Vomit As A Forensic Evidence

Vomiting is the involuntary, forceful expulsion of the contents of one's stomach through the mouth and sometimes the nose. Emesis is the medical term for vomiting.

Receptors on the floor of the fourth ventricle of the brain represent a chemo-receptor trigger zone, known as the area postrema, stimulation of which can lead to vomiting. Vomiting after eating usually expels the contents of the stomach and therefore the undigested contents of the meal. Matter from the stomach that has come up into and may be ejected beyond the mouth, due to the act of vomiting is known as Vomitus.

FEATURES OF VOMITING

pH : the pH of the vomitus is almost always highly acidic.

Odour : foul smell

Colour : Sometimes the vomitus may be streaked in blood and be a red and brown colour. This is called blood vomiting or hematemesis.

Fresh blood in the vomit appears red and usually comes from the upper gastrointestinal tract.

Blood that comes from the lower gastrointestinal tract usually undergoes oxidation and may appear brown in color.

Clotted blood appears dark red in color and is usually seen when there is perforation of a peptic ulcer.

Contractions of the duodenum lead to the secretion of bile in the vomitus. This gives a greenish tinge to the vomit. Severe vomiting may often yield green coloured vomit, although a bile-containing vomitus may also be yellow in colour.

EXAMINATION OF VOMIT

For the examination of vomit, presence of the following materials are to be taken into account:

Presence of Mucus

Free HCl

Endothelial cells from gastric mucosa

Undigested and semi digested food material

Test for Mucus

To the extract add 33% acetic acid drop by drop.

Opalescence appears which may be due to mucus or lipoid substance or both.

If on addition of more acetic acid opalescent does not disappear, presence of mucus is confirmed, because with excess of acetic acid lipoid globulins dissolve but not the mucus.

B.**Test for Free HCl (Gunzberg's Test)**

The reagent is prepared by 6 drops of 10% phloroglucinol in alcohol with 3 drops 10% vanillin in alcohol.

In a porcelain evaporating dish one drop of suspected extract is placed and 1-2 drops of Gunzberg's reagent is mixed at once.

The contents are allowed to dry completely. A brilliant red colour indicates free HCl.

C.**Endothelial Cells**

After centrifuging the extract for 10 minutes a thin film is made on a slide. The Endothelial Cells are observed under microscope.

D. **Pepsin Assay Using a Fibrin Blue-Agarose Gel Plate**

The pepsin within the sample is assayed for its proteolytic activity which is revealed in a fibrin blue-agarose gel plate, as a result of an enzymatic reactivity that takes the form of a concentric, blue, translucent ring around the tested sample. Apart from being able to determine the pepsin content of fresh or recent forensic samples, this method has also achieved positive reactions in aged gastric fluid stains that were kept at room temperature. No body fluids other than the gastric fluid and no proteolytic enzymes other than pepsin show a positive reaction with the use of this method.

E. **ELISA Detection of Gastric Mucosa-Expressing Proteins**

Four gastric mucosa-expressing proteins, pepsinogen I (PGA), pepsinogen II (PGC), gastrin (GAST), and mucin 5AC (MUC5AC) are used to detect the presence of vomit. Enzyme-linked immunosorbent assay (ELISA) procedure is used for the detection of these four candidate proteins.

FORENSIC IMPORTANCE

The identification of vomit stains may be helpful for crime scene reconstruction. Vomitus can be found in the cases of poisoning or drug abuse,hanging or sexual abuse. The questioned sample could be tested

for the presence or absence of any particular drug or poison if administered. This evidence is very rarely found at the crime scene and is not much evidentiary.

Examination of Faecal Matter As A Forensic Evidence

Faecal matter (or faeces) are the solid or semisolid remains of food that could not be digested in the small intestine. Bacteria in the large intestine further break down the material.Feces contain a relatively small amount of metabolic waste products such an alter form of bilirubin by bacteria, and the dead epithelial cells from the lining of the gut.

Feces are discharged through the anus or cloaca during defecation. About 100 to 250 grams of feces are excreted by a human adult daily.

Odour : The distinctive odor of feces is due to sketole, and thiols. These compounds contains sulfur, amines and carboxylic acids. Sketole is produced from tryptophan.

Colour : The brown colour of feces is due to the action of bacteria on bilirubin, which is the end product of the breakdown of hemoglobin (red blood cells).

COMPOSITION OF FAECAL MATTER

75 % water

25 % solid matter

About 30 % of the solid matter is of dead bacteria

About 30 % consists of indigestible food matter such as cellulose

10 to 20 % is cholesterol and other fats

10 to 20 % is inorganic substances such as calcium phosphate and iron phosphate

2 to 3 % is protein.

Cell debris shed from the mucous membrane of the intestinal tract also passes in the waste material, so as bile pigments (bilirubin) and also dead leukocytes (white blood cells).

EXAMINATION OF FAECAL MATTER

A. Physical Appearance

Colour : Faecal Matter is generally brown in colour due to urobilinogen, in infants it is yellow due to unchanged bilirubin and milk diet.

Abnormal Color – Yellow, green, blood streak, bright red, black

Odour: Aromatic due to indole and sketole.

Increased odour – Excessive Protein Ingestion.

Rancid – Milk indigestion commonly seen in infants and adults, normal in infants

Putrid – Severe diarrhea

B.**Microscopic Examination**

Suspected stains are softened with distilled water, for about half an hour. A small amount of scraping from the stain is transferred on to a microscopic glass slide and a drop of Lugol's iodine is added to it. The material is then covered with a cover slip and examined under microscope for the detection of undigested food particles, vegetable residues and muscle fibres.

Urobilinogen Test

Urobilinogen is formed in the intestine by reduction of bilirubin. Urobilinogen is oxidized to Urobilin, which is soluble in alcohol. This test relies on the formation of a green fluorescent zinc-urobilin complex formed in the presence of neutral alcohol zinc salt.

Reagent preparation:

Solution 1:

40% Alcoholic Mercuric chloride solution

Mercuric chloride 4 g

Methanol – 10 ml

Mix and store in stoppered bottle.

Solution 2:

40% Alcoholic Zinc chloride solution

Zinc chloride 4 g

Methanol 10 ml

Mix and store in stoppered bottle.

Solution 3:

Amyl alcohol

Procedure

A portion of the suspected stains is extracted with a little amount of distilled water.

Add 2-3 drops of solution 1.

Now add 2-3 drops of solution 3 and shake it thoroughly.

The supernatant alcohol layer is pipette off in another tube and in then 2-3 drops of solution 2 is added to it.

Under UV light rose pink colouration with beautiful green fluorescence is observed, that indicates the presence of bilirubin.

Standards and controls

A known fecal stain stained and unstained control should be tested each time the testing is performed. Use distilled water as a negative control.

D. **Identification of feces by detection of Bacteroides genes**

Detection of Bacteroides uniformis, B. vulgatus and B. thetaiotaomicron is aimed by real-time PCR using a gene sequence specific to these bacteria as it is present in abundant quantity in faeces.

FORENSIC SIGNIFICANCE OF FAECAL MATTER

The identification of feces is important evidence in particular crimes, including illegal fly tipping, harassment and sexual assault (particularly in cases of anal sexual assault); a trace of feces derived from the victim on the surface of a condom left at the crime scene can be crucial.

The identification of faecal deposits on clothing occurs frequently in cases involving homosexuality or homosexual assaults. It may also be present at the crime scene because abnormal mental abberration of the perpetrator or simply because of nervousness or natural desire.

If the fecal matter is already present in the crime scene then there is a possibility of transfer of fecal matter through the footwear or even on the garments of the suspect.

In sodomy and bestiality fecal matter as evidence may be found on penile swab as well as in the garments.

Fecal matter also plays a vital role in examination of the drug dependency nature of the suspect. It has also been observed that the color of fecal matter becomes green, black and red due to consumption of various drugs. It can also be used for the purpose of grouping of blood and hence it can help in person's individualization as well.

Sweat As A Biological Evidence

Sweat is a fluid secreted by the sweat glands also called sudoriferous glands. The process of production of sweat is called sweating or perspiration. Sweat glands are the exocrine glands which secretes their production onto epithelial cells by the specific ducts. There are two types of sweat glands :

Apocrine glands – they are mostly present at the armpit area, and genital areas.

Eccrine glands – these glands cover the major surface area of the body. They are present most in the soles and palms then, the head and least in the trunk region.

These two types of gland differ in a number of ways, from distribution and structure, to their excretory mechanism and secretory product .

COMPOSITION OF SWEAT

Majorly water

Trace amounts of lactic acid, minerals and urea.

Mineral contents:

Sodium (0.9 gram/liter)

Potassium (0.2 g/ liter)

Calcium (0.015 g/ liter)

Magnesium (0.0013 g/ liter)

Zinc (0.4 milligrams/liter)

Copper (0.3–0.8 mg/ liter)

Iron (1 mg/ liter)

Chromium (0.1 mg/ liter)

Nickel (0.05 mg/ liter)

Lead (0.05 mg/ liter)

EXAMINATION OF SWEAT

Sweat is one of the biological fluid which exhibits the blood group substances if the person is a secretor, therefore, the analysis of blood group can be done by examination of sweat. Sweat from secretor individual will contain the Antigens A, B, and H.

Odour – A small bit from the suspected sample is taken and heated . The specific odour that comes out is taken note of.

Gee's urea nitrate test – The sweat bearing areas are first examined for the presence of urea by the Gee's urea nitrate test. If the positive result is found then it is subjected to absorption inhibition, absorption elution or mixed agglutination test for the identification of blood grouping antigens in them.

Procedure

Stained material is extracted with acetone.

Now, the acetone extract is set to evaporate to make it more concentrated.

The residue is mixed with acetone solution in a test tube and mixed with glass rod.

A slide is prepared with the drop of solution. Cover it with the cover slips and prevent overflowing.

Leave it for few seconds.

Observe the slide under the microscope.

Observations: The crystals appear will have following characterisitics: long, colourless, rhombic shaped.

FORENSIC IMPORTANCE OF SWEAT

An average square inch of skin contains 650 sweat glands. That means our bodies leave small amounts of sweat on everything we touch — whether we're making a phone call, eating supper or committing a crime. Sweat stains become an important biological evidence in cases like kidnapping, sexual assault etc. It can also be present on any kind clothing or on victim's clothing which can relate us to suspect. It can also be present on surfaces / objects touched by victim or suspect.

Sweat can be analysed for determining ethanol, drugs, ions and metals.