DbGel

Protein Gel Database for Windows NT and Windows 98

Overview

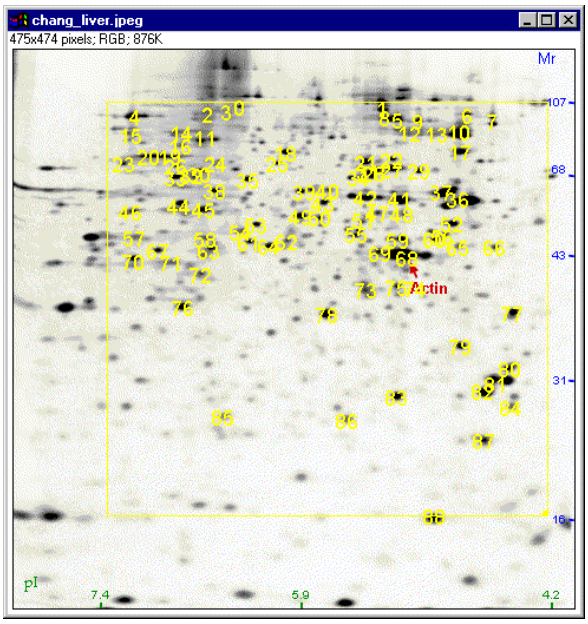
DbGel was designed to assist research biologists in the analysis, storage and retrieval of protein gels. DbGel is easy to use yet offers the most sophisticated gel querying tools available. DbGel leverages OLE dB, Microsoft's newest and most powerful database technology and can handle tens of thousands of gels. DbGel was written in Java and can be configured to function as an Internet Web Server. Thus, DbGel can easily be configured to serve an individual researcher or an entire research laboratory.

DbGel is easy to use. The user interface is extremely intuitive. The paradigm for storing and retrieving gels is simple and logical. There is no need for gel groups, masks and masters. New users quickly feel comfortable with DbGel.

DbGel offers a powerful assortment of querying tools including image query, lane query, protein query and SQL query. This allows the user to quickly retrieve the stored gels they want.

DbGel is the only product on the market to offer image query. Image query allows the researcher to retrieve gels that are visually similar to a "query" gel. The query gel can be an entire gel or a region of interest within a gel. DbGel automatically warps images and corrects for differing ranges and anomalous scaling among gels in the database.

DbGel generates 2D Gel HTML reports, which include spot-protein tables, and corresponding labeled images. These reports can be published to the web or Microsoft Excel. Finally, DbGel contains a powerful 2D Gel comparison tool that publishes a comprehensive HTML report indicating protein spots that are unique to each gel.



Contact dbgel@hotmail.com for a free evaluation copy

DbGel

Table of features and benefits

Features	Benefits
Storage for 1d and 2d Gels	DbGel organizes experimental results and permits datamining for both 1d and 2d Gels.
Intuitive, graphical 2d gel calibration	It is fast and easy to associated spots on a gel with proteins or standards having known IP-MW. This results in accurate 2d gel warping.
2d Gels are warped from x-y coordinates to IP-MW coordinates	Warping corrects for experimental error and varying conditions. This permits comparison of disparate gels
Creation and storage of compact, warped 2d gel feature vectors	This permits rapid image searches of the gel database.
Creation and storage of compact 1d gel lane feature vectors	This permits rapid searches of the 1d gel database based upon lane profile.
Automatic spot detection and spot data storage for 2d gels	Permits rapid searching of gels by protein/s. Spot IP, MW and Integrated Gray Value is determined
Protein database includes IP-MW fields	2d Gel spots are automatically associated with Proteins by IP-MW analysis
OleDb database connectivity	DbGel is scaleable from a workstation solution to an enterprise wide solution. DbGel can be configured to use OleDb compliant databases including Microsoft Access and Oracle 8.
Written in Java	DbGel is Internet-friendly and can be quickly ported from Windows.
Gel Reports generated in HTML	Informative gel reports can be published to the web for sharing of information. Spot data can be easily viewed in Microsoft Excel for further analysis.
2d Gel reports contain an automatically labeled reference image	The image can be used to reference spots listed in the spot table section of the report.
Storage of useful gel metadata	Description, experimental conditions, researcher, date, and other datum about gels and lanes can be stored.
Query results generated in HTML	Results can be easily published to the Web for effective sharing of information.
Internet and network aware	DbGel can be configured to run as a web server. Gels on the internet and on LANs can be opened and added to DbGel
Extensible plug-in architecture	DbGel can be customized as needed
Storage for 1d gels accounts for field strength, duration of experiment and pixels per inch	Users can query DbGel for similar lanes
MW-IP regions within 2d gels can be queried by image	Researchers can search DbGel for gels having similar image characteristics within a region of interest.
MW-IP regions within 2d gels can be queried by some or all spots	Researchers can search DbGel for gels having similar spots within a region of interest. The user may optionally specify which spots in the region are important.
Sophisticated database security	An administrator can assign read-write and gel-access rights to users or groups.
Users may execute SQL queries against gel metadata	Users can locate gels and lanes by experiment, date, description etc.
DbGel can import Swiss-2DPage database tables	DbGel takes advantage of Protein databases on the Internet.
DbGel includes advanced 2D Gel comparison routines	Researchers can quickly detect differences between gels.
Open source code. DbGel leverages NIH ImageJ	ImageJ is public domain software. Hundreds of developers are currently extending and improving ImageJ. DbGel users will benefit from all improvements and extensions.

DbGel

Features

Query by image

DbGel permits searching for gels by image characteristics. In this mode, an entire 2d Gel or a region of interest is the query. DbGel, compares the image characteristics of the query gel to image characteristics of gels in the database. Comparisons are made using optimized cross-entropy metrics. The result set contains the n-gels most similar to the query.

Scaleable

DbGel can run as a workstation or run as in Internet web server supporting multiple laboratories.

Query by protein spots

DbGel will permits querying the database by protein spots. DbGel will retrieve gels containing the specified proteins. Advanced warping technologies are used to account for experimental variations. DbGel uses warping technologies to auto-detect protein spots on calibrated gels.

Query by lane

DbGel handles 1d gels as well as 2d gels. The user can present a lane to the database. The database will return gels containing similar lanes. In order to account for experimental variation, lanes are normalized for pixels per inch, field strength, duration of field exposure and background. DbGel permits searching the database by entire lane or by a section of a lane. As with 2d gel queries, comparisons are made using optimized cross-entropy metrics.

SQL Query

Users can execute SQL queries against DbGel. SQL query allows users to search the database for gels by description, date, researcher, method, field strength, Kd range, pH range, etc.

Intuitive 2-d gel calibration

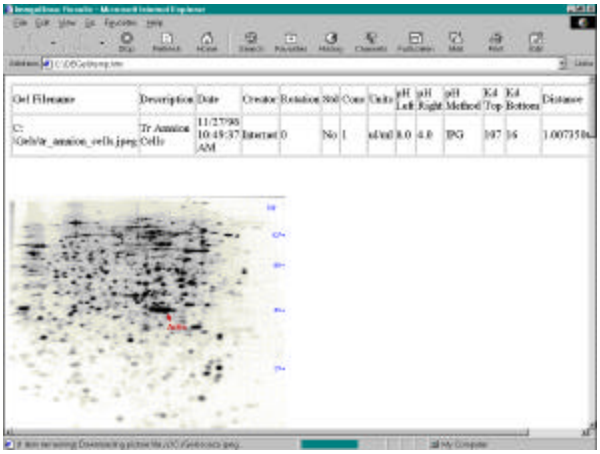
An intuitive user interface permits calibration of gels by identifying protein spots or gel calibration markers. Calibration allows gels of varying pH and Kd ranges to be accurately compared. In addition, calibration assists DbGel in auto-detecting proteins on new gels.

Advanced image warping

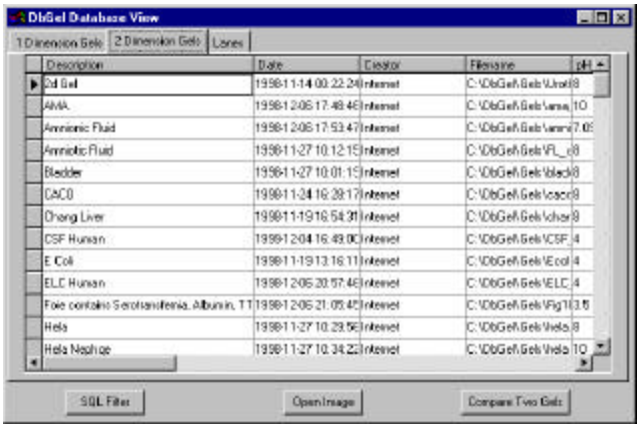
Image warping is critical for accurate gel querying and automatic detection of proteins. Gels are warped along the pH axis using bi-cubic splines. Gels are warped along the Kd axis using a combination of bi-cubic splines and least squares fitting. Images are warped before their features are extracted and stored in the database.

Protein Spot Report Generation

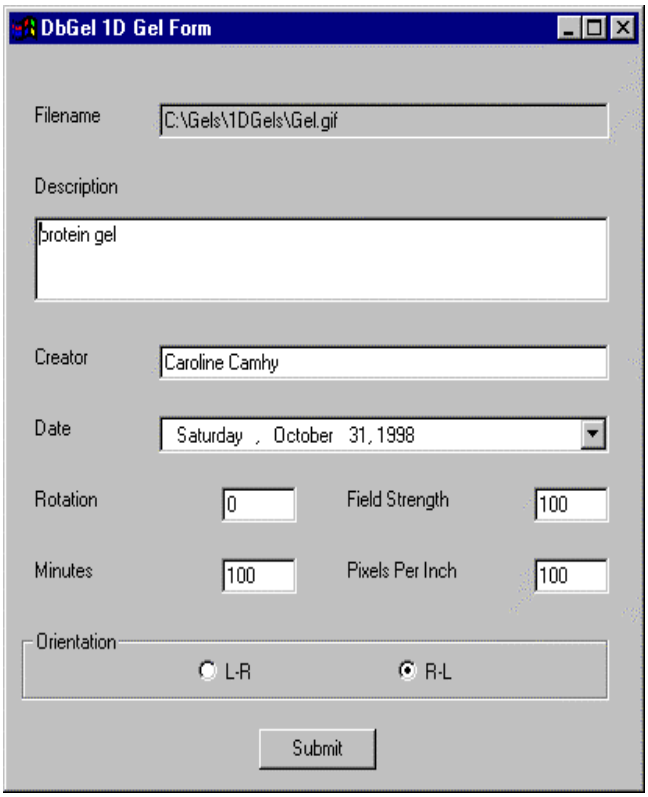
DbGel generates sophisticated 2D Gel reports that can be viewed in Internet Browsers and Microsoft Excel. These reports include automatically generated protein-spot tables and corresponding labeled images.



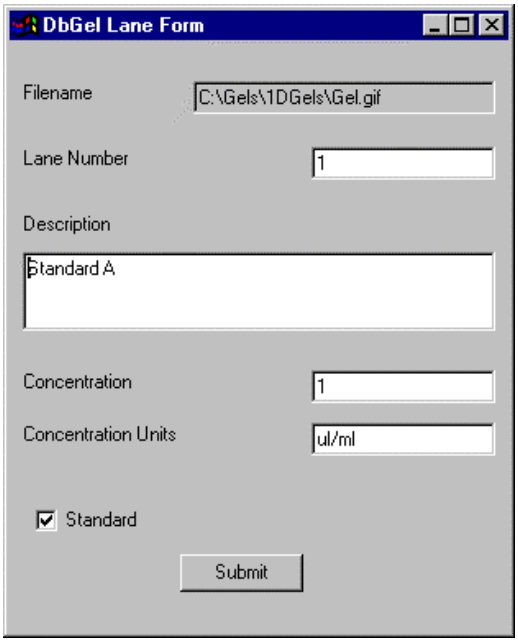
DbGel Views



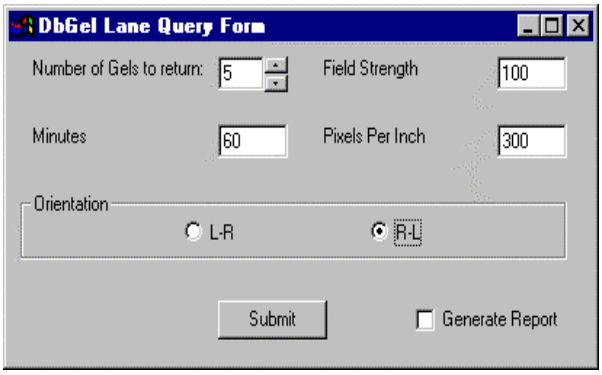
Gels are retrieved using the Database view. The user may access both one and two dimensional gels. One dimensional gels can be accessed by lane or gel.



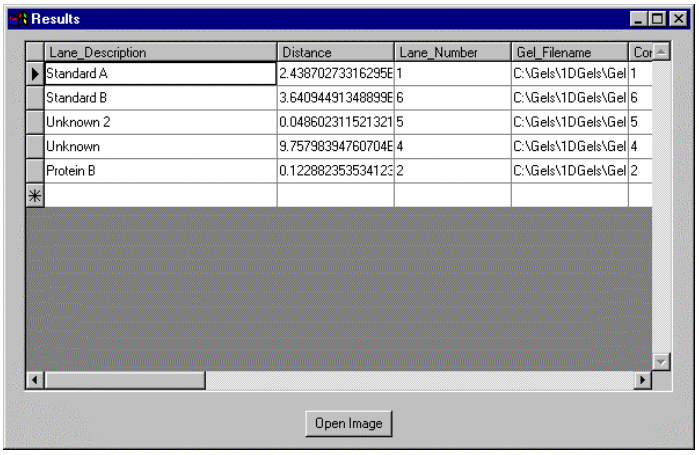
One dimensional gel information is entered in the 1D Gel Form. This information is used to normalize the lanes.



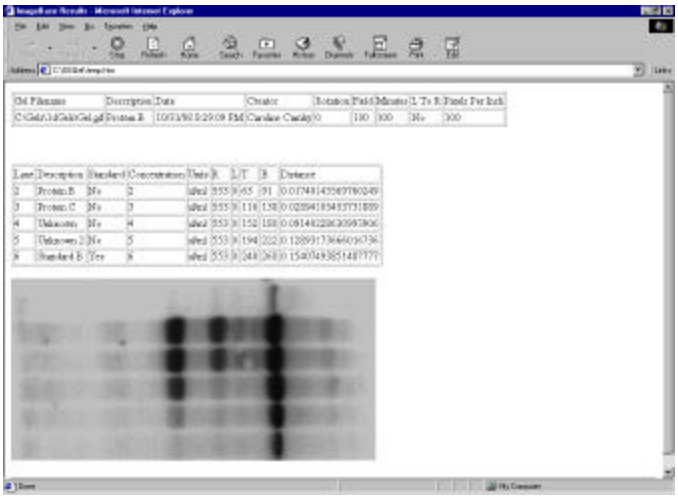
Individual lane information is entered in the Lane Form. DbGel automatically extracts and persists a normalized feature vector for each lane.



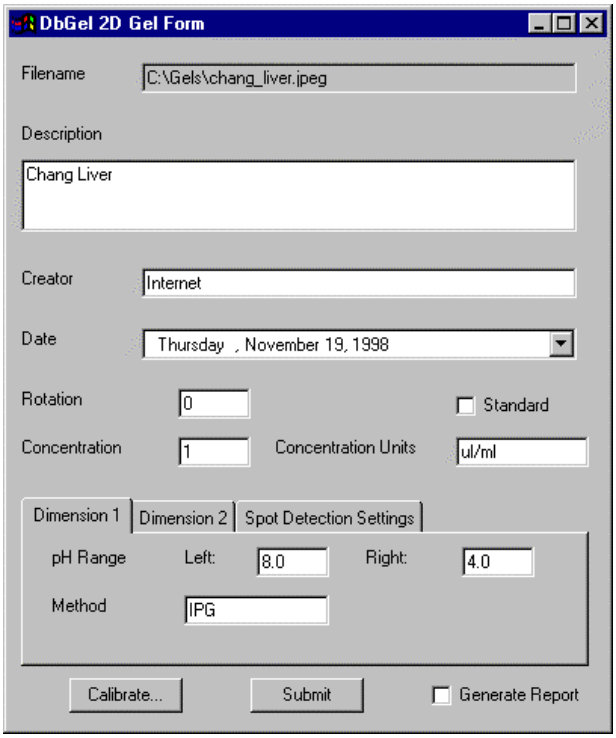
Lanes are queried using the Lane Query Form. The query can consist of an entire lane or a section of a lane. The lane is automatically normalized using the information provided. A feature vector is extracted and the most similar lanes are retrieved.



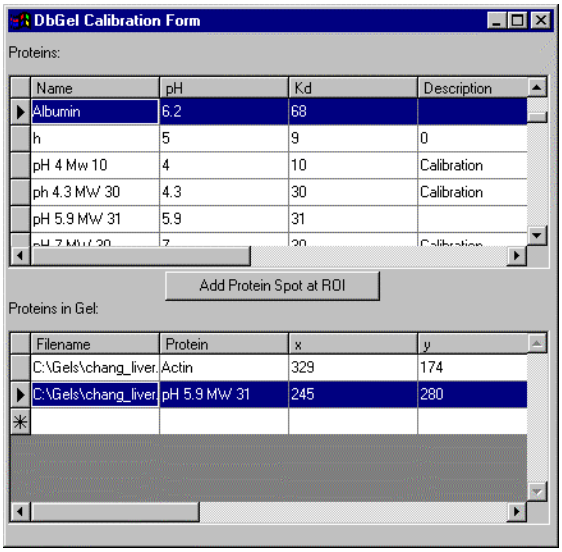
The results of the one-dimensional lane queries are displayed in the Results form.



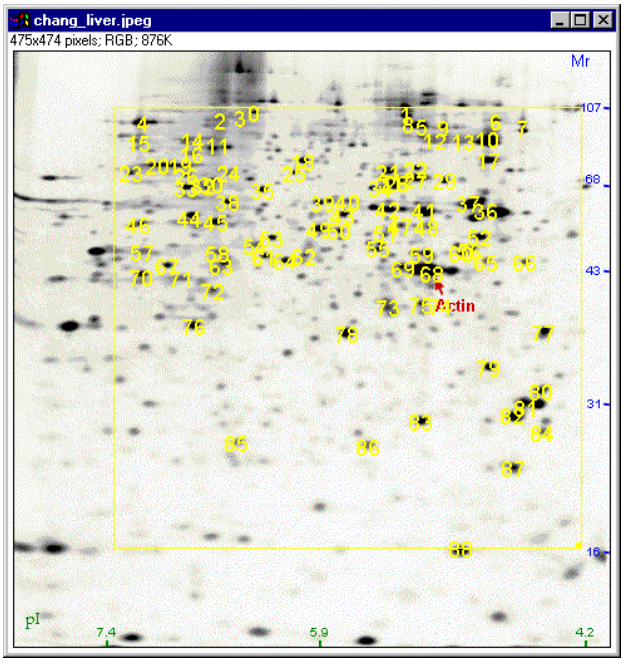
Alternately, a report of the one-dimensional lane queries results can be printed to the Internet Browser.



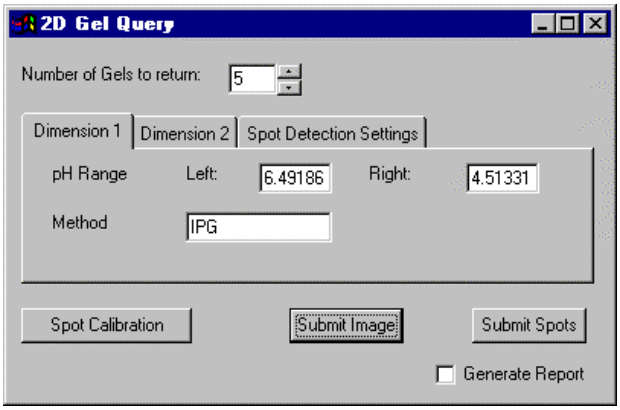
Two-dimensional gel information is entered in the 2D Gel Form. Isoelectric point and molecular weight extents are stored. The Spot detection threshold values can be manually tuned if necessary. Images are warped and converted to Lognormal form before feature vectors are extracted. Advanced spot analysis reports can be automatically generated.



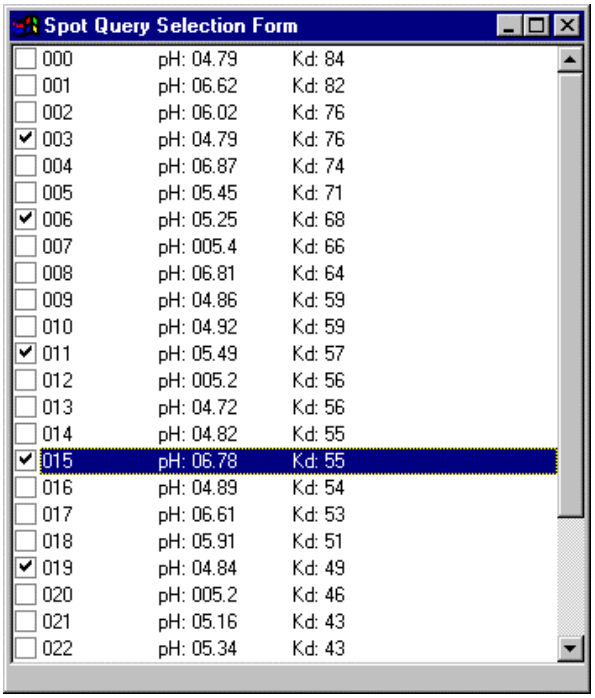
The Calibration Form is used to calibrate two-dimensional gels. The user can quickly associate coordinates in the image with calibration standards or proteins. These calibration points are used to create a warping mesh over the image. This mesh is used to convert the image to Lognormal form before it is persisted.



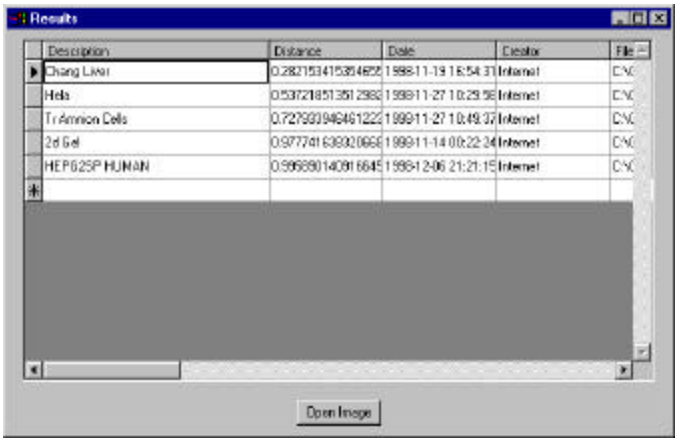
The calibration data is used to automatically determine isoelectric points and molecular weights for protein spots. This data is persisted for use in future queries.



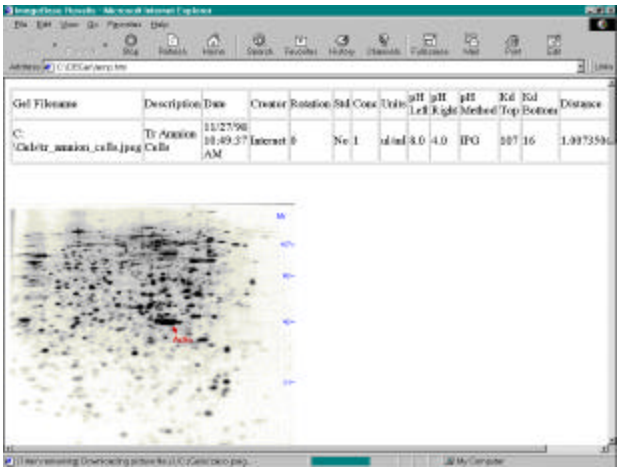
Two-dimensional gels can be queried by submitting spots or by submitting a region of the gel image. New gels can be calibrated first. Image queries convert a ROI into Lognormal form before they are presented to the query engine.



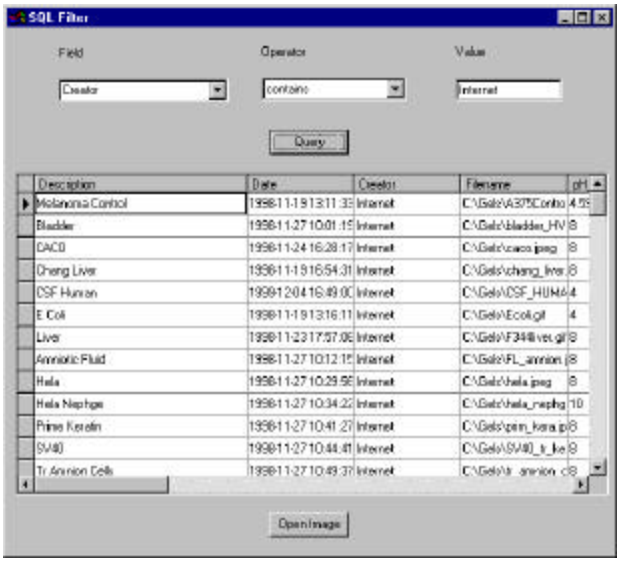
Protein queries are constructed by selecting spots on the query gel using the Spot Query Selection Form. Protein queries return all gels that contain the specified spots.



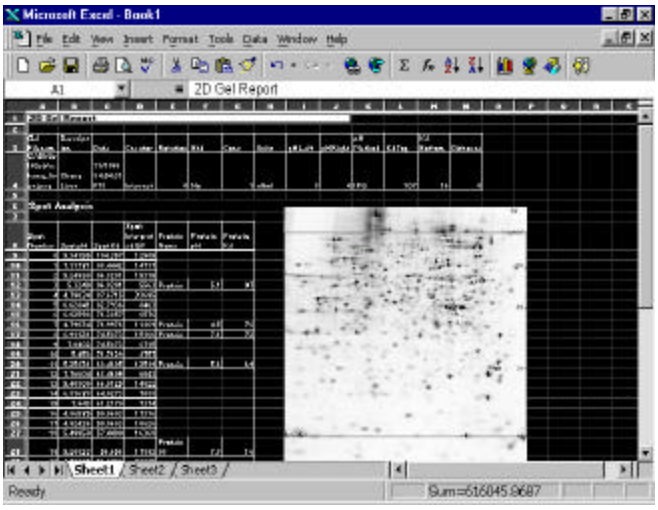
The results of the two-dimensional gel queries are displayed in the Results form.



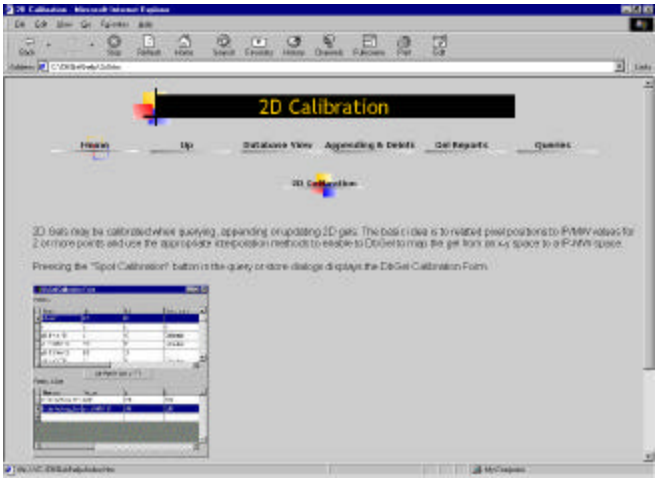
Alternately, query results are displayed in an Internet Browser. DbGel can be run as a personal gel database or serve an entire organization.



In addition to complex image queries, protein queries and lane queries, DbGel permits execution of SQL queries upon the gel database.



DbGel generates sophisticated 2D Gel reports that can be viewed in Internet Browsers or Microsoft Excel. In addition, DbGel generates 2D Gel comparison reports identifying unique proteins spots for each gel.



DbGel help is accessed from your Internet Browser.