NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES

Division of the National Health Laboratory Service

WHONET and Laboratory Based Antimicrobial Resistance Surveillance

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INTRODUCTION TO WHONET

- Lab configuration and data entry – quick introduction
- Data analysis 1
- Introduction to BacLink
- Practical applications and advanced features
  - Annual antibiogram
  - Outbreak detection
  - Macros, reports, and automation
- Can we apply in South Africa?

The complete laboratory information system

- Clinical reporting
  - return results to clinicians
  - permanent record
- Laboratory management system
  - preliminary and final results
  - guide technologists through needed laboratory tests
  - billing and financial accounting
- Data analysis

Uses of microbiology data

- Laboratory quality improvement
  - Laboratory testing
  - Utilization of laboratory services by clinical staff
- Infection control and outbreak preparedness
  - Identification of new and problem pathogens
  - Identification and investigation of outbreaks
- Antimicrobial policy
  - Trends in infections and resistance
  - Characterization of cross-resistance
  - Development of treatment guidelines
- Research
  - New resistance mechanisms
  - Risk factors for resistance
- Evaluation of interventions

WHONET: A microbiology data management tool

- Enhance the use of locally-generated data
  - Antimicrobial policy, infection control
  - Laboratory quality assurance
- Promote collaborations
  - National and international networks

WHONET around the World

- WHONET is currently used in approximately 110 countries, managing data from over 1500 laboratories.
  - Hospital and public health laboratories
  - Food and veterinary laboratories
  - Reference and research laboratories

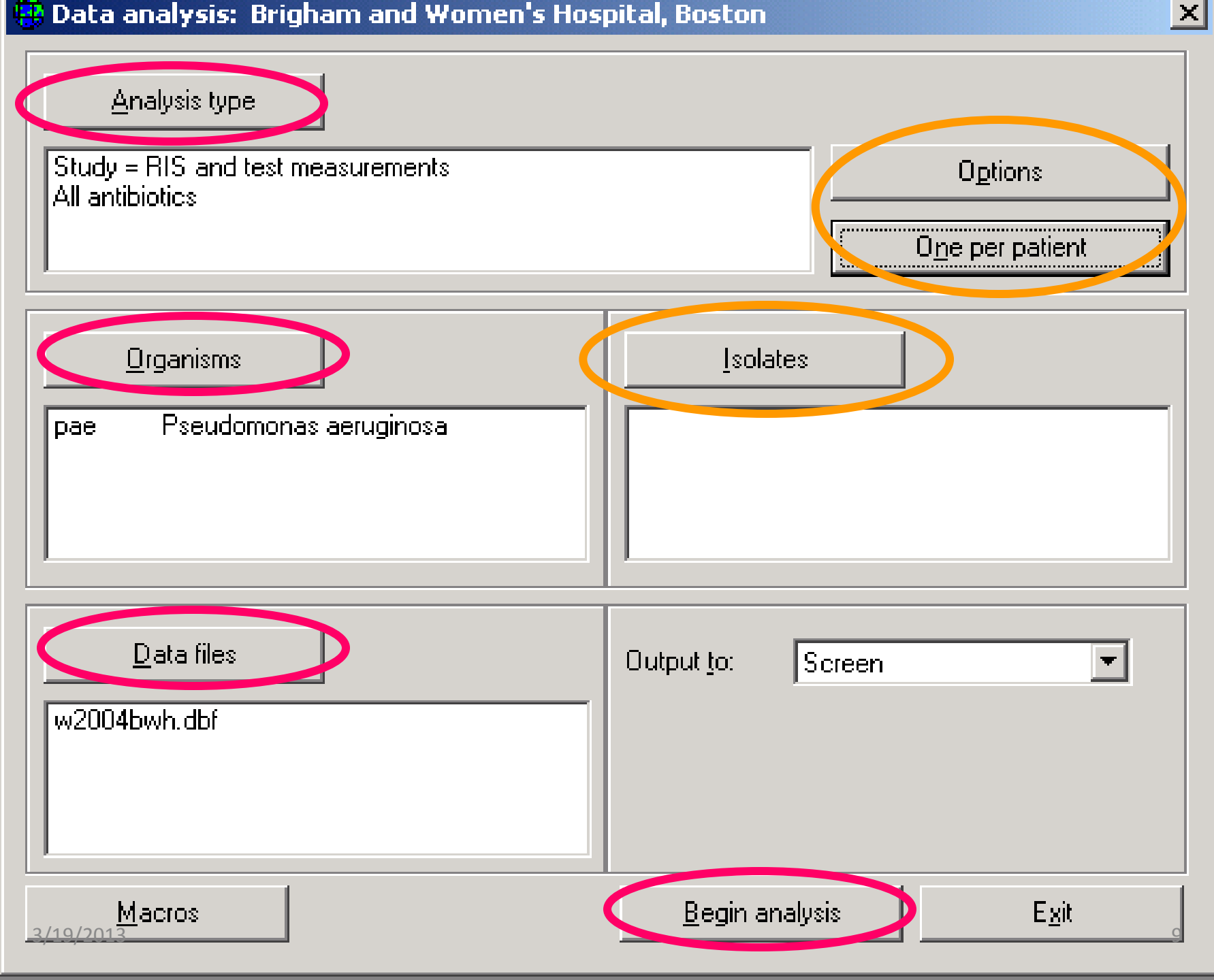
- Data collections
  - Routine laboratory data
  - Special surveys and research protocols

WHONET Use in the World

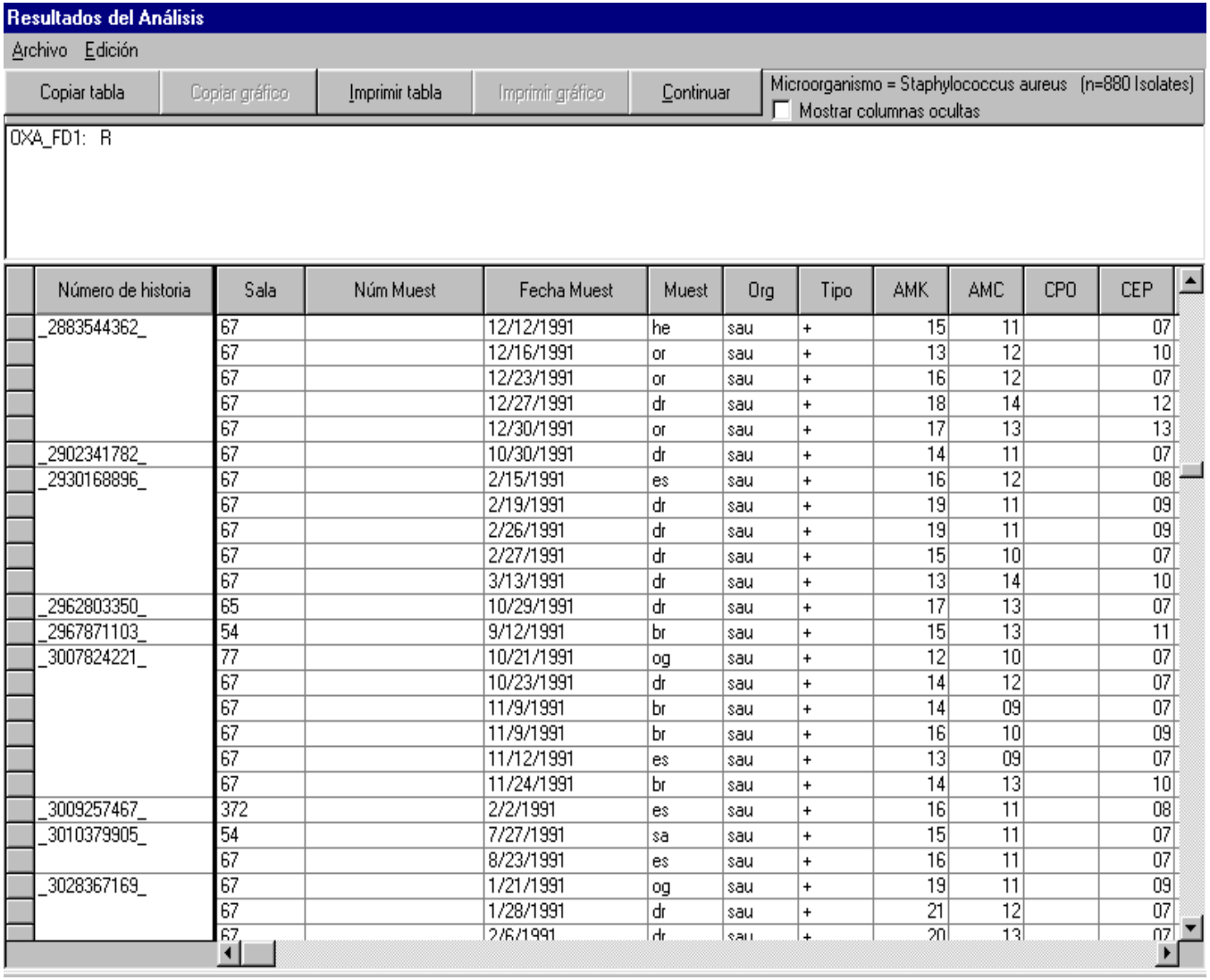
- **African Regional Office of WHO (AFRO)**
  - Algeria, Kenya, Namibia, South Africa, Tanzania, Zambia
- **Eastern Mediterranean Regional Office of WHO (EMRO)**
  - Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Saudi Arabia, Tunisia
- **European Regional Office of WHO (EURO)**
  - Austria, Belgium, Bosnia, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Ukraine, United Kingdom
- **Pan-American Health Organization (PAHO)**
  - Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, United States, Uruguay, Venezuela
- **South-East Asian Regional Office of WHO (SEARO)**
  - India, Indonesia, Sri Lanka, Thailand
- **Western Pacific Regional Office of WHO (WPRO)**
  - China, Hong Kong (China), Japan, Republic of Korea, Malaysia, Philippines, Singapore, Taiwan, Viet Nam

WHONET Availability

- Free of charge from WHO
  - www.whonet.org
- The software includes 20 languages
  - English, Estonian, French, German, Italian, Norwegian, Polish, Portuguese, Serbian, Spanish
  - Bulgarian, Greek, Russian
  - Chinese, Indonesian, Japanese, Thai
  - In development: Croatian, Latvian, Lithuanian, Romanian


Data analysis: Brigham and Women's Hospital, Boston
Analysis type
Study = RIS and test measurements
All antibiotics
Options
One per patient
Organisms
pae Pseudomonas aeruginosa
Isolates
Data files
w2004bwh.dbf
Output to:
Screen
Macros
Begin analysis
Exit

Isolate listing: list of patients with MRSA



Resultados del Análisis

Archivo Edición

Copiar tabla | Copiar gráfico | Imprimir tabla | Imprimir gráfico | Continuar

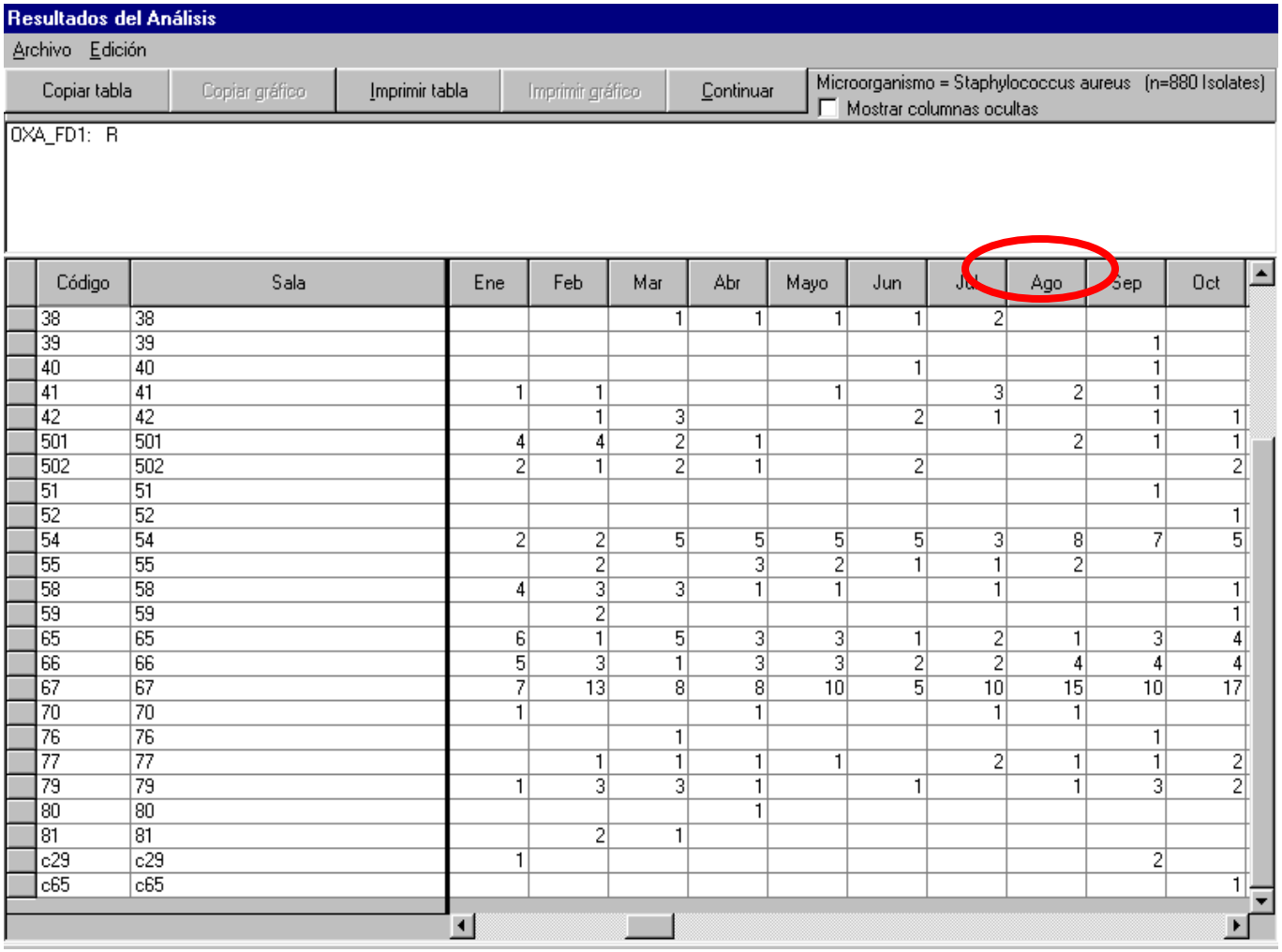
Microorganismo = Staphylococcus aureus (n=880 Isolates)

Mostrar columnas ocultas

OXA_FD1: R

Número de historia	Sala	Núm Muest	Fecha Muest	Muest	Org	Tipo	AMK	AMC	CPO	CEP
_2883544362_	67		12/12/1991	he	sau	+	15	11		07
	67		12/16/1991	or	sau	+	13	12		10
	67		12/23/1991	or	sau	+	16	12		07
	67		12/27/1991	dr	sau	+	18	14		12
	67		12/30/1991	or	sau	+	17	13		13
_2902341782_	67		10/30/1991	dr	sau	+	14	11		07
_2930168896_	67		2/15/1991	es	sau	+	16	12		08
	67		2/19/1991	dr	sau	+	19	11		09
	67		2/26/1991	dr	sau	+	19	11		09
	67		2/27/1991	dr	sau	+	15	10		07
	67		3/13/1991	dr	sau	+	13	14		10
_2962803350_	65		10/29/1991	dr	sau	+	17	13		07
_2967871103_	54		9/12/1991	br	sau	+	15	13		11
_3007824221_	77		10/21/1991	og	sau	+	12	10		07
	67		10/23/1991	dr	sau	+	14	12		07
	67		11/9/1991	br	sau	+	14	09		07
	67		11/9/1991	br	sau	+	16	10		09
	67		11/12/1991	es	sau	+	13	09		07
	67		11/24/1991	br	sau	+	14	13		10
_3009257467_	372		2/2/1991	es	sau	+	16	11		08
_3010379905_	54		7/27/1991	sa	sau	+	15	11		07
	67		8/23/1991	es	sau	+	16	11		07
_3028367169_	67		1/21/1991	og	sau	+	19	11		09
	67		1/28/1991	dr	sau	+	21	12		07
	67		2/6/1991	dr	sau	+	20	13		07

Isolate Summary: number of patients with MRSA by location and month


Resultados del Análisis

Archivo Edición

Copiar tabla | Copiar gráfico | Imprimir tabla | Imprimir gráfico | Continuar

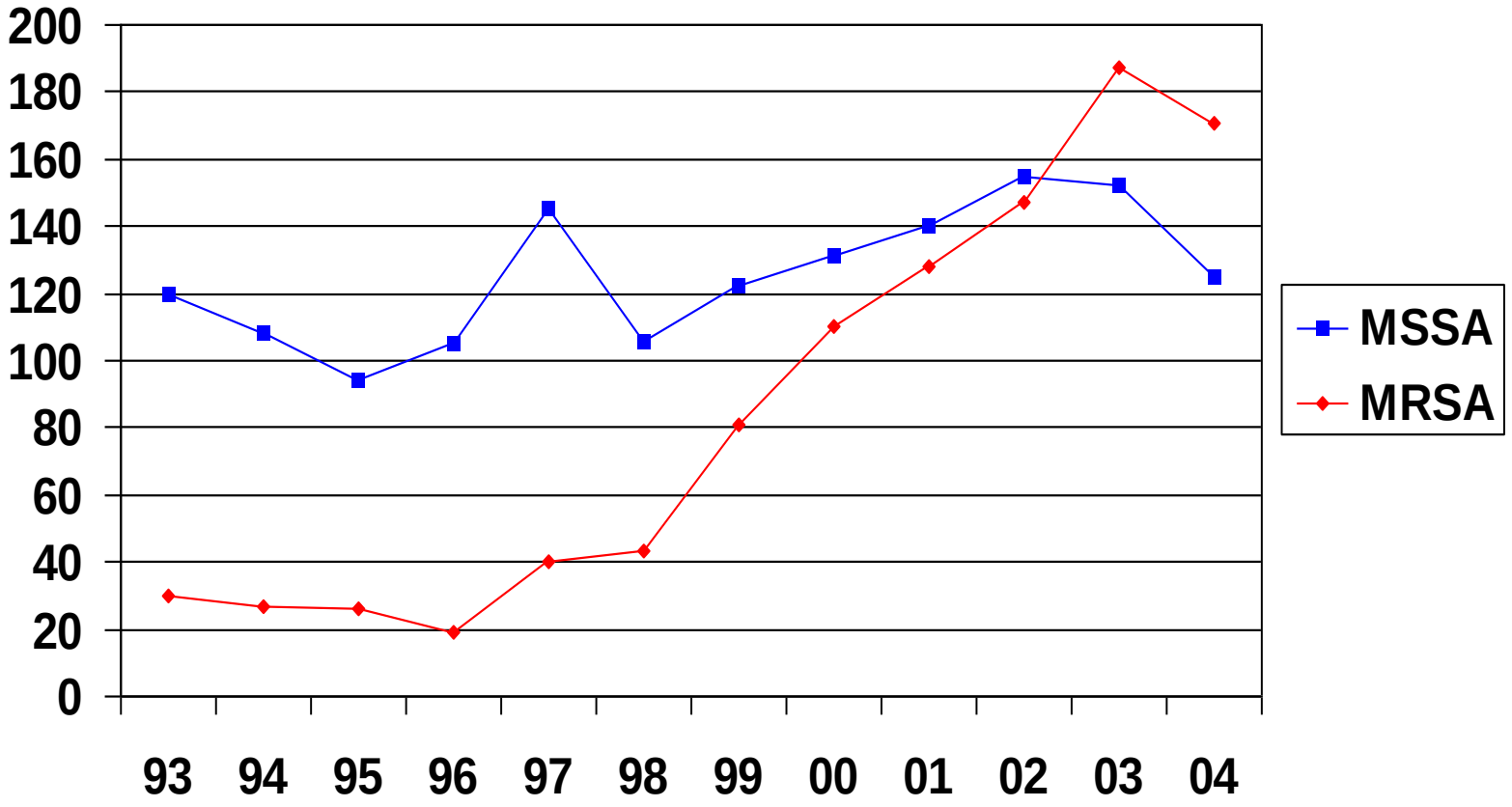
Microorganismo = Staphylococcus aureus (n=880 Isolates)

Mostrar columnas ocultas

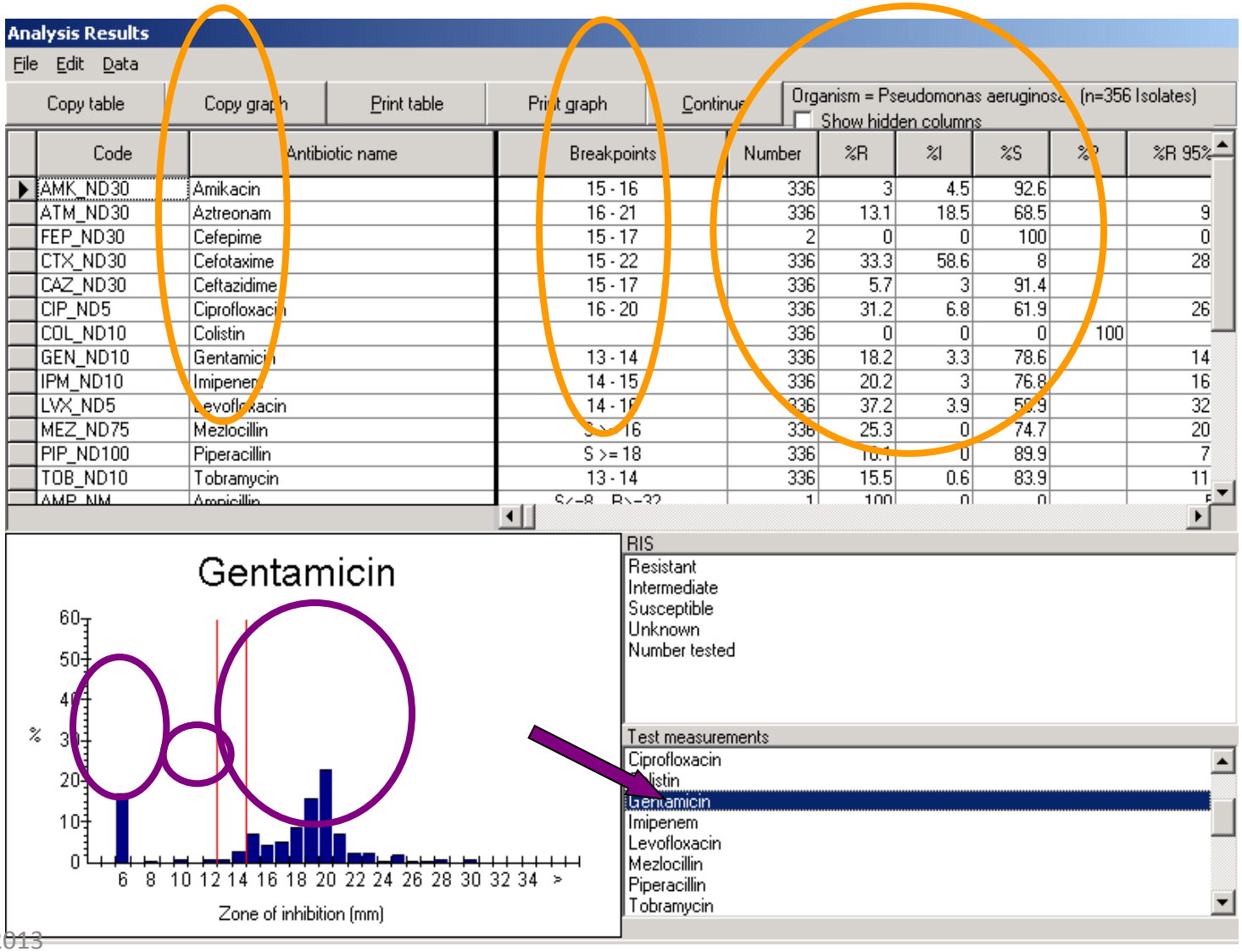
OXA_FD1: R

Código	Sala	Ene	Feb	Mar	Abr	Mayo	Jun	Jul	Ago	Sep	Oct
38	38			1	1	1	1	2			
39	39									1	
40	40						1			1	
41	41	1	1			1		3	2	1	
42	42		1	3			2	1		1	1
501	501	4	4	2	1				2	1	1
502	502	2	1	2	1		2				2
51	51									1	
52	52										1
54	54	2	2	5	5	5	5	3	8	7	5
55	55		2		3	2	1	1	2		
58	58	4	3	3	1	1		1			1
59	59		2								1
65	65	6	1	5	3	3	1	2	1	3	4
66	66	5	3	1	3	3	2	2	4	4	4
67	67	7	13	8	8	10	5	10	15	10	17
70	70	1			1			1	1		
76	76			1						1	
77	77		1	1	1	1		2	1	1	2
79	79	1	3	3	1		1		1	3	2
80	80				1						
81	81		2	1							
c29	c29	1								2	
c65	c65										1

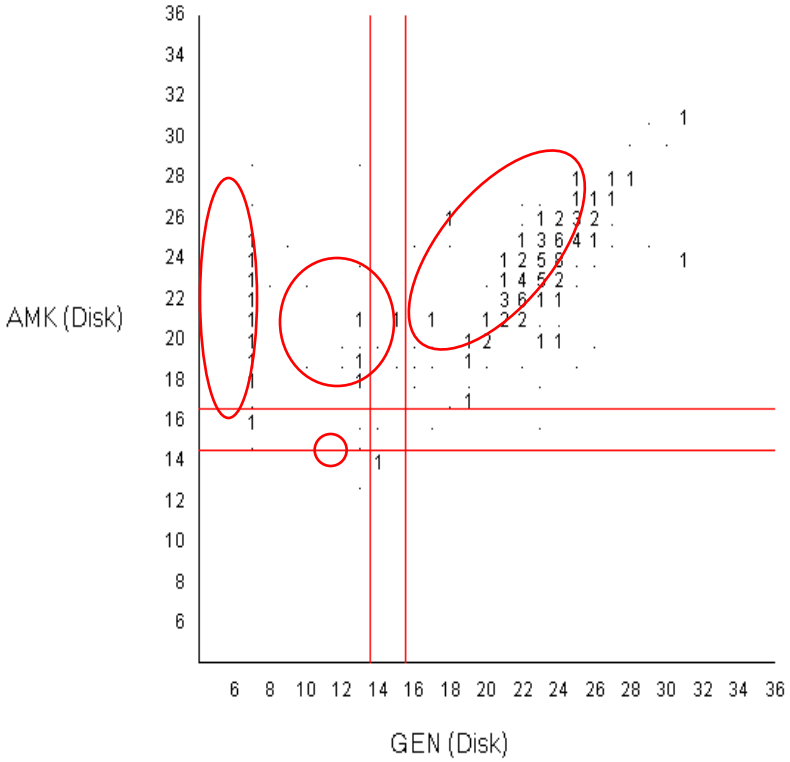
Blood isolates of *Staphylococcus aureus* at a U.S. Hospital, 1993-2004



%RIS and histograms: *Pseudomonas aeruginosa*



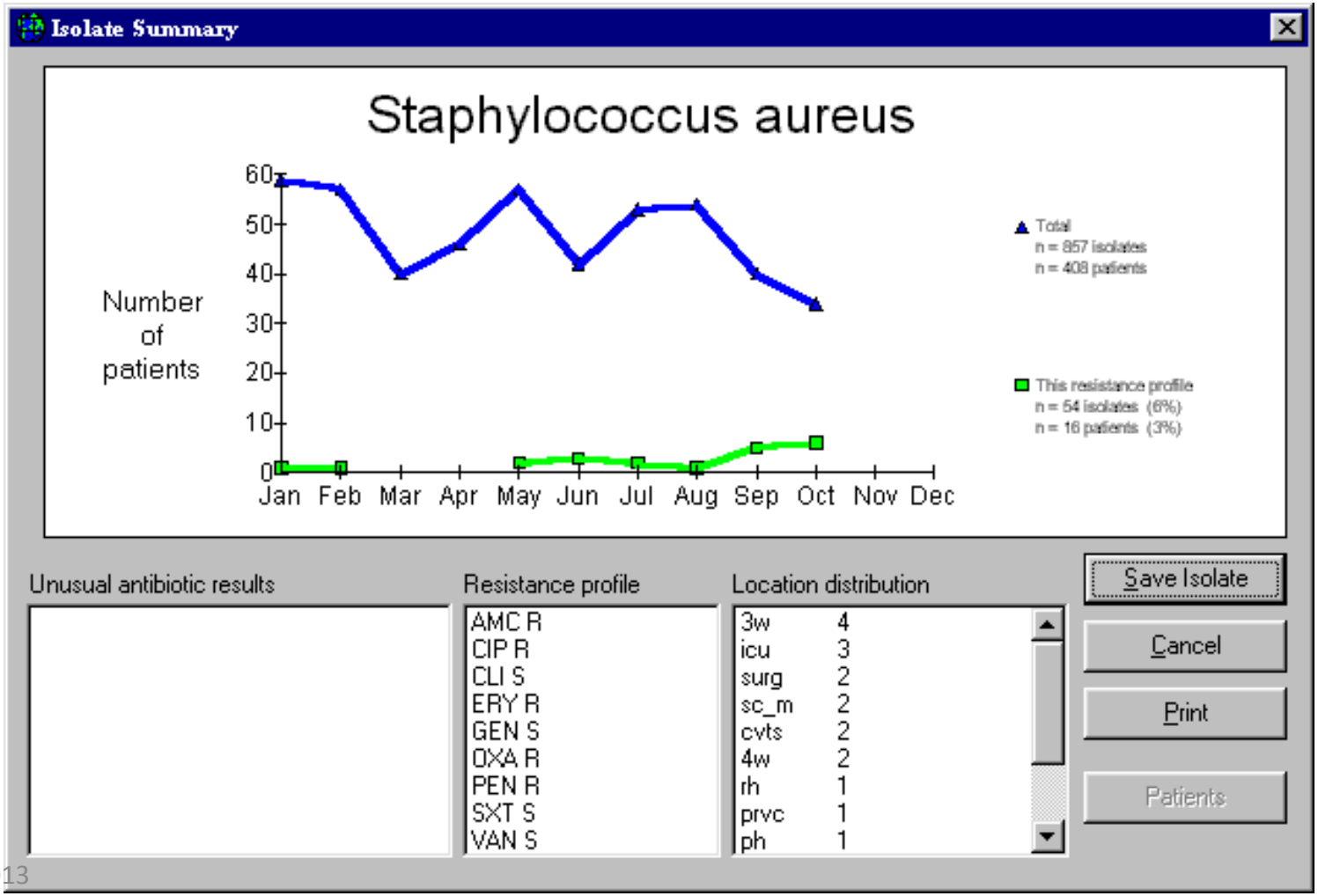
Scatter plot - *Klebsiella pneumoniae* amikacin *vs.* gentamicin



AMK (Disk)	R	I	S
S	10%	1.1%	85.9%
I	1.4%	0.3%	0.5%
R	0.3%	0.5%	

GEN (Disk)

Staphylococcus aureus
total and by resistance profile



Resistance profiles: *Klebsiella pneumoniae* multi-resistant clone beginning in July 1991

Resultados del Análisis

Archivo Edición

Copiar tabla | Copiar gráfico | Imprimir tabla | Imprimir gráfico | Continuar | Microorganismo = Klebsiella pneumoniae ss. pneumoniae | Mostrar columnas ocultas

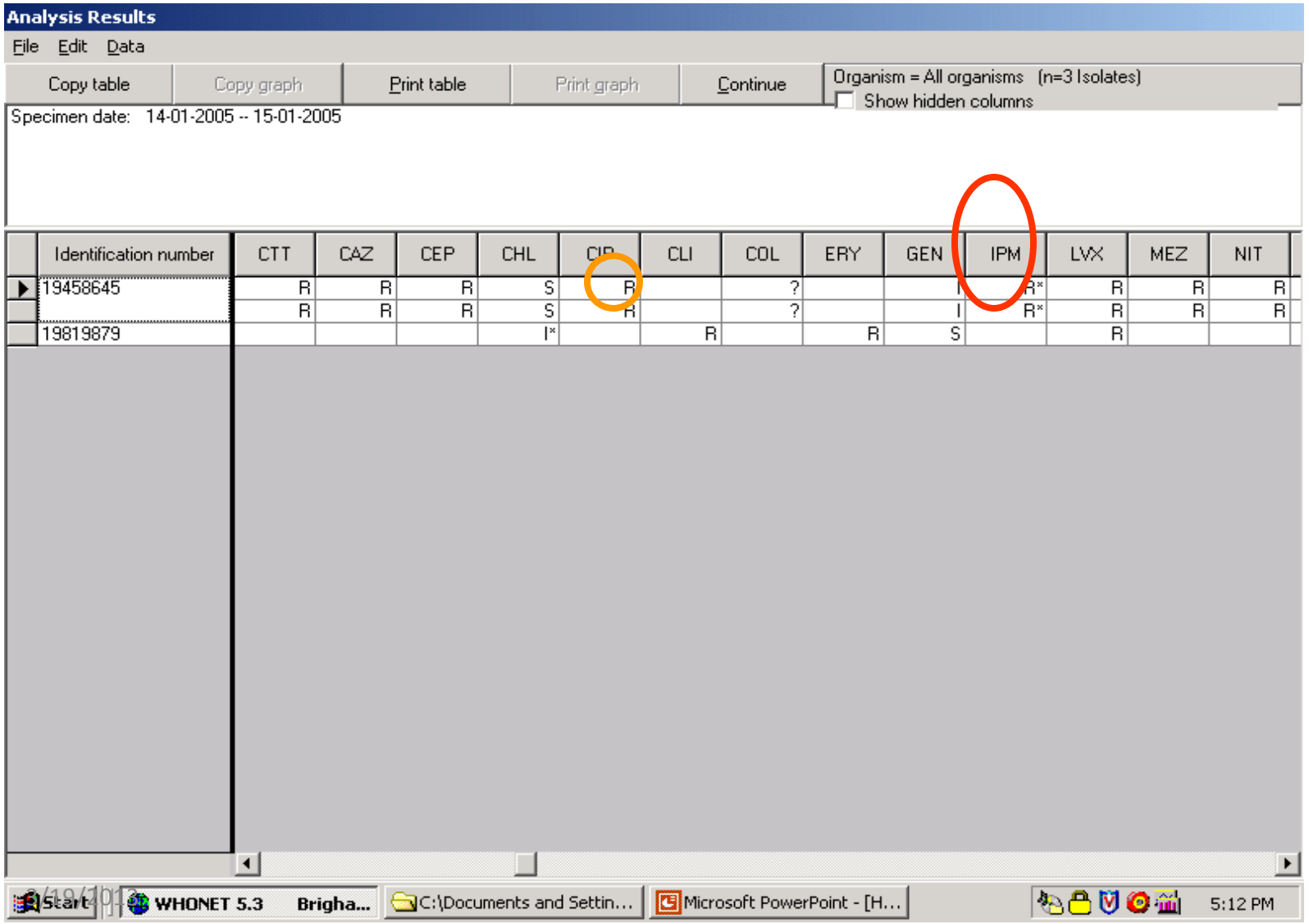
letra = Resistente
O Intermedio
Espacio = Sensible
\- = No probado

A = AMP 11 - 16
T = TCY 17 - 18
C = CHL 19 - 22
G = GEN 14 - 15
B = TOB 14 - 15

M = AMK 15 - 16
F = CAZ 15 - 20
X = CTX 15 - 20

Org	Perfil	Ene	Feb	Mar	Abr	Mayo	Jun	Jul	Ago	Sep	Oct	Nov	Dic
kpn	A CG		1										
	ATC	3	5	3		4	2	3		3	5	2	3
	A GB X	2	1										
	A C B F							2			2		
	A CGB	1		1	1								
	AT B F								1				
	AT GB			1									
	ATC F											1	
	ATC B						1			1			
	ATCG			1		1							
	A C B FX	1											
	A CGB X							1					
	AT B FX								1				
	ATC B F						1	2			1		
	ATCGB			1				3	1		1	1	
	A C BMFX		1										
	A CGB FX	2	1										
	A CGBMF	1											
	ATC B FX		1				1		1	1		2	
	ATCGB F							1					
	A CGBMFX		1					1					
	ATC BMFX								1				
	ATCGB FX				1		2	1	1				
	ATCGBMFX							1	1	1	1	2	

Bac Track Expert System
Isolate alerts

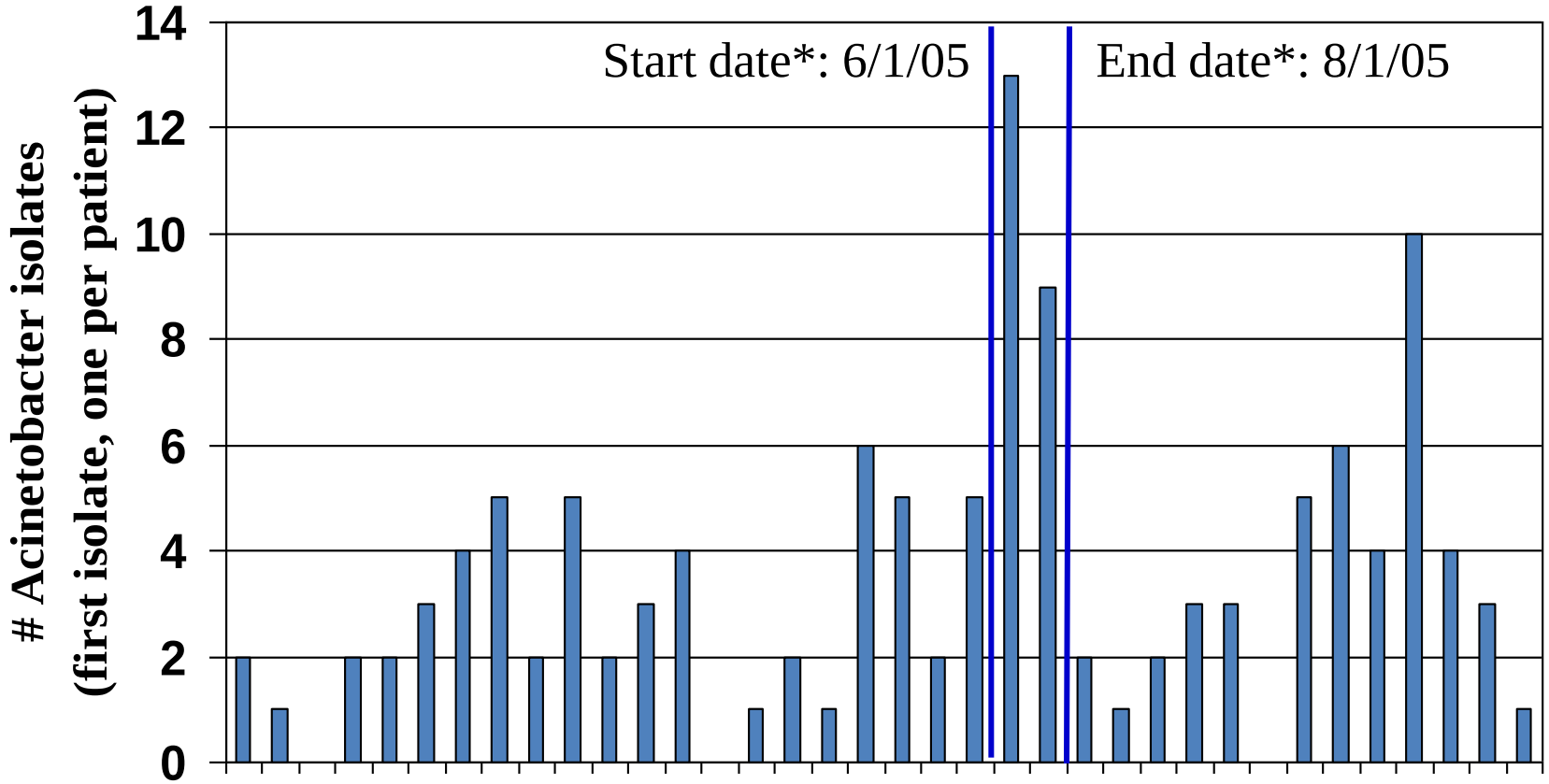


Example WHONET Clusters

Clusters	Alert Type	Recur Interval	Start Date*	End Date*	Initial Obs	Initial Exp	Total Obs	Total Exp
A. baumannii	Hospital	625	6/1/05	8/1/05	6	0.7	20	8
S. aureus	Unit	667	6/1/04	6/20/04	5	0.4	7	1.1
E. faecalis	Service	1,429	1/1/05	1/25/05	3	0.3	4	0.6
S. marcescens	Abx Profile	10,000	1/1/04	5/1/04	2	0.1	11	1.4

*Dates are fictitious

Acinetobacter baumannii isolates



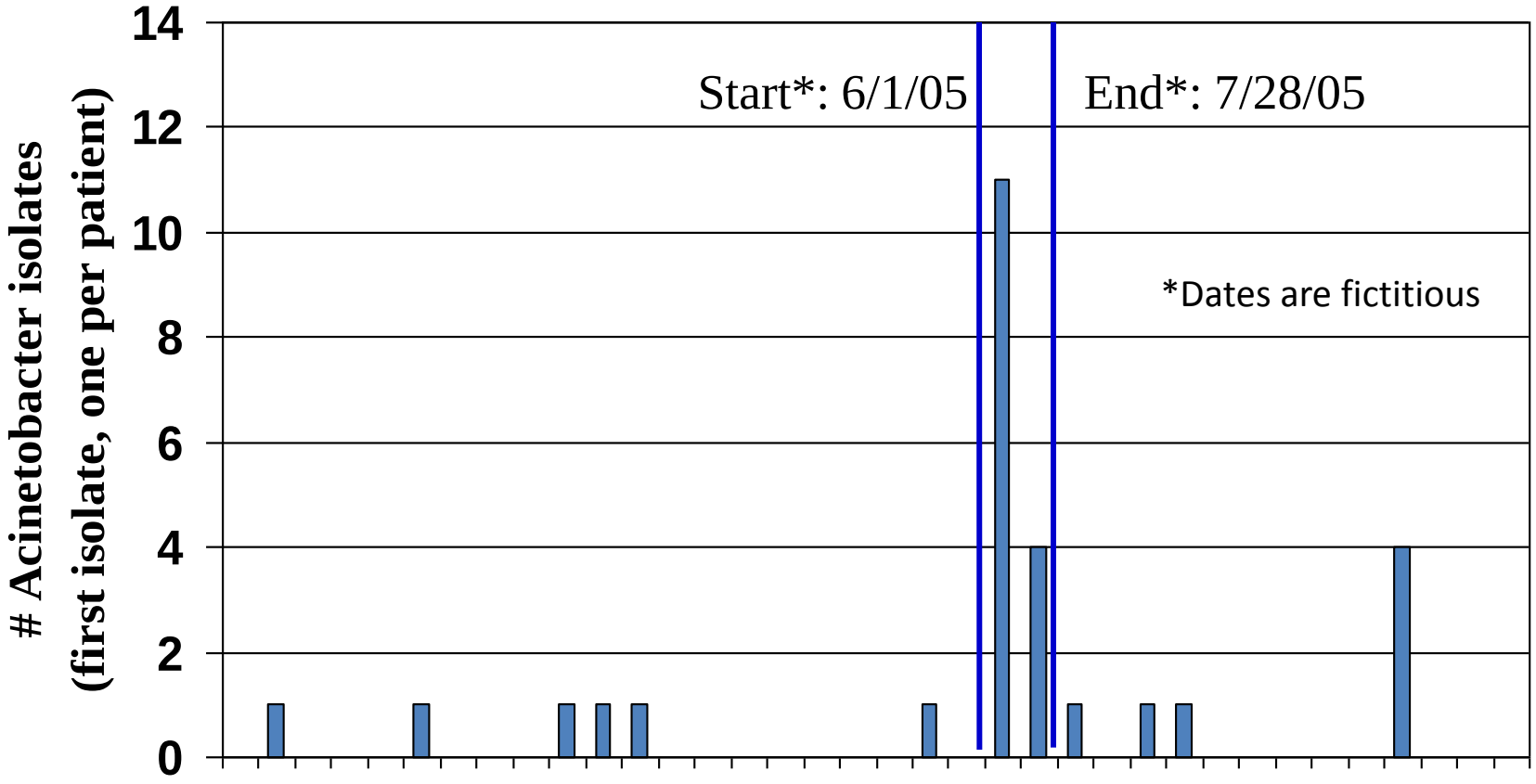
*Dates are fictitious

Acinetobacter baumannii clusters

Clusters	Alert Type	Recur Interval	Start Date*	End Date*	Initial Obs	Initial Exp	Total Obs	Total Exp
A. baumannii	Hospital	625	6/1/05	8/1/05	6	0.7	20	8.3
A. baumannii	Unit	2,000	6/1/05	7/10/05	3	0.3	4	0.6
A. baumannii	Abx Profile	10,000	6/1/05	7/28/05	6	1.7	15	7.5

*Dates are fictitious

Acinetobacter baumannii suspicious susceptibility pattern



Non-susceptible to 7 antibiotics: Ampicillin, Cefotaxime, Ceftazidime, Levofloxacin, Nitrofurantoin, Gentamicin, Trimethoprim/Sulfamethoxazole

BacLink 2
Microbiology data conversion utility

- Many laboratories in the world have already computerized their microbiology laboratory systems.
- This presents an obstacle and an opportunity.

Desktop softwares

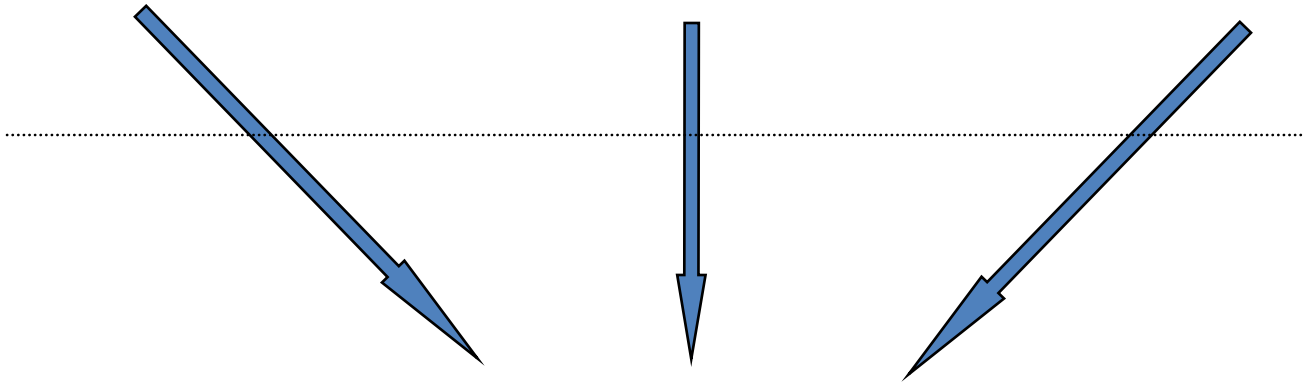
Excel
Access
EpiInfo

Laboratory systems

Mysis
MEDITECH
ADBakt

Laboratory instruments

MIC systems
Disk diffusion readers



BacLink

Data conversion

WHONET

Data analysis

Susceptibility testing instruments

Microdilution systems

- ATB
- Mast Scan
- MIC 2000
- Microscan
- Pasco
- Phoenix
- Sceptor
- Sensititre
- Vitek
- Wider

Disk diffusion readers

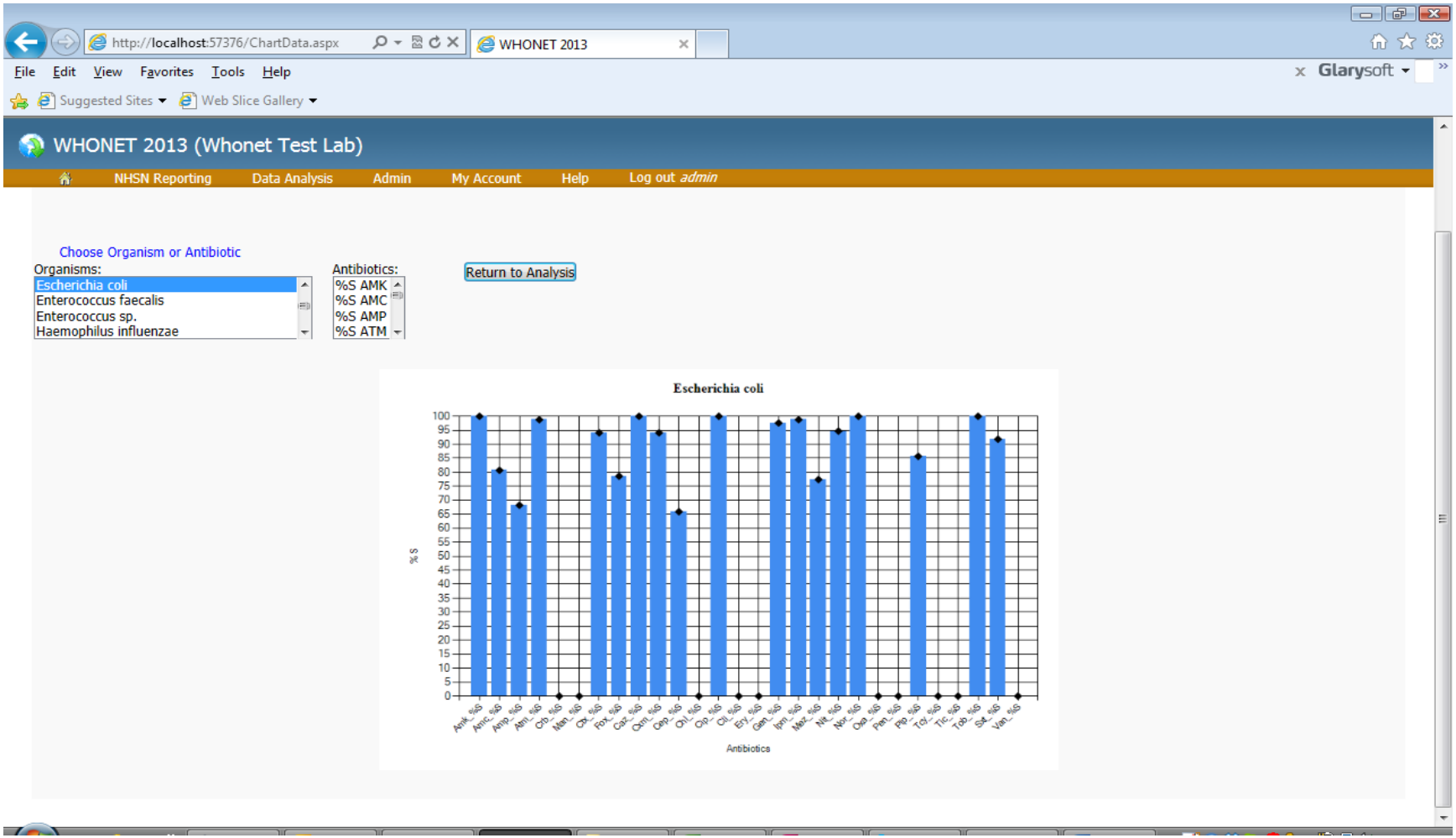
- Aura
- Biomic
- Mast Radius
- Osiris
- SirScan
- Videobac
- Wider

Laboratory information systems and other formats

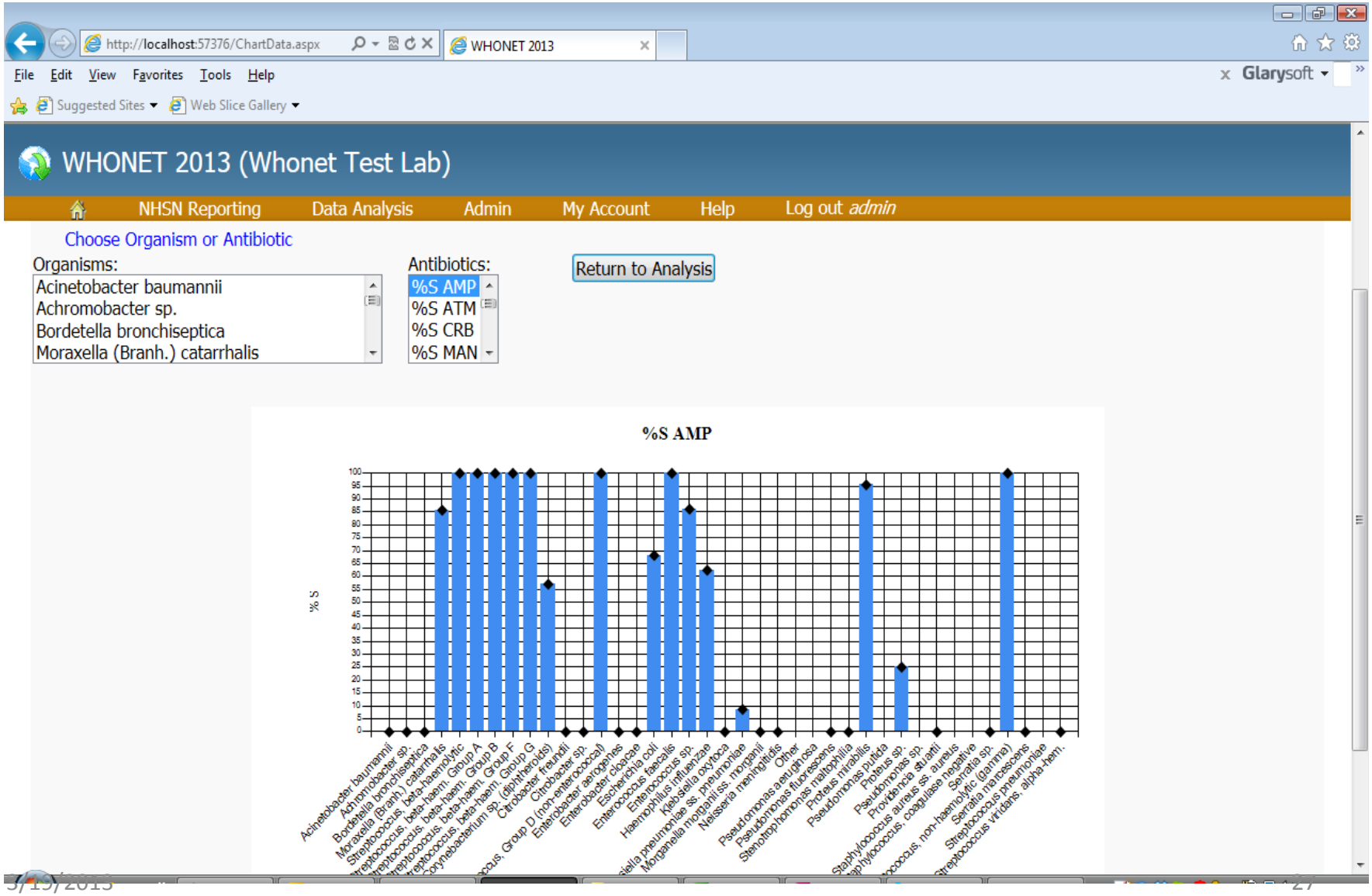
- Laboratory Information Systems
  - ADBakt (Sweden)
  - Cerner Classic
  - Cerner Millenium*
  - MADS (Denmark) System
  - Medicom
  - MEDITECH Client/Server
  - MEDITECH Magic
  - MYSIS*
  - Oman Laboratory Information
  - WinPath
- Other formats
  - CDC ELR format*
  - EARSS (European Union)
  - JIAQA (Japan)
  - NARMS (United States)
  - NORM (Norway)
  - WHO-AFRO Bacteriology Lab (Africa)

* = In development

%S Statistics for *E. coli*



%S Statistics for Ampicillin



WHONET use for AST for anaerobes

Clinically significant anaerobic bacteria isolated from patients in a South African academic hospital – antimicrobial susceptibility testing

S Naidoo, O Perovic, G A Richards, A G Duse October 2011, Vol. 101, No. 10 SAMJ

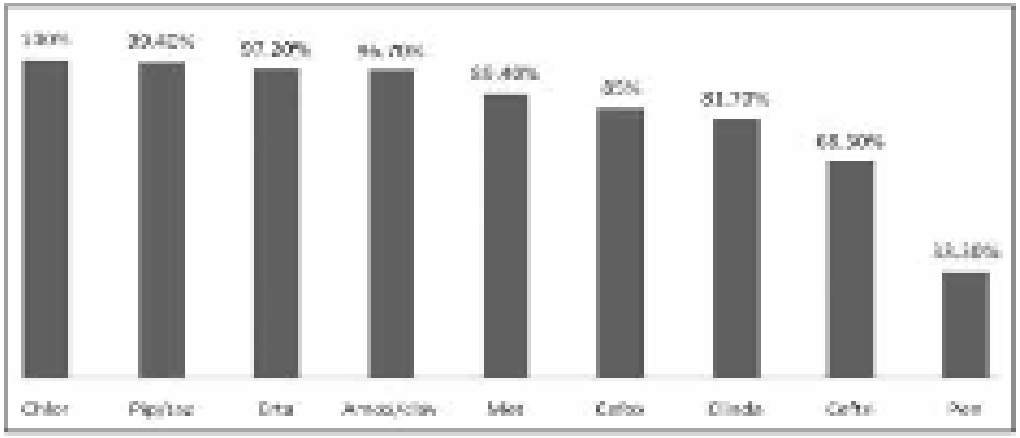


Fig. 1. Antimicrobial activities of 9 agents against all 180 anaerobic organisms.

Thank you for your attention!
And I wish to thank John Stelling for his support and allow me to use his material for presentation.

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