Modified Logistic Model

$$y = \frac{a}{[1 + e^{(b-cx)}]}$$

$$Y = P2 + \frac{A - P2}{[1 + e^{\left(\left(\frac{\mu m}{A}\right)*(\lambda - t) + 2\right)}]}$$

Y = OD600

P2 = second measure point

A = three highest consecutive points

λ = lag phase

t = time

Determining the μ_{max}

- Input data: OD600 measures in time

- Averages of replicates are divided in overlapped windows of data points

- Window sizes are adjusted to assure the same time interval in each window if different experimental time intervals are compared.

- In every overlapping window, the doubling rate of the extreme points are used to determine the rate of growth:

$$\mu = \frac{2.303(\log(OD_2) - \log(OD_1))}{(t_1 - t_2)}$$

- The highest one is sorted out

Determining The λ

- The lag phase is an issue of controversy in the microbial kinetics literature.

- Many concepts are available, but there are only a few objective ways to actually calculate it from the data.

- To overcome this we plotted our data to the logistic model with $\lambda = 0$.

- Iterated over all time points for the lowest standard deviation between the model vs. the actual data.

- This standard deviation is also stored for a further T-test comparison (still under preperation…)
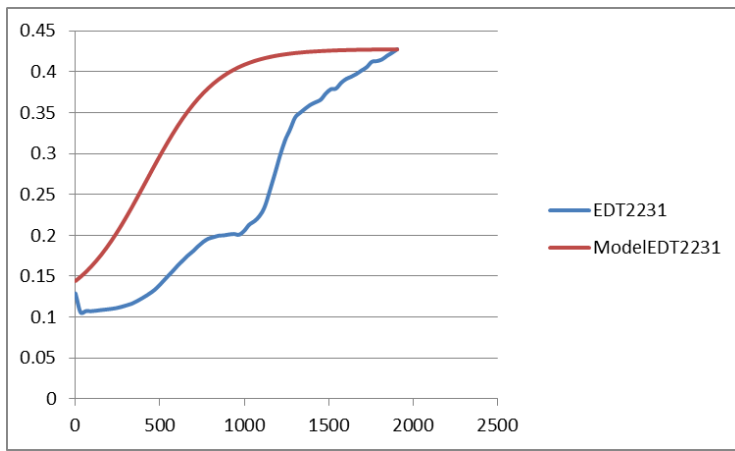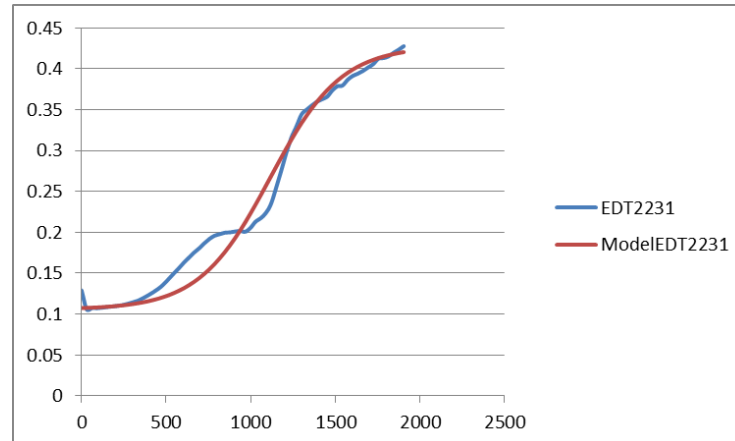
$$\lambda = 0$$

Stdev = 0.05324

$$\frac{\sum_{i=j=1}^{N} \sqrt{(xi - (\overline{xij}))^2}}{N}$$
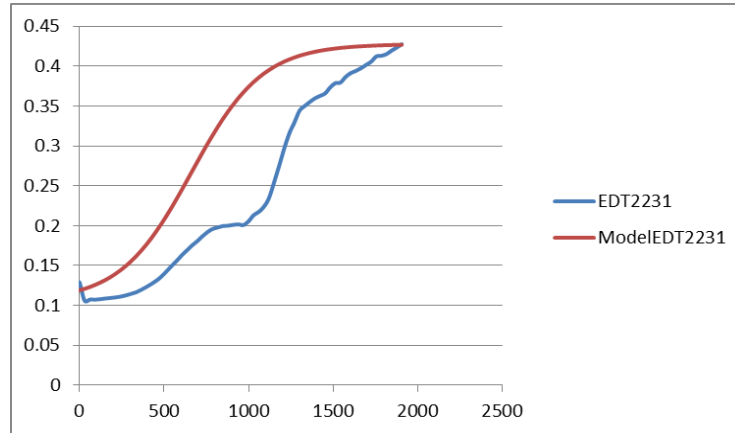
$$\lambda = 242$$

Stdev = 0.035192

$$\lambda = 696$$

Stdev = 0.0062439

Scoring

$$\frac{\sum_{i=j=1}^{N}\left(\frac{xi}{xj}\right)}{N}$$

Comparison of control x clones

Proportions	Scores	Predicted Performance
x ≥ 2	-4	Worst
2> x > 1.60	-3	Worst
1.60 ≤ x < 1.33	- 2	Worst
1.33 ≤ x < 1.14	- 1	Same
1.14 ≤ x < 0.8	0	Same
0.8 ≤ x < 0.65	1	Same
o.66 ≤ x < 0.57	2	Better
0.57 ≤ x < 0.5	3	Better
X ≤ 0.5	4	Better

Example Output

| Clone	Growth Condition	μ_{max}	λ	Asymptote	Score	Predicted performance
EDT2231	Adenosine, 0,2%	0.00131	363	0.355761		
EDT2235	Adenosine, 0,2%	0.00096	514	0.234526	- 2	worst
EDT2236	Adenosine, 0,2%	0.00144	424	0.333124	0	same
EDT2237	Adenosine, 0,2%	0.00141	242	0.192575	-2	worst

Other data are also stored in separate sheets of the same table, such as: mean and standard deviation of replicates, points used to plot the model and standard deviation of the model.
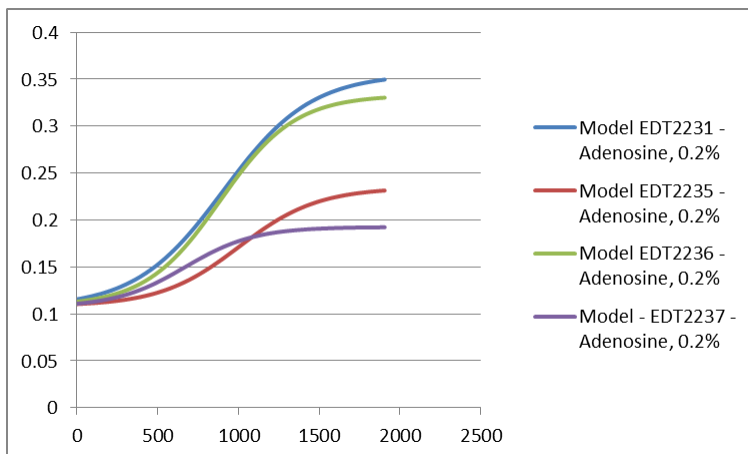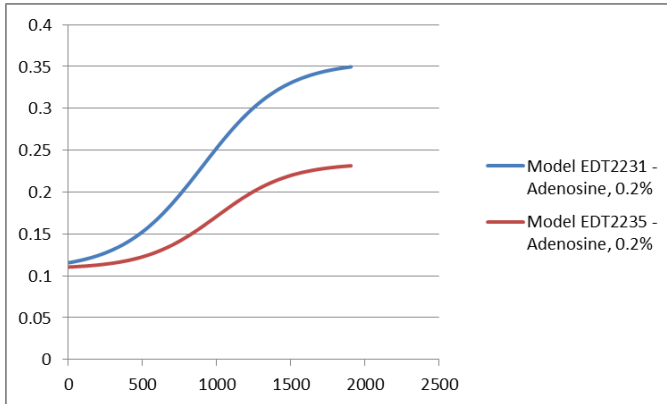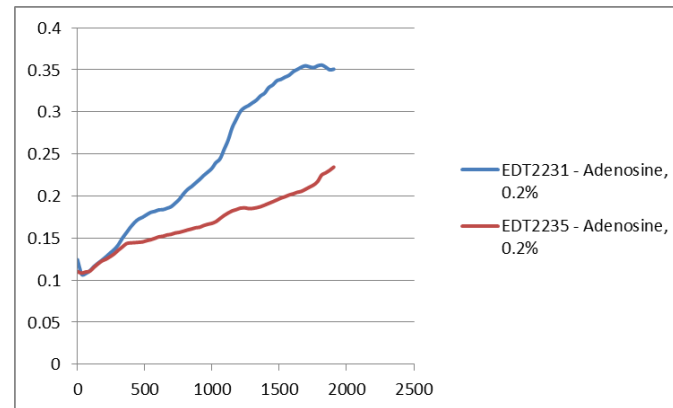
Examples

Actual Data
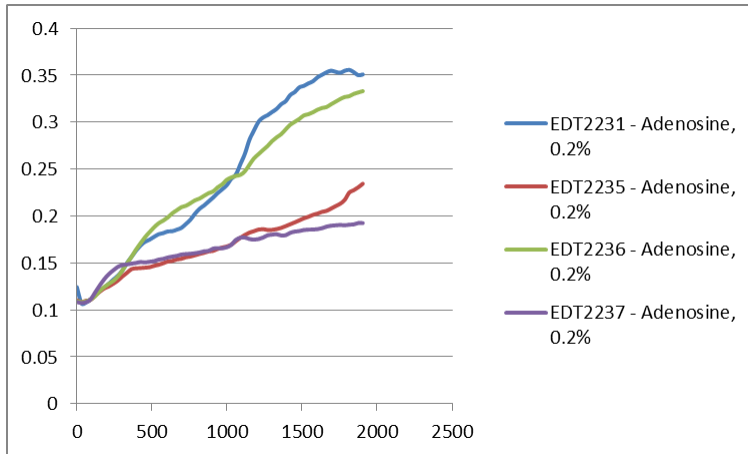
Chosen Models

Models + Actual data
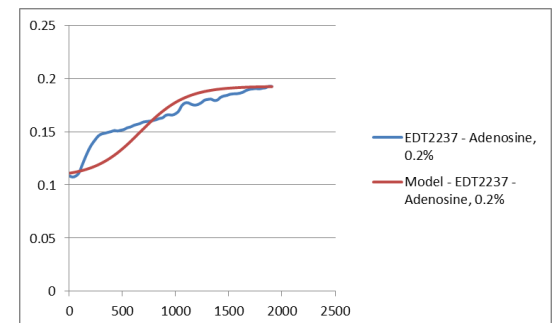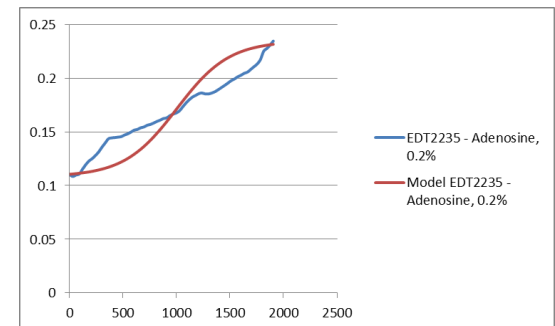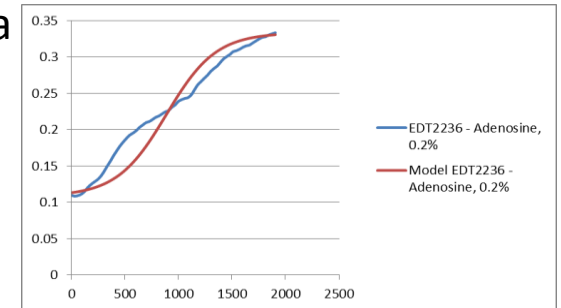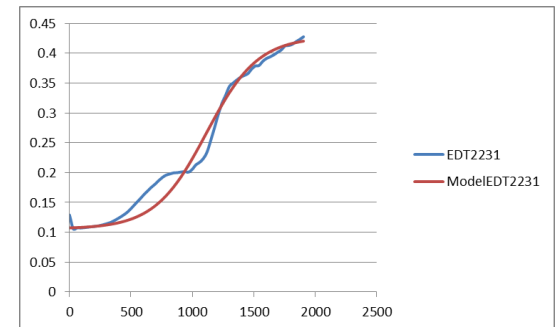
Comparisons

Proportion	Score	Predicted Performance
1.369	- 2	worst
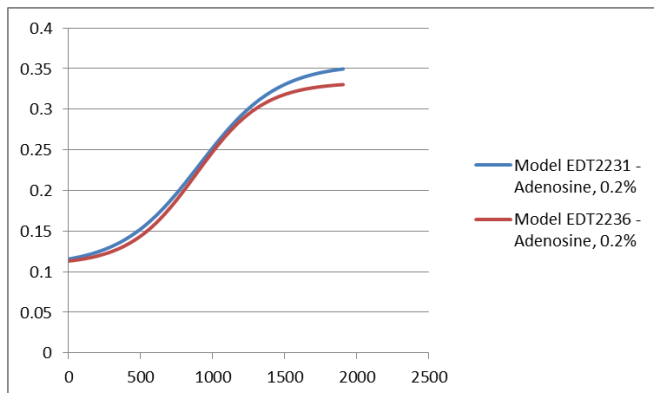
Proportion	Score	Predicted Performance
1.039805	0	same
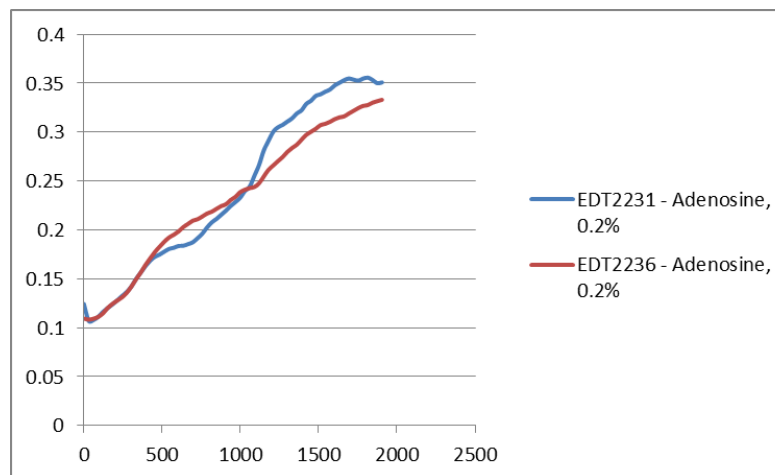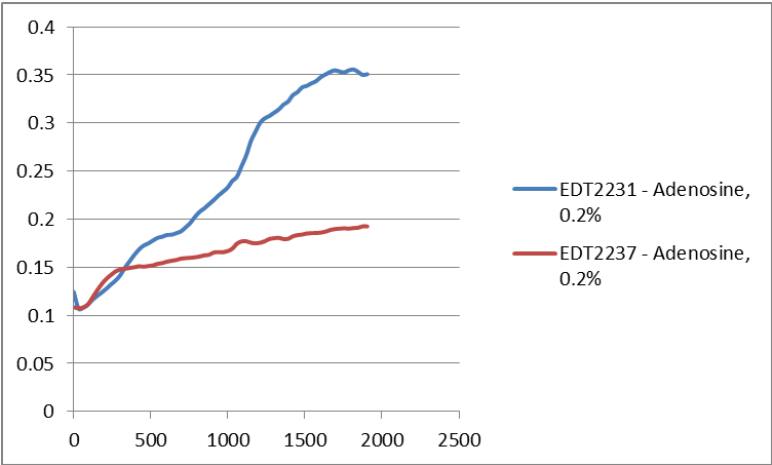
Proportion	Score	Predicted Performance
1.41373	- 2	worst