WHONET

Resistance Profiles



WHO Collaborating Centre for Surveillance of Antimicrobial Resistance

Boston, July 2022

Part 1. Antimicrobial resistance profiles

The final analysis that covered in this tutorial is the study of multi-resistance patterns using the analysis "Resistance profiles". Click on "Analysis type", and select "Resistant profiles". Because you are analyzing only one month of data, change the option "Month" in the middle of the screen to "Day".

Analysis type C Isolate listing and summary C % <u>R</u> IS and test measurements C <u>M</u> ulti-File %RIS and distributions	 Scatterplot Resistance profiles BacTrack - Isolate alerts Cluster detection
Report format 1. Listing 2. Summary ✓ Tables ✓ Graphs ④ Graphs ④ 3. Both	Summary Rows Resistance profile Columns Specimen date Day
Antibiotics Profile selection Automatic Include cluster alerts	Edit Profiles Cluster alerts

Then "OK" and "Begin analysis". The following isolate listing shows the bottom portion of the output.

lysis Results								🧷 Microphone 🛛 👰 Tool	s Rì C	
Edit Data										
Copy table Co	py graph	Print table	Print graph	Continue	Orga	anism = Staj Show hidde	phylococcus aur In columns	eus ss. aureus (n=86 Isolates)		
r = Resistant r intermediate e = Susceptible • Not tested		P = PEN S >= 0 = 0XA 11 - E = ERY 14 - C = CLI 15 - 2 G = GEN 13 -	29 12 22 0 14		T = R = V =	SXT 11 - 1 CIP 16 - 20 VAN S >= 1	5 5			
Identification number	Location	Specimen number	Specimen date	Specime n type	Organism	Organism	Profile	Resistance profile	PEN	
2175639469	csurg	_8989779431_	1/12/1995	ti	sau	+	ΡE	PEN ERY	16	
2253633137	csurg	8497348360	1/16/1995	wd	sau	+	PE	PEN ERY	14	
3276732611	csurg	_5501545556_	1/12/1995	an	sau	+	PE	PEN ERY	17	1
3394747373	csurg	_5308772735_	1/3/1995	wd	sau	+	ΡE	PEN ERY	13	1
3787251777	med1	_2482658810_	1/10/1995	sp	sau	+	ΡE	PEN ERY	15	Ē
4278468437_	med1	_4007572418_	1/12/1995	sp	sau	+	PE	PEN ERY	15	Ē
4628352016_	card	_0254239314_	1/18/1995	Ы	sau	+	PE	PEN ERY	15	Ē
5541251894_	neuro	_3266043238_	1/11/1995	wd	sau	+	PE	PEN ERY	12	Γ
5592728484	card	_4263578721_	1/18/1995	bl	sau	+	ΡE	PEN ERY	16	Ē
5896162606_	op	_6153460048_	1/25/1995	an	sau	+	PE	PEN ERY	12	Ē
6111029323_	card	_6243285689_	1/19/1995	Ы	sau	+	PE	PEN ERY	15	Г
6130695730_	csurg	_4753744358_	1/8/1995	th	sau	+	PE	PEN ERY	16	Ē
6147359758_	other	_4274227225_	1/31/1995	th	sau	+	ΡE	PEN ERY	12	Ē
6986161054_	card	_4461109465_	1/16/1995	ur	sau	+	ΡE	PEN ERY	12	Ē
8047770084_	card	_3150042708_	1/18/1995	ur	sau	+	PE	PEN ERY	15	Ē
9085120497_	card	_4011765263_	1/19/1995	Ы	sau	+	PE	PEN ERY	15	Ĺ.
1238843072_	er	_9921932435_	1/1/1995	fl	sau	+	PER	PEN ERY CIP	12	ĺ.
2109398192_	med1	_9565564435_	1/4/1995	wd	sau	+	PER	PEN ERY CIP	12	Ē
2232381088_	neuro	_5196466391_	1/23/1995	bf	sau	+	PER	PEN ERY CIP	11	Ē
3517258939_	er	_9598120009_	1/15/1995	ur	sau	+	PER	PEN ERY CIP	9	ĺ.
4573515957_	neuro	_5723451965_	1/31/1995	sp	sau	+	PER	PEN ERY CIP	16	Ľ
4849168779_	med1	_8122545878_	1/3/1995	no	sau	+	P-E R	PEN ERY CIP	9	É
0844575655_	med2	_0160995773_	1/25/1995	sp	sau	+	P EC R	PEN ERY CLI CIP	14	Ĺ
2133666291_	icu1	_3328458297_	1/12/1995	ur	sau	+	P EC R	PEN ERY CLI CIP	14	Ĺ
7300786709_	med2	_0426656102_	1/28/1995	sp	sau	+	PEC R	PEN ERY CLI CIP	13	Ĺ
1412374929_	oncol	_9806413557_	1/17/1995	wd	sau	+	POEC	PEN OXA ERY CLI	9	Ĺ
4025261715_	icu1	_4933799159_	1/19/1995	sp	sau	+	POEC	PEN OXA ERY CLI	11	Ĺ
1608132686_	card	_7019045586_	1/9/1995	sp	sau	+	POEC R	PEN OXA ERY CLI CIP	10	Ĺ
9876786254_	med1	_3984609303_	1/3/1995	wd	sau	+	POEC R	PEN OXA ERY CLI CIP	10	Ĺ
1013605973_	card	_1920548872_	1/5/1995	sp	sau	+	P ECGTR	PEN ERY CLI GEN SXT CIP	15	Ĺ
0844575655_	ор	_0160995773_	1/25/1995	ur	sau	+	POE GTR	PEN OXA ERY GEN SXT CIP	6	Ĺ
1137685856_	ор	_5108867058_	1/13/1995	ur	sau	+	POECGTR	PEN OXA ERY CLI GEN SXT CIP	6	Ĺ
1238843072_	op	_4268300617_	1/26/1995	ur	sau	+	POECGTR	PEN OXA ERY CLI GEN SXT CIP	6	1
1346406050	oncol	_2253236234_	1/6/1995	ur	sau	+	PUECGTR	PEN UXA ERY CLI GEN SXT CIP	6	Ĺ
5068601306	oncol	2749692996_	1/13/1995	sp	sau	+	POECGTR	PEN UXA ERY CLI GEN SXT CIP	6	Ĺ

This listing is very similar to the one you did in Data analysis 1 with the analysis option "Isolate listing and summary". But there are two additional columns: "Profile" (using one-letter antibiotic codes) and "Resistance profile" (using three-letter antibiotic codes). These columns indicate the multi-resistance pattern of the isolates. The profiles indicate the drugs to which the isolate is either resistant or intermediate (*i.e.* non-susceptible). For example "PE" = "PEN ERY" = isolates non-susceptible to penicillin and erythromycin, but susceptible to the other drugs requested.

Completely susceptible isolates appear at the top of the listing, followed by isolates nonsusceptible to one drug, then to two drugs, *etc.* Multi-resistant strains appear at the bottom of the listing. This analysis thus categorizes all of the observed isolates according to resistance phenotype. If a patient has multiple isolates, you can see whether the isolates have the same resistance phenotype, or whether the phenotype changes over time, for example accumulating mutations, resistance genes, and plasmids. By examining the dates and the room numbers, you may also detect possible outbreaks of certain strains of *S. aureus* as defined by their multi-resistance pattern.

Ana	lysis Re	sults											/ ^e Microph	none 👳 T	ools 🙎	÷	
Eile	Edit D	ata															
	Copy tabl	е Сору с	graph <u>P</u> rint	t table	Print graph	<u>C</u> ontinu	ie Org	ganism = Sta Show hidde	phylococc en columns	us aureus s ;	s. aureus	(n=86 Iso	ates)				
Letter = Resistant P = PEN S >= 29 0r intermediate 0 = 0X4 11 - 12 Space = Succeptible E = ERY 14 - 22 - = Not tested C = 0L1 15 - 20 G = 6ER 13 - 14 G						T = SXT 11. 15 R = CIP 16 - 20 V = VAN S >= 15											
	Org	Profile	R	esistance p	rofile	Num Isol.	%lsol.	Num Pat.	%Pat.	1-Jan-95	2Jan	3Jan	4Jan	5-Jan	6-Jan	7-Jan	8-Jan
	sau	E P P P P E P E C P P E C R P C C R P C C R P C C R P C C R P C C R P C R P P C R P P C R P P C R P P C R P P C R P P C R P P C R P P C R P P C R P P C R P C R P C R P C R P C R P C R P C R P C R P C R P C R P C R P C R P C R P C C C C	ERY PEN PEN C PEN ERY PEN ERY	CIP CIP CIP CIP J J CIP J CIP SEN SXT CI GEN SXT J GEN SXT	P JP CIP	10 4 27 4 3 19 5 5 1 1 3 2 2 2 2 1 1 1 4	12 5 31 5 22 6 1 1 3 2 2 2 1 1 5 5	10 4 26 4 3 19 5 1 1 3 3 2 2 2 2 1 1 1 4	13 5 34 25 7 1 1 4 3 3 3 1 1 5		1	1	1	1	1		
	S Number o patients		N OXA EI Cl 9-Jan 11-Jan 15-Jan 10-Jan 15-Jan 15-Jan	RY С Р	LIGEN \$	SXT an 25-ian 24-ian 25-ian	R 84 85 86 86 86 86 86 86 86 86 87 87 87 87 87 87 87 87 87 87 87 87 87	esistance pr au, PEN E au, PEN E au, PEN E au, PEN E au, PEN O au,	ofile RY RY RY CLI & ERY CLI & ERY CLI RY CLI GE & ERY CLI	CIP CIP CIP EN SXT CIP EN SXT CI GEN SXT) P CIP						

Click on "Continue" to see a summary of this list.

This output summarizes findings for all resistance phenotypes observed in the database. In this sample database, you will see that the most common phenotype is pan-susceptible (susceptible to all drugs requested) followed by "PEN" (non-susceptible to penicillin). Among MRSA isolates, the most common phenotype is "PEN OXA ERY CLI GEN SXT CIP", in other words non-susceptible to all drugs requested with the exception of vancomycin. The day-by-day distribution of this MRSA phenotype is shown in the graph.

Click on "Continue" to return to the main menu.

In this analysis, WHONET did not analyze results for all of the drugs tested again *S. aureus*. Instead, WHONET used the drugs indicated in the laboratory configuration. To see and modify the drugs used for this analysis, click on "Analysis type" and "Edit profiles".

Antibiotic profiles (Optional)	X
 Antibiotic profiles (Optional) The analysis 'Resistance profiles' uses the phenotype. Organism groups Staphylocooccus Streptococcus pneumoniae Streptococcus pneumoniae Streptococcus viridans Enterococcus suitans Enterococcus curitans Enterococcus suitans Enterococcus Gram negative urine Gram negative urine Salmonella Shigella Pseudomonas Non-fermenters Haemophilus Campylobacter Neisseria gnorrhoeae Neisseria meningitidis Anaerobes Mycobacteria Fungi Parasites	Antibiotics to classify organisms according to their resistance PEN DXA ERY CLI GEN SXT CIP VAN (NIT) PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (PEN ERY CLI OXA GEN VAN SXT AMC CIP (NIT) PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (PEN ERY TCY CHL NIT CLI CEP AMP (DXA GEN VAN SXT OFX (CEP AMP GEN SXT CTX IPM CXM MEZ ATM NOR AMC (NIT) CEP AMP GEN SXT CTX IPM CXM MEZ ATM NOR AMC (NIT) CEP AMP GEN SXT FOX CTX CAZ IPM (CXM MEZ CIP ATM) CHL TOB AMK GEN CBB PIP CAZ IPM MEZ CIP ATM) CHL TOB AMK GEN CBB PIP CAZ IPM MEZ CIP ATM (SXT) PEN ERY TCY CHL NIT SST TOB CLI (CEP AMP AMK OXA GEN AMP SXT CTX IPM AMC CXM CIP PEN ERY TCY CHL NIT SST TOB CLI PEN ERY TCY CHL NIT SSS TOB CLI
<u>E</u> dit	Add Delete OK

This list indicates which antimicrobials will be used, by default, for each organism group. For the item "Staphylococcus", click on "Edit".



On this screen, you can select the drugs to use for the resistance profiles. Drugs in the box "Profile antibiotics" will be used to define the resistance phenotype. Drugs appearing under "Supplementary antibiotics" will appear in the line-listing, but are not used to define the resistance phenotype.

<u>Note</u>: Any modifications that you make to the profile antibiotics while you are in the Data analysis area of WHONET will be forgotten as soon as you leave WHONET. Any edits that you do here are temporary. To save the changes permanently for future use, you will need to use the WHONET configuration program. To do this, you will need to go back to the main WHONET screen and select "Modify laboratory" and "Antibiotics". You will see a button called "Profiles". After you change the profile antibiotics, click on "Save" to save them into your laboratory configuration.