Molecular Analysis of the Systemic Dermatoses of Morgellons Disease

Morgellons disease (MD) is a multisystem infectious disease historically viewed as controversial and poorly understood by the medical community. These contentions involve difficulties in diagnosis, as symptoms of MD have similarities consistent with a psychiatric disorder involving the false beliefs of infestation by parasites, also known as delusional parasitosis or delusional infestation. Currently, the factors determining the etiology and transmission of MD are still unknown and the dispute surrounding Morgellons is substantial. MD doesn’t discriminate – it affects people of all ages, genders, and ethnicities. In MD patients, a distinct feature of near-microscopic and microscopic fibers is visual within the dermopathy, possessing unique characterizations and formations within the cutaneous and subcutaneous layers of the skin. These unique fibers are spontaneous and consist of a multitude of colors. Although the color of fibers is not fully understood, fiber-like filaments are perceived to be caused by an overproduction of keratin and collagen, with blue filaments containing granules of melanin. However, analysis from past research has given mixed results from unknown to keratin. Other signs and symptoms of MD include crawling sensations on and under the skin, intense itching, severe fatigue, cognitive difficulties, and behavioral effects.

The aim of this study is to investigate if an infectious etiology of the systemic dermatoses is present. Previous research endeavors suggest MD is a disorder associated with a tick-borne illness caused by the bacterium *Borrelia burgdorferi*. A pathogenic spirochete and the causative agent of Lyme disease (LD), transmitted to humans through the bite of an infected black-legged tick (*Ixodes scapularis*). MD studies are currently focused on spirochetes as the causative agent to understand if a coinfection exists and/or multifactorial etiology is a cohort. Recognition of the potential coexistence of multiple pathogens in MD etiology may stimulate the development of novel approaches to diagnosis and treatment. Therefore, allowing multiple diagnostic approaches to be applied simultaneously to detect for the major pathogens in MD.

Epithelial tissue samples are collected and deidentified for DNA extraction and polymerase chain reaction (PCR) is performed using specially designed primers to detect if *Bartonella henselae, Borrelia burgdorferi, Helicobacter pylori,* and *Treponema denticola* are present. After amplification, PCR products are visualized on a 1-2% agarose gel, stained with SYBR Safe, and visualized on the GelDoc Imager. Positive bands are excised and purified from gels using chemical and centrifugal measures. Eluted DNA is quantified using a NanoDrop spectrophotometer and then sent to OSU’s core facility for Sanger Sequencing. Bioinformatic tools are implemented, and nucleotide sequences interpreted for verification of our genes of interest.

Our results indicate the presents of multiple pathogenic organisms found in dermatological specimens, suggesting an infectious etiology of the dermopathy is present. Replication of preliminary data is ongoing for credibility of scientific claims. Future research needs to be conducted to continue the exploration of etiologic causes to support our findings. Through further analysis, the potential coexistence of multiple pathogens in MD may hold the answers to this unsolved mystery and bring a better understanding for MD to be recognized in the medical community.

Keywords: Morgellons disease, Lyme disease, fibers, etiology, *Borrelia burgdorferi*
Molecular Analysis of the Systemic Dermatoses of Morgellons Disease

Samantha G. Rice and Dr. Randy S. Wymore

ABSTRACT
Morgellons disease (MD) is a systemic infectious disease historically viewed as controversial and poorly understood by the medical community.1,2,4,5,6,8 These conditions involve difficulties in diagnosis, as symptoms of MD have similarities consistent with a psychiatric disorder involving the false beliefs of infection by parasites, also known as delusional parasitosis or delusional infestation.1,3,5,6 Currently, the factors determining the etiology and transmission of MD are still unknown and the dispute surrounding Morgellons is substantial. The aim of this study is to investigate if an infectious etiology of systemic dermatoses is present.

METHODS

Molecular Techniques

Microscopy

DNA Extraction

DNA extraction is performed using a kit by Monarch® HMW DNA Extraction Kit for Tissue.

Polymerase Chain Reaction

RESULTS

Table 1: Positive microbial organisms found in MD epithelial tissue samples

Table 2: Environmental Controls

ACKNOWLEDGEMENTS
We would like to extend our gratitude to OSU-CHS for their strong support; particularly, the School of Biomedical Sciences and the Pharmacology and Physiology Department. Thank you to the Charles E. Holman Foundation for funding this research. A special thank you to Betty Jo Westerfield and to my committee members Dr. Randall Davis, Dr. Dusti Sloan, and Dr. Jim Hess for your support. A special thanks to Linda Fries Crystal Shults, and BJ Redding for their assistance in various roles from helping to organize the lab, to ordering reagents, and the use of specialized equipment.

REFERENCES

CONCLUSION

Our results indicate the presence of multiple pathogenic organisms found in dermatological specimens, suggesting an infective etiology of the dermatosis is present.

DNA analysis of B. henselae, H. pylori, B. burgdorferi, and T. denticola have successfully matched with the GenBank®, the National Institute of Health genetic sequence database.

In preliminary research, over 95 molecular epithelial tissue samples were analyzed with each bacteria of interest; 109 positive bands were extracted with 29 successful sequences.

Over 32 molecular epithelial tissue samples have been analyzed, with results pending at the time.

Environmental contaminant controls were implemented to verify these bacterial agents are not readily found in the environment.

Although purification from PCR yields a higher concentration of DNA, gel purification yields a higher purity.

Research suggests there may be an infectious etiology of the dermatosis is present.

Through further analysis, the potential coexistence of multiple pathogens in MD may hold the answers to this unsolved mystery and bring a better understanding for MD to be recognized in the medical community.

FUTURE RESEARCH

Preliminary research is currently focused on analyzing Oklahoma Ticks for pathogenic organisms found in MD

The identification of a pathogenicity island is currently under investigation, preliminary research has shown the presence of genetically unique variants.

Future research needs to be conducted to continue the exploration of etiologic causes to support our findings.

Replication of preliminary data is ongoing for the credibility of scientific claims.

Additional primers are currently being assessed to assay in future samples.

Figure 1: Sir Thomas Browne Reproduction of Plates A. Image of the first illustration - "A representation of a barnacle. B. Two representations of barnacles. C. Being a perfect specimen. D. Figures of Clavus or barnacles". 

Figure 2: Micrograph Images of Fibers.

Figure 3: Images of 2% Agarose Gel with Subsequent Controls A.

Figure 4: National Center for Biotechnology Information BLAST Nucleotide Results

Figure 5: Distribution of B. burgdorferi, T. denticola and Bartonella henselae.

Figure 6: Distribution of B. burgdorferi, T. denticola and Bartonella henselae.