Bloodstain Pattern Analysis

Fly Artifacts, Bug Artifacts, and Related Patterns

Copyright: Larry Barksdale, March 14, 2002, Lincoln, Nebraska
Blood As Evidence - Tradition

- Used to establish identity.
- Used to establish spatial relationships.
- Used to determine probable origin of injury.
- Used to establish logical relationships between actors, events, and evidence.
- Used to corroborate narratives and other physical evidence.
- Used as data for the acceptance or refutation of an explanation of an investigative event.
Bloodstain Pattern Analysis – Basic Tenets

- Certain patterns are recognizable through comparison to known standards.
- Directionality, Angle of Impact, and Origin can be determined using acceptable scientific methods.
- The truth value of an assertion containing pattern recognition and/or origin is possible within an acceptable degree of scientific certainty.
Issues Involving Fly and Other Artifacts.

- Pattern recognition.
- Directionality and Angle of Impact.
- Mechanisms for production of fly and bug artifacts.
- Spatial relationships.
- Time.
- Environment.
Bloodstain Pattern – High Range Energy

- Consistent with gunshot or similar high energy mechanism.
- Small round patterns with many less than 1mm in diameter.
- Misting.
- Directionality, Angles of Impact, Origin.
- Void area.
- Positive presumptive test for blood.
Bloodstain Pattern – High Range Energy

- Mixture of large masses, medium round patterns, and small patterns.
- Possible tissue and hair remains.
- Logical spatial relationship to source.

Scene – 12 gauge shotgun
Bloodstain Pattern – Mid Range Energy

- Predominance of round stains and/or stains consistent with cast off behavior.
- Predominance of round stains larger than 1mm diameter.
- For expired blood, look for blood around mouth, nose, and on clothing of the victim.

Scene – expired blood
Bloodstain Pattern – Fly Artifacts

- Multiple small round patterns.
- Logical spatial relationship
- Absence of any indication of directionality or angle of impact other than ninety degrees.
- Absence of misting.
- Absence of tissue or hair.
- No identifiable void area.
- Absence of stains consistent with cast off behavior.

Scene – Victim directly below with multiple gunshot wounds to head & body.
Comparison of Patterns - Scenes

Bomb detonated in hand.

Victim blood expired on suspect shirt.
Fly Artifacts From the Lab
Fly Artifacts From the Lab
Fly Artifacts From the Scene

Photo: Courtesy of Dr. Mark Benecke (victim deceased undiscovered for one year)
Fly Artifacts From the Scene
Fly Artifact: Differentiation of Round Stains.

- Flies **Do** produce rounds stains less than 1mm diameter.
- Fly Artifact round stains do not necessarily have a crater appearance.
- Fly artifact stains are not necessarily beige or lighter in color than human bloodstains.
- Fly Artifact stains will test positive for presumptive blood.
- Fly Artifact round stains look exactly like mid-range energy (medium velocity) to high-range energy (high velocity) human bloodstains.
Fly Artifact: Differentiation of Round Stains.

- Logical relationship of stains to the scene (i.e., evidence of decomposition, flies present, maggots present).
- Logical relationship of stains to events (i.e., nature of wounds to the victim, stains in areas not related to investigative events).
- Fly Artifacts may be near windows, on glass, in upper ceiling areas, on paper, etc. They do not have to be in lighted areas!
- Absence of large masses, hair, & tissue within round stain concentration.

Scene: Victim deceased in enclosed area for extended time in 90 degree weather.
Bloodstain Pattern – Directionality

- A round stain indicates direction of travel (directionality) perpendicular to the surface of record.
- The regularity of the edges of a round stain is a function of target surface structure.
- The size of a round stain is a function of volume and distance.
Bloodstain Pattern – Directionality

- Round stains indicate a perpendicular direction of travel.
- Round stains indicate an angle of impact of ninety degrees.
- Uneven target surface structure produces uneven edges on blood stains.
Bloodstain Pattern - Directionality

- Blood into blood can produce small satellite spatters around the parent spatter.
- Large volumes or impacts may produce significant radial formations.
Bloodstain Patterns - Directionality

- The “tail” of a bloodstain with a tail points in the direction of travel of the bloodstain.
- The origin of the blood for the respective bloodstain is opposite the direction of travel.
- The angle of impact can be determined using the sine method ($w/|l|=\sin$).
Bloodstain Patterns - Directionality

- A line drawn through the center of the long axis of the bloodstain pattern defines the two dimensional trajectory of the respective blood spatter.
- Convergence of lines indicate the two dimensional origin (point/area) of the blood spatters.
- The third dimension of origin can be determined using the tangent method \((\tan = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b})\).

Scene: Assault with knife

Scene: Shooting
Fly Artifacts - Directionality

- Fly artifacts can have the “teardrop” shape associated with a human bloodstain.
- A fly artifact may appear to be similar to a wave cast-off bloodstain pattern.

Scene: Wall next to victim of double homicide
Fly Artifacts - Directionality

- Notice the similarity to projected and/or cast off human bloodstain patterns.
- Notice the randomness of directionality that would indicate a non-existent point of origin.
Distinguishing Fly Artifacts From Human Bloodstains

- Are any of the geometrical patterns similar to the “snake”, “tadpole”, “double wave”, or “sperm cell” standards?
- Is there a lack of directionality that would indicate a logical convergence?
- In any teardrop pattern, is the ratio of the length of the tail divided by the length of the body greater than one (Ltl/Lbd>1).
- In round stains, is there absence of hair, tissue, larger mass, or absence of misting?
- If a rough surface structure, is there a noticeable lack of spiny edges on round stains?
- Is there a noticeable lack of deviation.
- Are there noticeable beige colored stains?
- Do the teardrop stains show a lack of runoff (gravitational flow)?
- Are there stains in logical areas associated with the standard areas of expected fly artifacts?
Bug Artifacts

- Not only are flies, maggots, and pupae possibly present at a death scene, but there may be beetles and a community of insects.\(^5\)
- All of these may leave signs at the scene.
- Effects may be present indoors or outdoors.
- The brown area in the photo to the right is beetle artifact.

Photo: Courtesy of Dr. Mark Benecke
Bug Impacts on Vehicles

- The impact of bugs on vehicles can produce geometric patterns similar to human bloodstain patterns.
- Due to the morphology of a bug spatter, human blood may flow around a bug spatter.
- Bug spatters may become relevant during motor vehicle accident investigations as well as other crimes.
Bug Artifact on Vehicle Hood

Bug Artifact

Scene: Felony assault by beating & kicking.

Tuesday, January 8, 13
How Do They Do It?

- Impact spatters obviously come about from the contact of a bug or insect with a surface area.
- Fly artifacts may be left due to regurgitation or defecation.\(^6\)
- Fly artifacts may be as a result of regurgitation or tracking.\(^7\)
- Fly artifacts may be as a result of projection, transfer (tracking), regurgitation, and defecation.\(^8\)
- Beetles and insects may leave artifacts due to defecation and tracking.
- **Caution: The published literature has yet to definitively establish the mechanism of production of fly and bug artifacts.**
A Side By Side Comparison

Human

Artifacts
Fly Artifacts, Bug Artifacts, and other Artifacts can easily be misinterpreted as bloodstain patterns associated with human bloodshed. Care must be taken in correctly identifying bloodstain patterns. Comparison with known standards and careful reasoning are the tools for making decisions on patterns. If in doubt, one should not take into consideration a geometric pattern as resulting from human bloodshed.
1. Barksdale, L., & Sundermeier, J. (March 1999). Bloodstain Patterns or Fly Artifacts: The “X” Factor. News and Clues. Nebraska IAI. (The formula used for the determination of the ratio was $X = \frac{L_{tl}}{L_{bd}}$. $L_{tl}$ is the length of the tail. $L_{bd}$ is the length of the body. If the ratio is greater than one, the suspect stain should be carefully considered as a fly artifact.)

Footnotes & References


Footnotes and References


