DxWound

CogenDx

Clinical Bulletin: DxWound Technical Specifications

DxWound is a DNA-based diagnostic tool that provides a rapid and comprehensive assessment of the microbial environment of a wound. The tests identify aerobic and anaerobic bacteria, fungi, and antibiotic resistance genes plus a virulence gene specific to *Staphylococcus aureus*, and compile the information into a single report delivered, generally, one business day after receipt of the specimen. These test results may help clinicians rapidly determine course of antimicrobial therapy for patients with wounds/suspected skin and soft tissue infections (SSTIs).

DxWound Menu

DxWound offers microbial tests based on frequency in SSTIs, as well as evidence of pathogenicity and include bacteria which are listed as antibiotic resistant threats in the U.S. by the CDC.[1-5]

Each molecular test is designed to detect the species or species group listed. The *Bacteroides fragilis* group assay detects *Bacteroides fragilis*, *Bacteroides ovatus*, *Bacteroides thetaiotaomicron*, *Bacteroides uniformis*, *Bacteroides vulgatus*, and *Parabacteroides distasonis*; other clinically relevant species such as *Bacteroides caccae*, *Bacteroides eggerthii*, *Bacteroides stercoris* and other closely related organisms may also be detected. The *Prevotella* spp. assay detects *Prevotella bivia*, *Prevotella buccae*, *Prevotella buccalis*, *Prevotella corporis*, *Prevotella disiens*, *Prevotella intermedia*, *Prevotella loescheii*, *Prevotella melaninogenica*, *Prevotella nigrescens*, *Prevotella oralis*, and *Prevotella oris*, and may also detect other closely related organisms. The *Streptococcus anginosus* group (viridans) assay detects *Streptococcus anginosus*, *Streptococcus constellatus*, and *Streptococcus intermedius*. The *Streptococcus mitis* group (viridans) assay detects *Streptococcus mitis*, *Streptococcus oralis*, and *Streptococcus pneumoniae*; other clinically relevant species such as *Streptococcus pseudopneumoniae* and other *Streptococcus mitis* group organisms may also be detected.

Indications for Ordering

DxWound can be used for any patient suspected of having a SSTI or with clinical signs of a SSTI.

Specimen Collection

DxWound utilizes a swab for sample collection. The process is simple. First, cleanse and debride the wound as necessary. The Levine technique is then suggested for collection of the sample: the swab is rotated over a 1cm^2 area with sufficient pressure to express the liquid from within the wound tissue (see the Specimen Collection Manual for detailed instructions). The swab is then placed in a transport tube containing an inactivating solution that kills microorganisms at the same time as protecting the microbial DNA, thus preserving the wound microbiome in time at the point of specimen collection. The sample is stable for testing for up to 7 days at temperature levels ranging from 39°F to 140°F and for 30 days at room temperature.

Swabs collected in this manner perform equivalently to tissue specimens: in a pilot study conducted by Millennium Health of 71 chronic wounds, a comparison was performed between tissue biopsy and swab samples both tested using PCR technology (DxWound). The results found greater than 98% concordance between matched swab and tissue biopsy specimens. This result is consistent with published studies.[6]

The ability to detect target organisms depends on the proper collection and handling of the wound swab specimen. Variation in specimen quality may occur due to lack of bioburden or poor collection technique.

DxWound Test Menu

AEROBIC BACTERIA, GRAM-POSITIVE
Corynebacterium amycolatum
Corynebacterium striatum
Enterococcus faecalis
Enterococcus faecium
Mycobacterium abscessus
Mycobacterium chelonae
Staphylococcus aureus
Staphylococcus epidermidis (coagulase-negative)
Staphylococcus lugdunensis (coagulase-negative)
Streptococcus agalactiae (group B)
Streptococcus anginosus group (viridans)
Streptococcus mitis group (viridans)
Streptococcus pyogenes (group A)
AEROBIC BACTERIA, GRAM-NEGATIVE
Acinetobacter baumannii
Citrobacter freundii
Enterobacter aerogenes
Enterobacter cloacae
Escherichia coli
Klebsiella oxytoca
Klebsiella pneumoniae
Morganella morganii
Proteus mirabilis/vulgaris
Pseudomonas aeruginosa
Serratia marcescens
ANAEROBIC BACTERIA, GRAM-POSITIVE
Clostridium perfringens
Clostridium septicum
Finegoldia magna (Peptostreptococcus magnus)
Peptoniphilus asaccharolyticus/harei (Peptostreptococcus)

ANAEROBIC BACTERIA, GRAM-NEGATIVE
Bacteroides fragilis group
Porphyromonas asaccharolytica
Porphyromonas somerae
Prevotella spp.
FUNGI
Aspergillus flavus
Aspergillus fumigatus
Aspergillus niger
Candida albicans
Candida glabrata
Candida krusei
Candida parapsilosis
Candida tropicalis

ANTIBIOTIC RESISTANCE GENES	
CARBAPENEMASE	
IMP	OXA-48
KPC	SME
NDM	VIM
EXTENDED-SPECTRUM ß-LACTAMASE	
CTX-M	SHV
MACROLIDE/CLINDAMYCIN RESISTANCE	
ermA	ermB
OXACILLIN/METHICILLIN RESISTANCE	
mecA	
VANCOMYCIN RESISTANCE	
vanA	vanB
STAPHYLOCOCCAL VIRULENCE GENE	
lukF-PV (Panton-Valentine Leukocidin, PVL)	

Continued on next page.

Technology

DxWound is a PCR-based assay which analyzes microbial DNA using species-specific DNA sequences, such as 16S rRNA sequences for bacterial detection. In addition, sequences specific to virulence and antibiotic resistance genes are also analyzed. DNA is detected directly from the patient specimen without culture enrichment.

A series of commonly used therapeutic substances were tested and did not interfere with the DxWound PCR assay. These included dressings (e.g Puracol collagen dressing, Solosite wound gel), antiseptics (e.g., silver dressings, Iodosorb gel, Hydrofera Blue® dressing), analgesics (e.g., lidocaine) and topical antibiotic treatment (e.g., triple antibiotic ointment, mupirocin, silver sulfadiazine). In addition, hemoglobin was tested and did not interfere with the assay. It remains possible that other substances applied to the wound could interfere with the assay.

All DxWound tests have ≥95% accuracy and ≥99% reproducibility. Accuracy and reproducibility were established by testing reference specimens with characterized organisms or antibiotic resistance genes obtained from multiple sources including the FDA-CDC antimicrobial resistance isolate bank, commercial vendors, and other laboratories.

Limitations

- DxWound is targeted to a specific set of known wound/SSTI pathogens and is not designed to detect all microbes. Rarely, false negatives or false positives could be generated. A false positive is possible when a different organism is present due to sequence similarity between the tested organism and the actual organism present in the sample. Other cross-reactivities may apply. In addition, a false negative could be caused by rare genetic variations which could interfere with detection of a microorganism present in the specimen.
- The ability to detect target organisms depends on the proper collection and handling of the wound swab specimen. Variation in specimen quality may occur due to poor collection technique, lack of bioburden, or substances applied to the SSTI/wound that interfere with the test, as well as specimen contamination due to non-sterile procedures.
- For antibiotic resistance genes and the virulence gene, these tests detect the presence of genes and do not detect whether the genes are expressed. These tests do not detect all known antibiotic resistance mechanisms, nor do they identify with which organism an antibiotic resistance gene is associated. It is possible that an antibiotic resistance gene is associated with an organism that is not included in the tests.
- The DxWound Genetic Analysis Report does not make recommendations for treatment. All test results should be evaluated in the context of the patient's individual clinical presentation.

Technical Assistance

For technical assistance with interpretation or to speak with one of our clinical support specialists, scientists, or clinical pharmacists, please call Client Services at (877) 866-0603, Monday – Friday 5:00am to 5:00pm (Pacific Time).

Reporting

All test results are reported, generally, within 1 business day of specimen receipt. These results are available in the online portal as a DxWound Report.

How To Order

Using a CogenDx test requisition (paper or electronic), medically necessary tests are ordered by individual test based on patient-specific elements identified during the clinical assessment and documented in the patient's medical record by the provider. Submit swab specimen in the collection device provided according to the directions in the Specimen Collection Manual. A completed Documentation for DxWound Testing form is required with each order.

References

1. Weiner LM, Webb AK, Limbago B, et al. Antimicrobial-Resistant Pathogens Associated With Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011-2014. *Infect Control Hosp Epidemiol* 2016;**37**(11):1288-301
2. Moet GJ, Jones RN, Biedenbach DJ, Stilwell MG, Fritsche TR. Contemporary causes of skin and soft tissue infections in North America, Latin America, and Europe: report from the SENTRY Antimicrobial Surveillance Program (1998-2004). *Diagn Microbiol Infect Dis* 2007;57(1):7-13
3. Messer SA, Jones RN, Fritsche TR. International surveillance of Candida spp. and Aspergillus spp.: report from the SENTRY Antimicrobial Surveillance Program (2003). *J Clin Microbiol* 2006;44(5):1782-7
4. Wolcott RD, Hanson JD, Rees EJ, et al. Analysis of the chronic wound microbiota of 2,963 patients by 16S rDNA pyrosequencing. *Wound Repair Regen* 2016;24(1):163-74
5. U.S. Department of Health and Human Services Centers for Disease Control and Prevention. Antibiotic resistance threats in the United States, 2013. https://www.cdc.gov/drugresistance/threat-report-2013/. Accessed April 18, 2017.
6. Kallstrom G. Are quantitative bacterial wound cultures useful? *J Clin Microbiol* 2014;52(8):2753-6

CogenDx

Contact CogenDx to learn more.

Client Services: **(877) 866-0603**

cogendx.com