

# WHONET and BacLink: Software Tools for Laboratory-Based Surveillance of Infectious Diseases and Antimicrobial Resistance

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## OBJECTIVE

This paper describes two free softwares developed for the automated and semi-automated capture, processing, and analysis of microbiology laboratory data. Applications include early detection of hospital and community outbreaks, guiding local treatment guidelines and public health policy, and immediate alert of important pathogens and potential errors in laboratory testing.

## BACKGROUND

Clinical and public health microbiology laboratories of the world are a rich, underutilized resource in monitoring the changing epidemiology of microbial populations worldwide. Two areas of public health importance in which effective use of relevant local data are critical include: 1. guiding local treatment guidelines, informed by knowledge of local patterns of infection and antimicrobial resistance; and 2. the early identification and characterization of outbreaks.

Most laboratories in the developed world and many in the developing world have clinical databases designed to meet the day-to-day needs of clinical reporting, specimen processing, billing, and permanent information storage. Unfortunately, most such systems were not developed with the epidemiological needs of microbiologists, infection control staff, public health authorities, and policy-makers in mind. To address this critical gap, our group at the WHO Collaborating Centre for Surveillance of Antimicrobial Resistance has developed the WHONET and BacLink softwares to support local, national, and international infectious disease surveillance programs.

## METHODS

WHONET is a Microsoft Windows-based database software for the entry, reporting, and analysis of microbiology laboratory test results [1]. The technical objectives of the software are: 1. to enhance the use of local results to support policy and infection control interventions; and 2. to promote national and international collaborations through the exchange of data in a standardized format. WHONET can be used as a stand-alone system in laboratories without another data management system, or through use of BacLink, WHONET can be used as an add-on to existing systems. BacLink is a data conversion utility for microbiology laboratory data which permits the conversion of data from: 1. simple desktop applications, such as Microsoft Excel, Access,

dBASE, EpiInfo, and simple text files; 2. most commercial laboratory instruments for automated organism identification and susceptibility testing; and 3. laboratory and hospital information systems. Both softwares, translated into 17 languages, are available free-of-charge from the World Health Organization.

## RESULTS

WHONET is currently used in over 80 countries managing data from over 1000 clinical, public health, veterinary, and food laboratories, primarily within the context of national surveillance networks and international collaborations.

Figures depict examples of analyses possible with WHONET. Areas of analysis include: quality assurance, epidemiology of microbial populations and resistance, and outbreak detection. An exciting current area of work is the integration of WHONET with SaTScan [2] for the automated detection of disease clusters of public health importance.

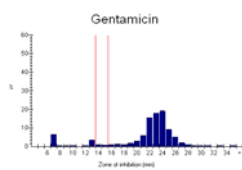


Figure 1

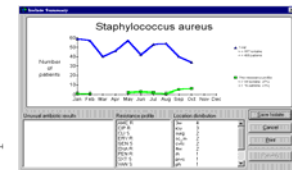


Figure 2

Figure 1 – Susceptibility test measurements for *K. pneumoniae* against gentamicin, showing susceptible (wild-type) isolates to the right of the graph and two distinct resistant clones to the left.

Figure 2 – Temporal trends in *S. aureus* isolations. The upper line depicts all patients with *S. aureus*; the lower line depicts a particular clone of *S. aureus* defined by its multi-resistance phenotype.

## CONCLUSIONS

WHONET and BacLink are widely disseminated free software tools which strengthen local data analysis capabilities and network collaborations. Integration of SaTScan into WHONET will enhance cluster detection at the level of both species and transmissible resistance genes.

## REFERENCES

- [1] O'Brien, TF, Eskildsen MA, Stelling JM. Using internet discussion of antimicrobial susceptibility databases for continuous quality improvement of the testing and management of antimicrobial resistance. Clin Infect Dis 2001; 33 (suppl 2).
- [2] Kulldorf M. and Information Management Services, Inc. SaTScan(TM) v.7.0: Software for the spatial and time-scan statistics. <http://www.satscan.org>, 2006.

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