
Purpose

To explore the use of forensic techniques in an applied context.

Body discovered

A body has been discovered at a house in Redhill, Surrey. The body was found outside, near the house, and the immediate cause of death was thought to be a stab wound to the abdomen. From the state of decomposition of the body it would appear the victim had been dead for at least a week when discovered.

Experts investigate

The crime is investigated by various forensic 'experts'.

Forensic pathologist

A body was discovered at a house in Redhill, Surrey on May 11 2009. The body was found outside, near the house, and the immediate cause of death was thought to be a stab wound to the abdomen. From the state of decomposition of the body it would appear the victim had been dead for at least a week when discovered. As the forensic pathologist on the crime investigation team you need to present evidence for the cause of death of the deceased. You will need to summarise the relevant findings and conclusions from your work.

You have the following to use to construct your evidence for cause of death:

Autopsy report

Blood test report from the toxicology lab.

Forensic entomology report

Scene of Crime Officer (SOCO)

Your work is mainly conducted at the scene of the crime.

You will need to summarise the relevant findings and conclusions from your work.

You are the Scene of Crime Officer for a murder at a house in Redhill, Surrey. The body was found outside, near the house on May 11 2009. The immediate cause of death was thought to be a stab wound to the abdomen. From the state of decomposition of the body it would appear the victim had been dead for at least a week when discovered. As the SOCO for this case you need to present a report at the crime investigation meeting detailing the evidence collected at the crime scene.

Crime Investigation Officer

The investigating officer you must chair the crime investigation meeting. You should ask for reports from the forensic experts:

Scene of Crime Officer (SOCO)

Forensic pathologist

Entomologists

Fingerprinting experts.

You will need to consider all of the information to determine the possible course of events that led to the death, and make a decision as a team about the course of action to be taken. Do you have a good case to present to the Crown Prosecution Service? Should you arrest anyone on suspicion of murder?

Autopsy report

Autopsy on:	Mr Patrick Barrett-Hughes
Date of birth:	16/06/75
Address:	Greyfriars, Whitepost Hill, Redhill, Surrey
Date of death:	Unknown
Date autopsy:	13/05/09
PM done by:	Dr U.C. D'Eath
Cause of death:	Ruptured spleen and blood loss from abdominal stab wound.

HISTORY

Body was found on May 11 2009 at home address, outside, near a garage block.

EXTERNAL EXAMINATION

Body bloated and discoloured green/black over most of the surface. It is estimated 1 week to 10 days must have elapsed since death. Abrasions and small cuts were present on face and knuckles of right hand. There was a stab wound to upper left abdomen, which had bled profusely internally and externally. Bleeding shows that death took place up to 30 minutes after the stabbing.

Weight: 98.3 kg

Height: 184 cm

INTERNAL EXAMINATION

Central nervous system:

Scalp	Normal
Skull	Normal
Meninges	Normal
Middle ears	Not examined
Dural sinuses	Normal
Vessels at base of brain	Normal
Brain	Normal
Spinal cord	Not examined

Respiratory system:

Hyoid bone and larynx	Normal
Trachea and main bronchi	Normal
Pleural cavities	Normal
Lungs (left, right)	Both lungs were normal
Diaphragm	Normal

Cardiovascular system:

Pericardial sac	Normal
Heart	Normal
Aorta and arteries	The aorta, innominate artery, carotid arteries and renal arteries contained some atheroma. The pulmonary arteries were normal.
Venae cavae and veins	Normal

Gastrointestinal system:

Mouth, tongue, pharynx	Normal
Oesophagus	Normal
Stomach	The stomach contained a small quantity of clear liquid. The mucosa was normal.
Duodenum	Normal
Small intestine	Normal
Large intestine	Normal
Appendix	Normal
Rectum	Normal
Liver	The liver tissue was normal. The capsule was intact.
Gall bladder and biliary tree	Normal
Pancreas	Normal
Peritoneal cavity	Normal

Genito-urinary system:

Kidneys	The renal capsules stripped easily to reveal normal renal surfaces. The renal cortex, medulla, calyces and pelvis of both kidneys were normal.
Ureters	Normal
Bladder	Normal
Prostate gland	Normal
Testes	Normal

Reticuloendothelial system:

Spleen Ruptured capsule,
resulting in extensive internal bleeding
Lymph nodes Normal
Thymus gland Normal fatty change

Endocrine system:

Thyroid gland Normal
Parathyroid glands Normal
Adrenal glands Normal
Pituitary Not examined

Musculoskeletal system:

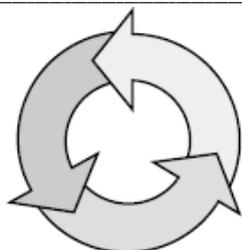
The spinal column, ribs and pelvis were intact.

Specimens retained:

Blood sample.

Comment:

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Dr U.C. D'Eath BMEDSCI, MB ChB
Forensic Pathologist

Blood test report from the toxicology lab

Working for all

Redhill and South Laboratory
Toxicology Report
76 Wanefield Park Road
Redhill
Surrey

Enquiries concerning this report should be directed to:
Ms I.M. Analyst

Case name: Mr Patrick Barrett-Hughes **Report number:** 2009/1762

Age: 34 **Sex:** M **DoB:** 16/06/75

SAMPLES RECEIVED			TEST DONE	ANALYTICAL FINDINGS	
Lab No.	Date	Time	Type	Compound	Concentration
	14.5.09		Blood	Cocaine	Cocaine 0.6 mg l ⁻¹
			Urine	Drugs of abuse screen	Cocaine Detected Cocaine metabolite(s) Detected
			Blood	Cocaine metabolite	Benzoylcegonine >1000 µg l ⁻¹

INTERPRETATION

Following a recreational dose, blood cocaine concentrations are usually below 0.3 mg l⁻¹; concentrations above 1 mg l⁻¹ are often associated with serious toxicity. Benzoylcegonine (cocaine metabolite) was identified and quantified by immunoassay; concentrations above 500 µg l⁻¹ are indicative of recent exposure to a recreational dose of cocaine. Note that cocaine is unstable in blood. No other drugs of abuse detected in the samples analysed within analytical limits.

Forensic entomologist briefing document

A body has been discovered at a house in Redhill, Surrey. The body was found on May 11 2009 outside, near the house, and the immediate cause of death was thought to be a stab wound to the abdomen. From the state of decomposition of the body it would appear the victim had been dead for at least a week when discovered.

As the forensic entomologist on the crime investigation team you need to present evidence for the estimated time of death of the deceased.

You have also been given some maggots from a blood-stained shirt that was found at 35a Garlands Rd, but may be connected with the death. The shirt was found outside in the bin, wrapped in a plastic bag.

You have the following to use to construct your evidence for time of death:

Average temperature data for May 2009. The average temperature for the week before the body was found can be calculated from this.

Diagrams of some preserved maggots taken from the body at the crime scene.

Diagram showing length of *Calliphora vicina* with age for different temperatures.

Graphs showing emergence of adults from maggots from the body and from a bloodstained shirt that may be linked with the murder. The maggots have been incubated on liver until emergence of adults, so as to simulate the conditions where the dead body was found. The maggots were incubated at the average temperature for the week before the body was found.

You need to do the following:

Calculate the average temperature for the period 4–10 May, i.e. the period of a week before the body was found. Round up to the nearest whole °C. This is the temperature used to incubate maggots found on the body and shirt.

Measure the length of the maggots, and use the graph of length variation over time with temperature to estimate the age of the maggots. Use the average temperature you have calculated above and the line for the measured maggot length to read the age of the maggot from the x-axis.

Calculate the estimated date of death, using the time for a complete life cycle (as discovered from incubation of the second generation), and the dates of emergence of the first adults from each sample. The time between eggs being laid on the dead body and discovery of the body can be calculated using the formula:

$$\begin{array}{l} \text{time of discovery of} \\ \text{body after egg laying} \end{array} = (\text{time taken for complete life cycle}) - \begin{array}{l} \text{time taken for emergence of first adults from the} \\ \text{maggots found on the body} \end{array}$$

It is assumed that this gives an approximate estimate of time of discovery of the body after death. Does this agree with the estimated age of the maggots using their length?

You need to account for the difference in the apparent age of the maggots from the nostril and those from the body and shirt. Find out what factors can accelerate maggot development so that you can make suggestions. If you want to suggest any toxicology tests are performed on the body, ask the lab performing the autopsy to do this for you.

C. *vicina* complete life cycle determination

The adults emerging from the maggots found on the body and shirt were allowed to lay eggs on a fresh liver sample. The eggs were incubated in conditions to simulate the environment of the dead body to find the time required for a complete life cycle. The *C. vicina* second generation adults first started to emerge after exactly 28 days.

Table 1 Average temperature data for 2009.

Date in May		Average daily temperature/°C
Mon	1st	7.25
Tues	2nd	7.30
Wed	3rd	8.25
Thurs	4th	7.85
Fri	5th	5.30
Sat	6th	9.85
Sun	7th	12.2
Mon	8th	9.95
Tues	9th	10.80
Wed	10th	13.50
Thurs	11th	13.25
Fri	12th	13.00
Sat	13th	10.85

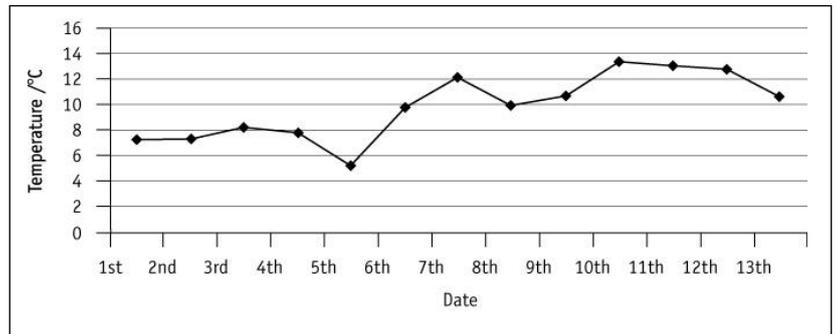


Figure 1 Average daily temperature: May 2009.

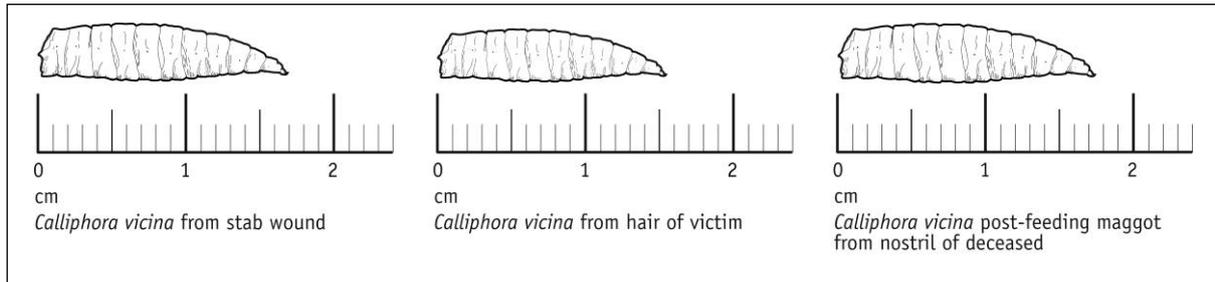


Figure 2 Length of maggots taken from body.

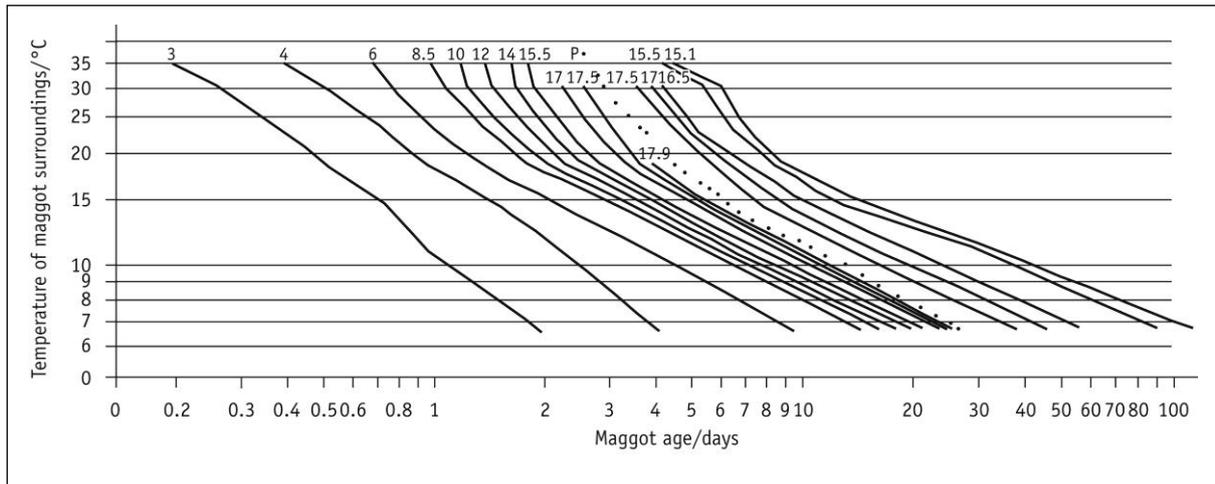


Figure 3 Diagram showing how length of *Calliphora vicina* varies with temperature over time. Each line is for a measured maggot length in mm. Lines to the right of the dots are lengths of post-feeding maggots.

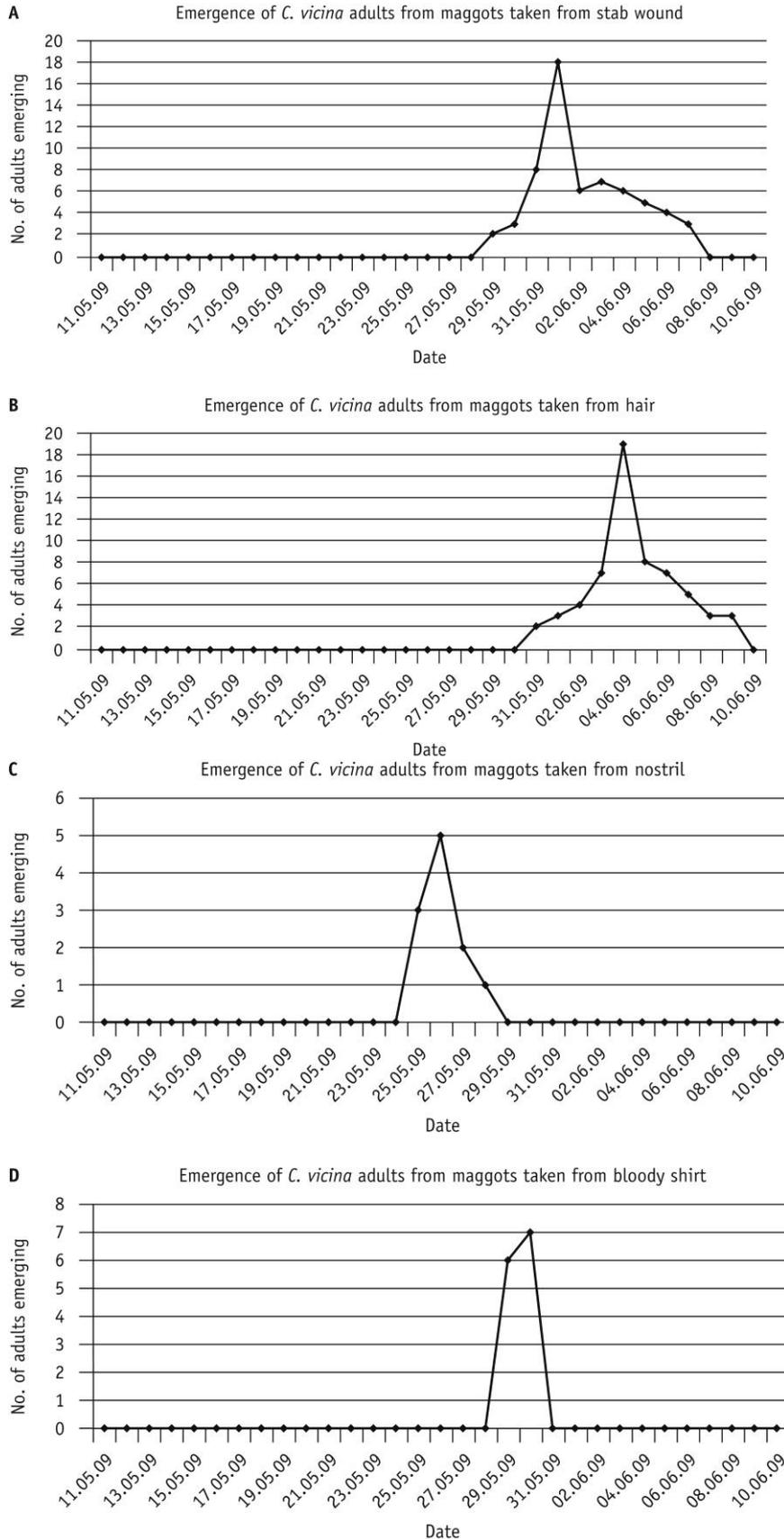


Figure 4 *Calliphora vicina* emergence data. The maggots from the body and blood-stained shirt were incubated on liver at the temperature calculated as the average for the period before the body was found. The graphs show the emergence of adults from the maggots.

Fingerprint expert briefing document

A body has been discovered at a house in Redhill, Surrey on May 11 2009. The body was found outside, near the house, and the immediate cause of death was thought to be a stab wound to the abdomen. From the state of decomposition of the body it would appear the victim had been dead for at least a week when discovered. As the fingerprint expert on the crime investigation team you need to present evidence matching either the deceased (Mr Patrick Barrett-Hughes) or the main suspect (Mr Anthony Gifford of 35a Garlands Rd) to other items from the crime scene.

You have a selection of fingerprints from the crime scene, along with 'ten print' fingerprint cards taken from Mr Patrick Barrett-Hughes, and the prints of Mr Anthony Gifford from the central records department.

Sixteen or more matching points should be found in order to confirm the match between a crime scene print and one of the people implicated in the crime, but fewer are accepted in court if the expert considers the features to provide sufficient evidence of a match.

You need to summarise any conclusions you come to about the fingerprints you have been given to match.

Matching fingerprints

The basic fingerprint patterns must first be matched and then the point details are identified.

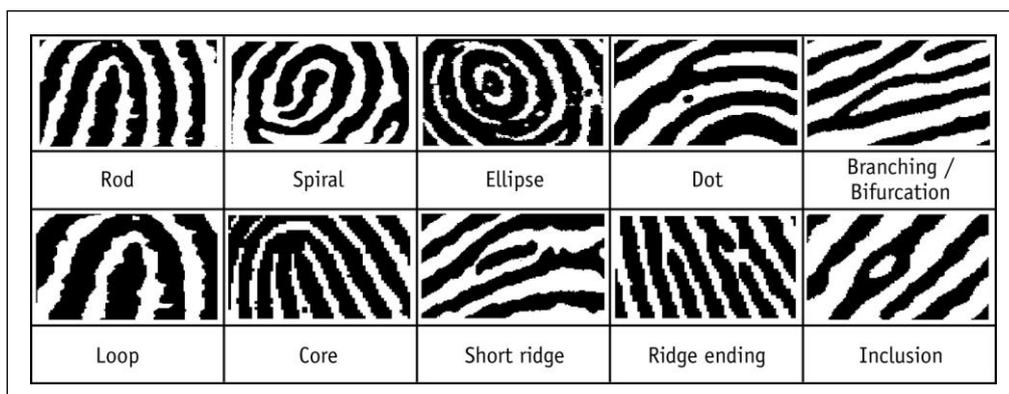


Figure 1 Fingerprint patterns.

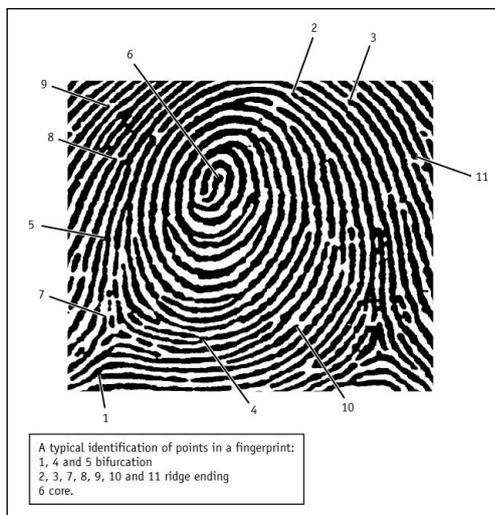


Figure 2 An example of eleven features to be used in point matching of this fingerprint.

Salters-Nuffield Advanced Biology Resources

Left hand: Mr Anthony Gifford



Little finger Ring finger Middle finger Index finger Thumb

Right hand Mr Anthony Gifford



Thumb Index finger Middle finger Ring finger Little finger

Left hand: Mr Patrick Barrett-Hughes



Little finger Ring finger Middle finger Index finger Thumb

Right hand: Mr Patrick Barrett-Hughes



Thumb Index finger Middle finger Ring finger Little finger

Prints from the money package found in Mr Patrick Barrett-Hughes jacket pocket. -



Print from the briefcase containing cocaine found at 35a. Garlands Road, Redhill.

