
senaite.ast Documentation

Release 1.0.0

**Riding Bytes
Naralabs**

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CONTENTS

1	Installation	3
2	Quickstart	5
2.1	Adding a pre-defined AST Panel	5
2.2	Microorganism identification analysis	6
2.3	Assignment of an AST Panel to a Sample	7
2.4	Custom AST Panel for a Sample	7
2.5	Selective reporting	9
3	Changelog	11
3.1	1.0.0 (unreleased)	11
4	License	13

This add-on enables Antibiotic Sensitivity Testing (AST) for [SENAITE LIMS](#) by allowing the user to add analyses to a sample that are specifically designed for the measurement of the susceptibility of microorganisms to antibiotics. These analyses can be added either by means of pre-defined AST Panels or by direct assignment of Antibiotics and Microorganisms through a matrix.

[senaite.ast](#) also incorporates a default analysis for the identification of microorganisms present in a given sample. Once microorganisms are identified by means of this identification analysis, the system automatically populates the list of available AST Panels for selection with those that fit better with the identified microorganism(s).

Resistance analyses are qualitative and the supported results are: [R]esistant, [S]ensible, [+] positive and [-] negative. Although user can configure AST Panels for the automatic addition of analyses for the capture of diameter of the zone of inhibition, the system does not automatically calculate the qualitative results based on the diameter of zone and the minimum inhibitory concentrations (MICs).

Once installed, this add-on allows the laboratory to:

- Maintain microorganisms (via [senaite.microorganism](#))
- Maintain antibiotics and antibiotic classes (via [senaite.abx](#))
- Maintain pre-defined AST Panels
- Analysis for the identification of microorganisms
- Assignment of pre-defined AST Panels to a sample
- Sample-level customization of AST Panel
- Selective reporting of resistance results

This documentation is divided in different parts. We recommend that you get started with [Installation](#) and then head over to the [Quickstart](#).

Table of Contents:

INSTALLATION

Add `senaite.ast` in the eggs section of your buildout:

```
eggs =  
    ...  
    senaite.ast
```

Run `bin/buildout` afterwards. With this configuration, buildout will download and install the latest published release of `senaite.ast` from Pypi, as well as `senaite.microorganism` and `senaite.abx` if not yet installed.

Once buildout finishes, start the instance, login with a user with “Site Administrator” privileges and activate the add-on:

http://localhost:8080/senaite/prefs_install_products_form

Note: It assumes you have a SENAITE zeo client listening to port 8080

QUICKSTART

This section gives an introduction about [senaite.ast](#). It assumes you have [SENAITE LIMS](#) and `senaite.ast` already installed. Please read the [Installation](#) for further details.

2.1 Adding a pre-defined AST Panel

To add pre-defined AST Panels, click the “gear” icon from top right, go to “AST Panels” view.

⚙️ AST Panels ⊕ Add

Active Inactive All

Search ↻ 🔍

...

<input type="checkbox"/>	Title	Microorganisms	Antibiotics
<input type="checkbox"/>	Gram negative panel	Acinetobacter baumannii*, Pseudomonas aeruginosa*, Staphylococcus aureus*, Helicobacter pylori, Salmonella spp, Neisseria gonorrhoeae, Haemophilus influenzae, Klebsiella pneumoniae*, Enterobacter cloacae*	Amp, Amc, Cro, Cn, Nor, Cip, F, Sxt, Mem, Caz, Tzp, Ak, C, Te, Pef
<input type="checkbox"/>	Gram positive panel	Enterococcus faecium*, Staphylococcus aureus*, Streptococcus pneumoniae*	Fox, C, E, Sxt, Te, Ox, Amp, Va, F

2 / 2 Export

From this view, you can either create a new AST Panel or edit an existing one:

Edit AST Panel

Title

Gram negative panel

Summary

Used in item listings and search results.

Microorganisms

The names of selected microorganisms are displayed as row headers in the sensitivity results entry view. From all microorganisms selected here, only those identified in the Sample are added in results entry view

Enterococcus faecium	→	Acinetobacter baumannii	↑
Shigella spp		Pseudomonas aeruginosa	
Streptococcus pneumoniae	←	Staphylococcus aureus	↓
		Helicobacter pylori	
		Salmonella spp	

Antibiotics

The abbreviations of selected antibiotics are displayed as column headers in the sensitivity results entry view

Cefoxitin	→	Ampicillin	↑
Erythromycin		Amoxy + clavulanate	
Oxacillin	←	Ceftriaxone	↓
Vancormycin		Gentamicin	
		Norfloxacin	

☒ Include zone size in mm

When enabled, an additional row for the introduction of the zone size (in mm) is displayed in the results entry view, below resistance call options

☒ Selective reporting

When enabled, an additional row to indicate whether the resistance result for each microorganism-antibiotic tuple has to be reported in results report or not

From this view, you can choose both the Microorganisms and the Antibiotics. Please read the [documentation of senaite.microorganism](#) and the [documentation of senaite.abx](#) for further details.

If the option “Include zone size in mm” is checked, besides the qualitative analysis for antibiotic susceptibility, the system will also add analyses for the capture of the zone of inhibition in mms automatically when this panel is selected.

If the option “Selective reporting” is checked, the system will also add an analysis to allow the user to indicate the resistance results to be displayed in results report. If unchecked, all resistance results will be rendered.

2.2 Microorganism identification analysis

Besides AST Panels, this add-on creates a new analysis service with name “Microorganism identification” and the category “Antibiotic Sensitivity Testing (AST)” as well.

When this “Microorganism identification” service is assigned to a Sample (either from Sample Add form or later, through “Manage analyses”), a new analysis with pre-defined result options is added.

Analyses

<input checked="" type="checkbox"/>	Analysis	Method	Instrument	Analyst	Status	Result	Specification	Retested	Attachments	Captured	Submitter	Due Date	Hidden
<input checked="" type="checkbox"/>	Microorganism identification	None	Manual	admin	Unassigned	<div>Enterobacter cloacae</div> <div>Enterococcus faecium</div> <div></div>		No				2020-12-03	<input type="checkbox"/>


1 / 1

Note: The selection list of this type of analysis is populated with the microorganisms registered in the system that are in “active” status.

This analysis behaves as a multi-selection list, so the user can choose as many microorganisms as required.

2.3 Assignment of an AST Panel to a Sample

For the assignment of an AST Panel to a sample, go to sample view. Below the analyses listing, a section for Sensitivity Testing is displayed:


 Antibiotic Sensitivities

Panels




<input checked="" type="checkbox"/>	Microorganism	Result	Status	Captured	Submitter
0 / 0 <input type="button" value="Export"/>					

Select one of the available AST Panels and press the button “Add”. Analyses are added automatically based on the settings of the AST Panel of choice.

Note: If no AST Panels are displayed, please check that at least one of the microorganisms identified (see *Microorganism identification analysis*) is assigned to a pre-defined AST Panel.

 Antibiotic Sensitivities

Panels

<input type="checkbox"/>	Microorganism	Result	Status	Ak	Amc	Amp	C	Caz	Cip	Cn	Cro	F	Mem	Nor	Captured	Submitter
<input type="checkbox"/>	Enterobacter cloacae	 Zone size (mm)	Unassigned	<input type="button" value="Ak"/>	<input type="button" value="Amc"/>	<input type="button" value="Amp"/>	<input type="button" value="C"/>	<input type="button" value="Caz"/>	<input type="button" value="Cip"/>	<input type="button" value="Cn"/>	<input type="button" value="Cro"/>	<input type="button" value="F"/>	<input type="button" value="Mem"/>	<input type="button" value="Nor"/>		
<input type="checkbox"/>		 Resistance	Unassigned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<input type="checkbox"/>		 Report	Unassigned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

3 / 3




You can add as many AST Panels as you wish, but only identified microorganisms will be added by default. Microorganisms are displayed in rows and Antibiotics (abbreviations) in columns.

2.4 Custom AST Panel for a Sample

Sometimes user might want to add additional microorganisms, even if they were not initially identified or add new Antibiotics, even if they weren’t defined in the pre-defined AST Panel of choice.

From same view, press the “Custom” button and a matrix with microorganisms as rows and antibiotics as columns is displayed for easy selection. By default, only microorganisms identified are displayed. However, user can press “All microorganisms” button to extend the list with the rest of microorganisms registered in the system:

AST Panel

Identified microorganisms
All microorganisms

Search

Microorganism	Ak	Amc	Amp	Fox	Caz	Cro	C	Cip	E	Cn	Mem	F	Nor	Ox	Pef	Tzp	Sxt	Te	Va
Acinetobacter baumannii	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enterobacter cloacae	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enterococcus faecium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haemophilus influenzae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helicobacter pylori	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Klebsiella pneumoniae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Neisseria gonorrhoeae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pseudomonas aeruginosa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salmonella spp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shigella spp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Staphylococcus aureus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streptococcus pneumoniae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12 / 12
Export

Note: System allows unbalanced entries, so user can choose different antibiotics for different microorganisms at will.

Once the button “Save” is pressed, the user is redirected to the Sample view and the list of AST analyses is updated accordingly:

Antibiotic Sensitivities

Panels
Select panel
Add
Custom ...
Selective reporting

Valid
Invalid
All

<input type="checkbox"/>	Microorganism	Result	Status	Ak	Amc	Amp	C	Caz	Cip	Cn	Cro	F	Mem	Nor	Captured	Submitter
<input type="checkbox"/>	Enterobacter cloacae	Zone size (mm)	Unassigned	Ak	Amc	Amp	C	Caz	Cip	Cn	Cro	F	Mem	Nor		
<input type="checkbox"/>		Resistance	Unassigned													
<input type="checkbox"/>		Report	Unassigned													
<input type="checkbox"/>	Enterococcus faecium	Zone size (mm)	Unassigned	Ak	Amc	Amp	C		Cip	Cn	Cro	F	Mem	Nor		
<input type="checkbox"/>		Resistance	Unassigned													
<input type="checkbox"/>		Report	Unassigned													
<input type="checkbox"/>	Haemophilus influenzae	Zone size (mm)	Unassigned	Ak	Amc	Amp	C	Caz	Cip	Cn	Cro	F	Mem	Nor		
<input type="checkbox"/>		Resistance	Unassigned													
<input type="checkbox"/>		Report	Unassigned													

9 / 9
Export

2.5 Selective reporting

User can easily set the resistance results to be included in the results report by means of the “Report” analysis. However, there is also the option to define the selective reporting all-at-once. Press the “Selective reporting” button and a matrix with microorganisms as rows and antibiotics as columns is displayed for easy selection.

AST Panel Selective Reporting

Microorganism	Ak	Ame	Amp	Caz	Cro	C	Clp	Cn	Mem	F	Nor
Enterobacter cloacae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enterococcus faecium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Haemophilus influenzae	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3 / 3

Export

Save

Cancel

From this view, user can choose the tuples Microorganism-Antibiotic to be reported in results. Once the button “Save” is pressed, the value for analyses with name “Report” for all microorganisms are updated accordingly.

CHANGELOG

3.1 1.0.0 (unreleased)

- Initial Release

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