Detection of Human Blood in Peridomestic and Domestic Kissing Bugs (*Triatoma* spp.) Utilizing a Rapid Forensic Test

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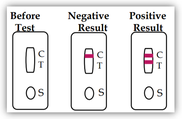
Introduction

DNA- and proteomics-based techniques have been used to identify the vertebrates triatomines have fed upon.

These procedures are **time consuming**, require access to a laboratory with sophisticated equipment, and trained personnel.

The **Rapid Stain Identification of Human Blood** (RSID™ Blood) is a lateral flow, immunochromatographic assay, used to detect as little as 1µL of **human blood in forensic samples** within 10 minutes after 1-2 hours of specimen preparation.



To determine whether the RSID™ Blood could be used to identify human blood within triatomines we conducted several experiments following the manufacturer's extraction protocol.

Methods

Peridomestic and domestic triatomines were provided from night-time trapping collections and citizen science projects across four U.S. states (Arizona, Texas, Louisiana, California).

***Triatoma* species included:**

Triatoma protracta

Triatoma gerstaecker

Triatoma recurva

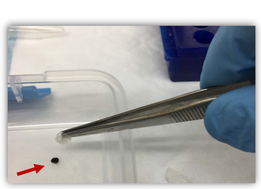
Triatoma sanguisuga

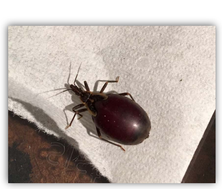
Triatoma lecticularia

Triatoma rubida

Only triatomines with **visible blood meals** after hindgut dissection were included (N=49)

Laboratory-raised *T. rubida* having only fed on laboratory mouse (*Mus musculus*) blood (N=20; negative controls) were also fed human blood (N=5; positive controls) from a healthy volunteer through an artificial membrane apparatus were tested with RSID™ Blood.





Fecal drops (FDs) from both known negative and positive controls and those provided from containers provided from collected triatomines were tested with RSID™ Blood.

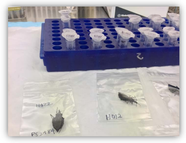
Results

All five laboratory-raised *T. rubida* (100%) that were fed human blood through an artificial membrane feeding **tested positive at 12 hrs, 3, 5, 7, & 14 days post-feeding.**

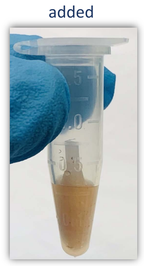
Laboratory-raised *T. rubida* having only fed on laboratory mouse (*Mus musculus*) blood **all tested negative** (N=15/15) at various stages of engorgement.

Peridomestic and domestic triatomines with detection of human blood with RSID™ Blood (N=23/49; 47%)

- N = 9/20 (45%) Arizona specimens
- N = 4/7 (57%) Louisiana specimens
- N = 9/21 (42%) Texas specimens
- N = 1/1 (100%) California specimen



Extraction buffer added



(2 hours)

Cotton-tip stick soaked in blood sample

Samples running (10 mins)

Eight different laboratory-raised *T. rubida* having only fed on laboratory mouse blood provided eight FDs which all tested **negative**.

Three triatomines that tested positive from our field collection, two of which were **known to have fed on a human**, provided three different FDs, all tested **positive**.

In addition, laboratory-raised *T. rubida* that fed on human blood, provided two FDs, which were positive.

Discussion

Determining if a kissing bug has taken a human blood meal can be **difficult** since they feed on a variety of other vertebrates.

DNA-based techniques have proven to be both highly sensitive and specific. However, given their reliance on amplification, false positives from contaminating DNA (not derived from a blood meal), can occur.

The RSID™ Blood is designed to detect a human sialoglycoprotein found on the cell surface of erythrocytes called **glycophorin A**. It has been shown not to cross-react with other vertebrate blood, including several non-human primates and other mammals, birds, and reptiles.

Our preliminary experiments have shown that it can accurately detect a triatomine human blood meal. Furthermore, human blood was also detected in the feces when a human blood meal was present.

Individuals who encounter kissing bugs, are often curious to know if in fact they were bitten and blood was taken.

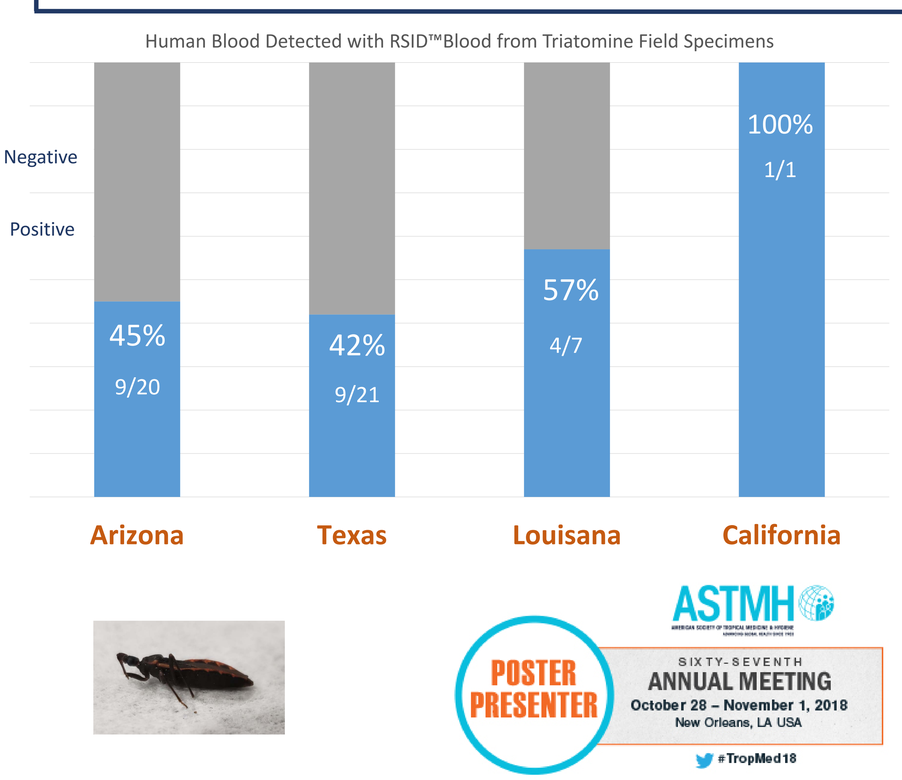
This test could be used to make that determination without the need for specialized equipment or laboratory-trained personnel.

Conclusion

Given the low-cost, ease of use, and rapid results, this test may have implications in triatomine research and field work.

This rapid test may also be applicable for other hematophagous vectors such as mosquitoes, ticks, and biting flies who bite humans.

More study is needed to determine sensitivity as compared to more validated vector blood meal testing, such as DNA- and proteomics-based methodologies.



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