CRPμTIC: Critical Reagents Program Microbial Threat Information Center

A Solution for Organization, Storage, Retrieval and Display of Microbial Data

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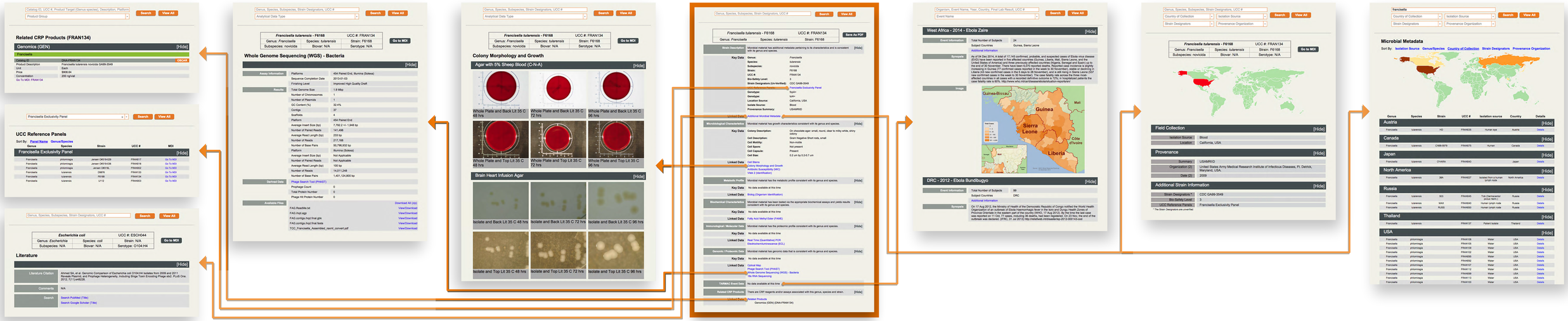


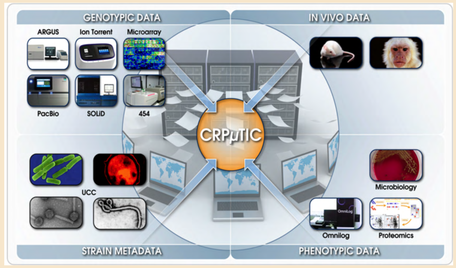
Abstract

Background: Increasingly sophisticated next-gen technologies have altered the manner in which bacterial and viral pathogens are characterized and have enabled improved phenotype-to-genotype linking. As such, genomes and phenomes can be generated at a rate that vastly outpaces the application of these datasets to medical countermeasure development. In order to manage the vast amount of data produced by such efforts, CRPμTIC has been developed. CRPμTIC is an information management system for the organization, storage, retrieval and display of microbial information from high-throughput phenotypic and genotypic characterization of biodefense pathogens and their near neighbors. This information is integrated with other pertinent strain information that can be used for product development.

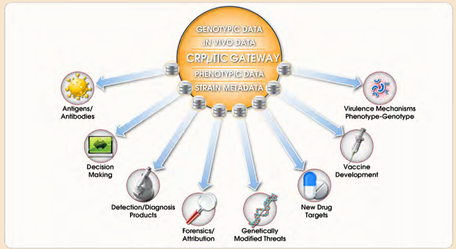
Methods and Results: CRPμTIC is both a web-resident database and a low-common denominator process easily adapted by laboratories and enables the capture and central storage of data. CRPμTIC is based on open source software (e.g., PostgreSQL), is portable and has a full complement of strain and assay data administration functions with role-based access to maintain data integrity. CRPμTIC captures key assay- and strain-related data in simple user interfaces, and appends the more detailed instrument-level source files for user download. The various data types include: sample metadata (organism ID, clinical, temporal, geographical and acquisition information); microbiological and biochemical characterization data; genomic data such as PCR, optical mapping, and whole genome sequencing; and finally data on various CRP products developed using these strains. The data are organized in a modular structure (Microbial Data Index (MDI), Microbial Metadata, Analytical Data, and CRP Products) through which the user can quickly navigate and identify records of interest by filtering on strain names and other identifiers (e.g., country of collection). Results can be sorted in various ways, including level of strain characterization. The unique feature of CRPμTIC is that all the information and products pertaining to a given organism are traceable to a single, well characterized microbial source stored in a repository, the Unified Culture Collection (UCC). UCC represents well-characterized microbes accessioned from geographically and temporally divergent sources that are subsequently characterized using a variety of technologies. The data organized in CRPμTIC can be output in the form of an MDI with hyperlinks to the specific analytical data pages that provide additional information on specific assay results. CRPμTIC currently contains over 1400 assay results, over 1300 organisms, over 1000 CRP products and has over 30 assay data types.

Conclusions: CRPμTIC serves as an end-to-end information management solution for microbes - from isolation of an organism all the way to product development. Although CRPμTIC does not offer analytical tools, the user can download the primary data and perform secondary analyses using their own analytical tools to answer specific queries of their interest. Also, the framework of CRPμTIC is easily adaptable to new assay types and is portable to different hosting platforms. CRPμTIC is intended to serve agencies across the USG as a reliable source of information about CRP reference materials and assays for the development of medical countermeasures including diagnostics and therapeutics.

Concept

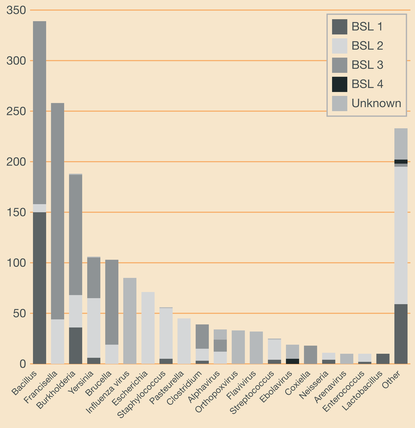


Applications

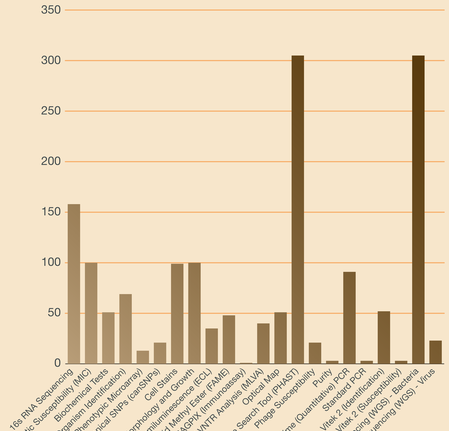


Stats

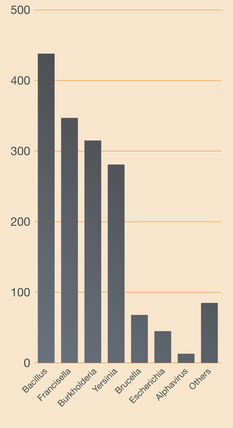
Number of Strains by Genus



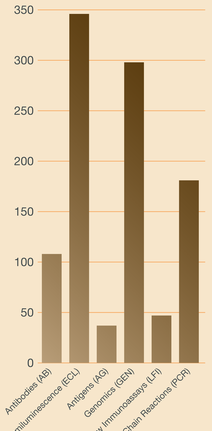
Number of Strains by Analytical Data Type



Number of Analytical Data Types by Genus



Number of Products by Group



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