

## Introduction

The transfer function that allows for the quantification of the culture's Optical Density (see *OD Calibration* experiment) is not stable for all cell volumes. As a consequence, cultures with identical OD but different total volumes will result in distinct turbidostat measurements. The purpose of this experiment is to establish the relation between cell culture volume and the distortion of OD measurements, in order to define the minimum volume for which these quantifications are consistent.

## Materials

- Turbidostat (including the electronics module)
- Turbidostat box
- ~50 ml of LB medium
- ~15 ml of cell culture (cell type does not matter)
- Turbidostat's vial

## Procedure

First of all, before starting the experiment, various setup steps must be followed. After an overnight, the obtained cell culture's OD is measured by the use of the spectrophotometer. Then, the corresponding dilutions are carried out in order to obtain an OD of 0.4 or 0.5 with a total volume equal to the maximum capacity of the vial, which in our case is 18 ml. Remember to use the following formula:

$$OD_i * V_i = OD_f * V_f \rightarrow V_i = \frac{OD_f * V_f}{OD_i}$$

After the dilution process is done, OD measurements can be carried out. Once the vial is placed in the turbidostat and covered with its box, the sample is first homogenized by the fan, which is turned off when the OD LED is turned on. Then, the photodiode registers ten analog values per sample, over which an average is computed. For more details go to the procedure section of the OD calibration experiment. This process is performed repeatedly reducing the total volume 1 ml at a time, until a proper characterization of the behaviour is defined. As many volume reductions as needed can be performed.

Finally, a scatter plot of the total volume over the measured analog value is drawn in Excel, where linear regression is performed to establish a transfer function. Here, the minimum volume at which the measured OD value is consistent will be identified

## Results

Arduino INPUT pin	Total volume (ml)
652,9	9
602,4	10
559,9	11
549,7	12
527,7	13
521,9	14
507	15
513,1	16
500,8	17
<b>Minimum volume</b>	<b>14 ml</b>

Table1: correspondence between Arduino analogic value and the utilized culture volume

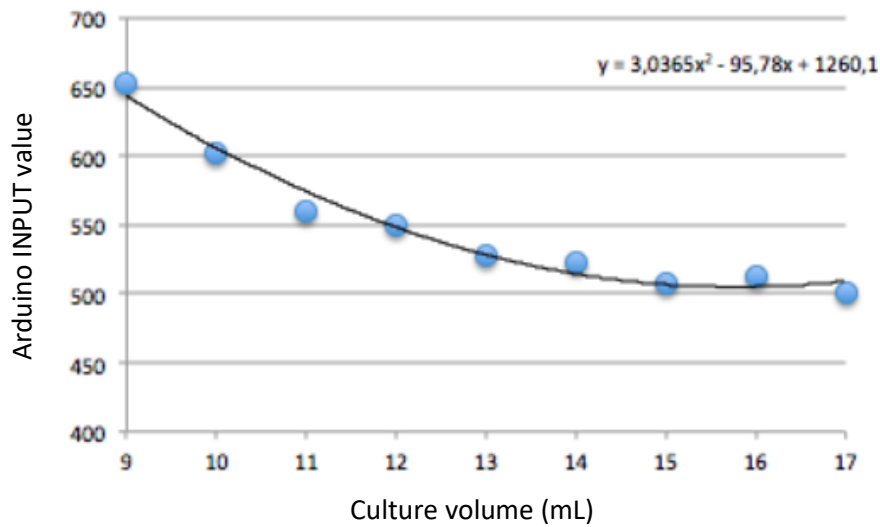


Figure 1. Graph of the obtained results