources of information of what had been studied previously on this topic area. The main sources of information that have been used for the completion of this research project are quantitative data from educational books and journals.

There are many different sources of evidence within a crime scene, and either one could potentially help solve a criminal case. It has been long realised that examples of evidence has been popularised in the well known tales of Sherlock Holmes the fictional detective forensic scientist. The creator Sir Arthur Conan Doyle was ahead of his time in having an uncannily clear understanding of the basic principles of modern forensic science and the value of the potential physical evidence.

The first non fictional forensic scientist to articulate a rational basis for transfer evidence occurrence was Edmond Locard, The Locard Exchange Principle, as it is now called states that any time there is contact between two surfaces, there will be a mutual exchange of matter across the contact boundary, however Paul L. Kirk advanced on this principle, he said, 'it is virtually impossible for a criminal to commit a crime without leaving evidence behind and carrying evidence away with him.'(De Forest et al 1983, p. 149)

(De Forest et al 1983, p. 184) states that clothing is one of the main sources of and receivers of trace evidence, it is important that clothing that has been worn by the victim and the suspect at the time of the crime should be examined.

For this experiment the researcher wanted to test different washing powders e. g. biological and non biological and also to leave clothes soak in blood for several minutes in bleach to discover if the blood could still be located, however (Eloisa et al 2009) discovered that using bleach on the materials they had used e. g. cotton and synthetic materials, that there was no trace of any blood.

Aim

The aim of this research was to find whether blood left to soak on materials would be retained on various fabrics after washing at varying temperatures 40 °C V's 60°C and also utilising different brand of washing powder, biological and non biological. The blood will be left on the materials for different times e. g. wet versus dry blood. After laundering the clothes they will be air dried and a presumptive test will be carried out utilising LMG (Leucomalachite Green) to try to discover if any blood remains either visually or by using the presumptive test.

Safety Rules

Laboratory coat and safety glasses to be worn at all times, gloves doubled must be worn when handling blood. Work must be completed in the fume cupboard and away from sources of ignition. All labels should be read and considered before using any substances.

All blood waste is to be disposed of in either the disinfectant chlorox or autoclave bag.

Hazards

The primary risks come from the blood, however human blood could not be used for this experiment as it was against the human tissue Act 2004. For this experiment horse blood was utilised, as animals have similar set of cell types red and white blood cells and proteins. Another hazard can come from the use of hydrogen peroxide solution, which can cause burns.

Method

Various materials were used for the experiment, natural fibres such as cotton and silk and manmade fibres such as nylon and polyester. This was to find whether there would be a difference in the blood remaining on the clothes. The material was cut into small squares, and using a 1ml pipette blood was placed on the materials, these were left for varying times, 10 minutes, so that the blood was still fresh and wet, one day so that the blood had time to soak into the material and some materials left to dry for a week. When the blood was placed on the garments the researcher assumed that the blood would instantly soak in to all of the materials, however the researcher found that the blood placed on the manmade fibres, e. g. the polyester and viscose the blood sat on top of the materials for approximately 10 minutes before any actual soaking could be seen. However with the natural fibres e. g. the cotton and silk the blood started to soak into the materials almost immediately. The garments were then left to dry naturally in a laboratory fume cupboard prior to washing.

The materials were then taken to the washing machines to wash the items at low temperature 40°C firstly using Ariel™ biological washing powder, the clothes were then left to dry. The experiment was then repeated with the washing machine set as before however the researcher utilised Persil™ non biological washing powder.

Biological washing powder at 40° on clothes laundered after 10 minutes.

Denim

Silk

Cotton

Polyester

Wool

Biological washing powder at 40° on clothes laundered after 1 day.

Denim

Silk

Cotton

Polyester

Wool

Biological washing powder at 40° on clothes laundered after 1 week.

Denim

Silk

Cotton

Polyester

Wool

Non Biological washing powder at 40° on clothes laundered after 10 minutes.

Denim

Silk

Cotton

Polyester

Wool

Non Biological washing powder at 40° on clothes laundered after 1 day.

Denim

Silk

Cotton

Polyester

Wool

Non Biological washing powder at 40° on clothes laundered after 1 week.

Denim

Silk

Cotton

Polyester

Wool

Results

The researcher conducted a visual of the laundered materials to see if the use of different washing powders helped with the removal of stains. We found that the Persil™ non biological washing powder had more of a desired effect on the process of removing the stain in both the manmade and natural fibres; however stains retained more on the cotton fibres. The Ariel™ biological powder which also included the stain removal Actilift had shown to have a very disappointing removal of the blood stain the natural fibres, however in the polyester material after laundering, at the site of where the blood was placed a white residue remained on the material.

Even though for this experiment DNA was not extracted from the materials which had a positive testing for blood, the evidence of blood after laundering show a potential that DNA could possibly be extracted for possible suspect match, this then could be checked on the NDNAD® (The National DNA Database) for a potential match. The NDNAD was established in April 1995 and is run by the FSS (Forensic Science Services). Governed by a combination of the Home Office, the Association of Chief Police Officers and the Association of Police Authorities the NDND in 2007 contained over 4
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million profiles; this number represents roughly 6% of the United Kingdom population. In England and Wales the police can routinely take DNA samples from anyone who has been arrested for committing a recordable offence, if found guilty a prison sentence can be imposed.

Refs

<http://www.biotechlearn.org>.

[nz/themes/biotech_at_home/enzymes_in_washing_powers](http://www.biotechlearn.org/nz/themes/biotech_at_home/enzymes_in_washing_powers)

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