How to calibrate and use temperature readings taken with tiny tag loggers

Over the last 20 years, the importance of controlling embryo temperature, as indicated by egg surface temperatures (EST), has become well understood.

It is now very simple to record EST, using miniature data loggers with an external flexible thermistor probe such as the Tinytag made by Gemini Data Loggers **(https://www.geminidataloggers.com/data-loggers/tinytag-talk-2/tk-4023)**.

The ***Aviagen Hatchery How Tos No. 3 and No. 6*** describe how to measure egg shell temperature, and where best to place the probes in different types of machine.

Temperature loggers will save records of EST within a setter, the data can be analyzed and displayed in different ways and the record can cover the entire time eggs are in the setter.

Their unit cost is low enough that several can be set up in a machine, to assess temperature variability.

Their main disadvantages are that the loggers cannot be read in real time (newer models can be read in real time through a wifi or radio link, but they are more expensive), the records are accurate only to 0.5°C and the probes cannot be recalibrated by the user.

However, there is a way to check a batch of loggers so that differences between loggers can be identified and corrected as necessary.

Checking between-logger variability

Tiny tags do not have a calibration option. However it is possible to check the variability of readings obtained within a batch of loggers, and correct the temperatures recorded using a simple excel calculation.

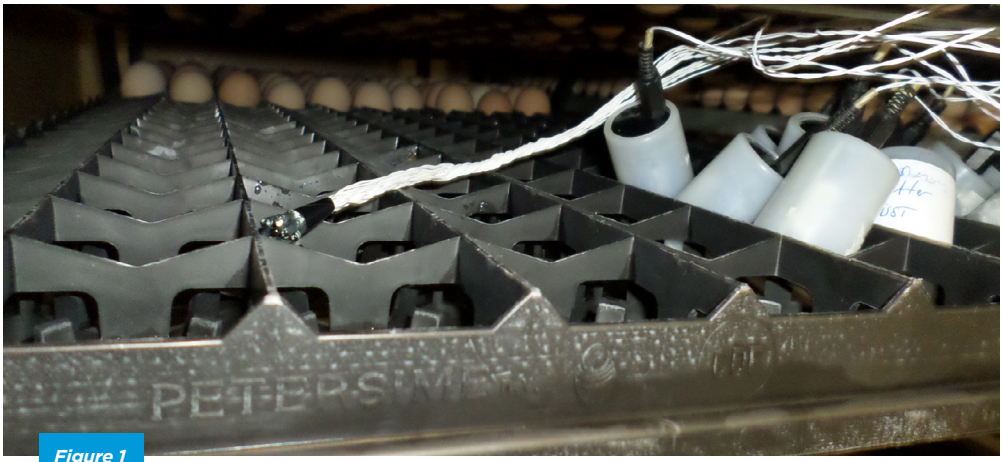

Figure 1

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How to calibrate and use temperature readings taken with tiny tag loggers *Continued*

		1	2	3	4	5	6
1	26/07/2016 09:05:01	99.367 °F	100.075 °F	99.863 °F	100.115 °F	99.971 °F	99.247 °F
2	26/07/2016 09:05:06	99.367 °F	100.072 °F	99.857 °F	100.112 °F	99.965 °F	99.253 °F
3	26/07/2016 09:05:11	99.367 °F	100.072 °F	99.851 °F	100.115 °F	99.958 °F	99.259 °F
4	26/07/2016 09:05:16	99.367 °F	100.072 °F	99.845 °F	100.115 °F	99.955 °F	99.265 °F
5	26/07/2016 09:05:21	99.370 °F	100.069 °F	99.835 °F	100.112 °F	99.949 °F	99.272 °F
—	—	—	—	—	—	—	—
355	26/07/2016 09:34:31	99.312 °F	100.072 °F	99.675 °F	100.140 °F	99.900 °F	99.259 °F
356	26/07/2016 09:34:36	99.305 °F	100.069 °F	99.685 °F	100.121 °F	99.894 °F	99.250 °F
357	26/07/2016 09:34:41	99.296 °F	100.069 °F	99.688 °F	100.106 °F	99.885 °F	99.238 °F
358	26/07/2016 09:34:46	99.287 °F	100.066 °F	99.691 °F	100.088 °F	99.878 °F	99.222 °F
359	26/07/2016 09:34:51	99.275 °F	100.063 °F	99.694 °F	100.069 °F	99.872 °F	99.204 °F
360	26/07/2016 09:34:56	99.262 °F	100.063 °F	99.694 °F	100.054 °F	99.866 °F	99.182 °F
		99.802 °F	100.097 °F	99.717 °F	100.164 °F	99.934 °F	99.223 °F
	Average of all loggers	99.825 °F					
	Corrections	0.000	0.295	-0.075	0.362	0.132	-0.519

*Probe 1 is the closest to average

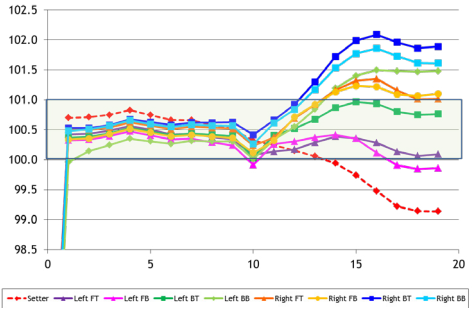
For this purpose:

- **Identify each thermistor/logger with a number**
- **Hold all the thermistors together using adhesive tape and place them into a setter containing day 2 – 4 day eggs for at least an hour as shown in Figure 1.**
- **Download and export the data from all the loggers into Excel**
- **Calculate the average temperature readings of the last 30 minutes for each logger**
- **Take one logger as the reference (the one closest to the average) and calculate how much each of the others loggers differ from this reference probe. Install the loggers in a setter for a full run, following the methods described in *How Tos 3 and 6***
- **After completing the run, apply corrections to each logger before any further analysis**

Once corrected, the EST values can be plotted versus time, to show where hot and cool spots lie within the machine, and also how temperatures change and become more variable during incubation.

As an example, in the chart below, sensors were placed at the top and bottom of trolleys at the back and front of the machine, to the left and right of the central fan. Temperatures for each 24 hour period have been averaged, to remove temporary blips during machine checks and variability due to egg turning. The red line shows the air temperature at the sensor, which was warmer than the EST readings until 6 days, and cooler after 12 days. At 17 days:

- **EST at the right hand side of the machine was warmer than at the left (101.5°F vs 100.6°F)**
- **The front of the machine was cooler than the back (100.6°F vs 101.5°F)**



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