

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need:

Behavior of Blood Outside the Body

Describe the need:

SEE ALSO ATTACHED ADDENDUM for additional details.

Currently, there is a limited understanding of how intrinsic properties of liquid blood, environmental factors and fluid dynamic properties relate to the size, shape, distribution and appearance of bloodstains and bloodstain patterns. This understanding is fundamental to enhancing BPA through the ability to develop predictive, interpretative models.

Research is needed to study:

1. Intrinsic properties of blood (e.g. hematocrit levels, lipid levels, species, clotting, etc.)
2. Environmental factors (e.g. target surface characteristics, atmospheric conditions, etc.)
3. Fluid dynamic processes (e.g. drop formation, travel of drops through the air, deposition, etc.)

Keyword(s):

Bloodstain pattern analysis (BPA), bloodstain, physics, fluid dynamics

Submitting subcommittee(s):

Bloodstain Pattern Analysis

Date Approved:

March 1, 2021

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Yes. Bloodstain Pattern Classification Methodology Standard in progress.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

Yes. Refer to the Bloodstain Pattern Analysis Bibliography.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

- Adam, CD. Fundamental studies of bloodstain formation and characteristics, *Forensic Science International* 2012;219(1-3):76-87.
- Flight, C., Jones, M. and Ballantyne, K. (2018). "Determination of the maximum distance blood spatter travels from a vertical impact." *Forensic Sci Int* 293: 27-36.
- Kabaliuk N, et al. Experimental validation of a numerical model for predicting the trajectory of blood drops in typical crime scene conditions, including droplet deformation and breakup, with a study of the effect of indoor air currents and wind on typical spatter drop trajectories. *Forensic Science International* 2014;18:107-20.
- Stotesbury, T., M. C. Taylor and M. C. Jermy (2017). "Passive Drip Stain Formation Dynamics of Blood onto Hard Surfaces and Comparison with Simple Fluids for Blood Substitute Development and Assessment1 , 2." *Journal of Forensic Sciences* 62(1): 74-82.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

Yes. "Fundamental understanding of droplet formation, droplet trajectory and the resultant formation of bloodstain patterns."

5. In what ways would the research results improve current laboratory capabilities?

This research would enable an analyst to better relate the appearance of bloodstains and the corresponding mechanism. This research leads to objective measurable characteristics which are required for pattern classification.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

This research is at the core of BPA and contributes to the fundamental understanding of blood behavior outside the body. The scope of this research establishes its scientific basis by determining how bloodstains are affected by:

1. intrinsic properties of liquid blood
2. environmental factors and
3. fluid dynamic properties

Once established, this knowledge will provide the framework for improved methodologies and interpretations.

7. In what ways would the research results improve services to the criminal justice system?

Research would provide a basis for a more complete and reliable determination of pattern-producing mechanisms, resulting in a better reconstruction of events. Ultimately, BPA would be more reliably presented to the criminal justice system.

8. Status assessment (I, II, III, or IV):

II

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.