

# Titratable acidity in milk and buttermilk

## Introduction

Titratable acidity (TA) in milk arises from natural acidity (due to citrates, phosphates, and carbonates in the milk), and from developed acidity (due to lactic acid produced by bacteria). TA is used to determine the keeping quality and heat stability of milk. Cheesemakers may use TA to monitor initial acid development to check for culture activity.

TA is measured by titrating the sample with a strong base, sodium hydroxide, and expressing the results as % lactic acid or in another traditional degree of acidity unit, such as Therner degrees (Th), Soxhlet-Henkel degrees (SH), or Dornic degrees (D).

## Equipment

Thermo Scientific™ Orion Star™ T910 pH Titrator Kit, Cat. No. START9102, which includes the Thermo Scientific™ Orion™ ROSS™ Sure-Flow™ pH Electrode, Cat. No. 8172BNWP, and Orion ATC Temperature Probe, Cat. No. 927007MD.

## Sample Preparation

Pipet 20 mL of milk into a 100 mL beaker. Add reagent grade water (RGW) to the 60 mL mark. The sample is ready to titrate.

## Equipment Preparation

1. Program and save the method. See the program parameters on the next page.
2. Select the saved method.
3. At the titration Pre-Check screen, choose the Calibrate option and calibrate the pH electrode.
4. After calibration, place the electrode, stirrer, dispenser, and ATC into the sample and start the titration. Enter the weight or volume if prompted.
5. Between titrations, rinse the electrode, stirrer, dispenser, and ATC thoroughly with RGW.



Orion Star T910 pH Titrator Kit

## Titration Results

Sample	Results	RSD (n = 4)	Duration (min:sec)
Whole milk	0.1239% LA (%w/v)	0.35%	1:30
Whole milk	0.1203% LA (%w/w)	0.67%	1:17
Buttermilk	0.7559% LA (%w/w)	0.53%	4:12*

\*For faster titration, use a larger predose or titrate less sample.

Programmed Parameters	TA Milk
Parameter	Titrateable acidity
Sample	Milk
Aqueous or non-aqueous	AQ
Electrode	
Electrode type	pH
Electrode name	Edit as desired
Resolution	0.01
Buffer group	USA
Titrant	
Titrant name	NaOH
Titrant ID	Edit as desired
Conc input mode	Manual
Concentration	0.1M
Titration	
Titration technique	Preset end point
Number of endpoints	1
Endpoint values	8.4
Display units	pH
Titration type	Direct
Blank required	No
Titration units	%w/v
Reaction ratio, titrant	1
Sample mol. wt.	90.08
Sample amount	Fixed vol., 20 mL
Pre-dose titrant vol.	0 mL
Max total titrant vol.	20 mL
Titration process control	Routine
Pre-stir duration	5 sec.
Stir speed	Fast
Sample ID	Manual

## Electrode response

Electrode Response: the fats in milk can coat the pH bulb and slow down the titration. For faster titrations, follow this rinsing protocol between titrations: rinse the pH bulb in 1 inch of 1% detergent solution in a small plastic beaker, then rinse in a small plastic beaker of tap water, before using a squirt bottle to rinse thoroughly with RGW.

For Acidity in Milk results in other units, edit the Method, Titration section, to change the Titration Units as follows:

- g/100 mL: select “g/100 mL”
- Th: select “mM” (Th and mM are equivalent) or select “F\*Consumption mmol” and enter factor as 111.1.
- SH: select “F\*Consumption mmol” and enter factor as 44.4.
- D: select “F\*Consumption mmol” and enter factor as 100.
- %w/w: select “%w/w”, specify fixed weight of 20 g or select variable weight. Alternately, keep fixed volume of 20 mL and enter the milk density when prompted.
- g/100g: select “g/100g”, specify fixed weight of 20 g or select variable weight. Alternately, keep fixed volume of 20 mL and enter the milk density when prompted.

## References

1. AOAC Official Method 947.05, Acidity of Milk, Titrimetric Method
2. ISO 6091, Dried Milk – Determination of titrateable acidity

## Titration and electrode care

Refer to the titration and electrode user manuals for details on cleaning, storage, and maintenance recommendations to keep the titration and electrode performing well.

### Daily care

- If bubbles are visible in the titration tubing, dispense titration until bubbles have been expelled.
- Add electrode fill solution to the bottom of the fill hole and leave the fill hole open during measurement.
- Rinse electrode well with RGW between titration cycles.
- It may be beneficial to dip the electrode into 1% laboratory detergent after sample titrations to remove fats and proteins. Rinse thoroughly with tap water, then RGW to remove all traces of detergent.
- Cover the fill hole and store electrode in storage solution overnight.

### Weekly or biweekly care

- Drain and replace the fill solution of the electrode.
- Change the storage solution in the electrode storage bottle.
- Consider standardizing the titration on a weekly basis.

### As needed

- For slow or drifty electrode response, soak 15 minutes in warm (not hot) 1% laboratory detergent while stirring. Rinse well with RGW afterwards. Soak in storage solution.
- If still slow or drifty, use Orion pH cleaning solution D per instructions.
- See the user manuals for maintenance details.

Find out more at [thermofisher.com/titrator](https://thermofisher.com/titrator)

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