REFERENCE MANUAL FOR THE DAIRY QUALITY
Dairy Health Check DEVICE

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Dairy Quality Inc.
HELPING FARMERS

mpengo
Apps for the mobile professional.

This is a comprehensive guide to Dairy Quality Inc.'s DAIRY HEALTH CHECK device. If you have just purchased an DAIRY HEALTH CHECK, we suggest starting with the Quick-Start guide:

Quick-Start Guide (English)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide7.2014%28ENG%29.pdf

Una Guia Rapida (Espanol)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide%28SPA%29.pdf

Guide de Demarrage(Francais)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide7.2014%28FRE%29.pdf

The DAIRY HEALTH CHECK Device from Dairy Quality Inc. is an incredible new innovation in milk quality testing. Somatic Cell Count testing can now be done right in the milking parlor. Using

the Dairy Quality device and, amazingly, an iPod Touch (is also compatible with iPhone 5/5s) SCC readings can be determined in seconds, without the expense and time it takes to send samples off to the lab.

This guide discusses in detail, setting up and using the DAIRY HEALTH CHECK device and using the Dairy Health Check app.

Indication for Use

The DAIRY HEALTH CHECK iPod microscope accessory and Dairy Health Check app provide images of stained somatic cells in the milk of dairy animals to provide a preliminary estimate of the somatic cell count in the milk sample. The Dairy Health Check microscope accessory and Dairy Health Check app is not intended to be a primary means for diagnosis of any disease/condition or for scale to determine payment price of milk.

How It Works

The DAIRY HEALTH CHECK and the Dairy Health Check app work using the well-known principles of optical fluorescence. Dairy Quality is, however, very different from traditional testing. The method and apparatus for reading and presenting the sample, analyzing the sample, and providing the results are all now available on one simple to use mobile platform (patents pending).

To measure somatic cells in a sample, the cells are stained with a fluorescent dye. There are a number of chemicals that can accomplish this, and they are absorbed by the nuclear DNA of the cell. The cells are then caused to fluoresce by activating them with a high intensity light of a specific wavelength. Finally, through a series of lenses and special filters (including emissive filters, absorption filters, and dichromatic filters), the cells are projected to the camera lens of the Apple® iPhone or iPod Touch device.

The Dairy Health Check app has specialized imaging routines that view the image and count the cells within the field of view of the camera. By knowing the fluid volume being measured, the app can derive the SCC value, and both the image and SCC value is displayed to the dairyman.

Depending on the characteristics of the image, the Dairy Health Check app can also attempt to provide an indication of pathogen possibly contributing to a high SCC (see the '**Pathogen Indication**' section in this guide).

Smart-devices supported

Because of the different sizes of the various smartphones, different Dairy Health Check models are required to properly align the camera lens of the phone to the output of the device. The Dairy Health Check device is currently available in versions for:

- iPhone 5/5S
- iPod Touch 6th Generation

Setting up the Device

- Remove the device from the shipping box
- Remove the battery from the shipping box
- With a screwdriver, remove the back plate of the DAIRY HEALTH CHECK and install the 9 volt battery/cell, paying close attention to the polarity
- Re-affix the back plate

Installing the Dairy Health Check App

Most DAIRY HEALTH CHECK models come complete with an iPod and the Dairy Health Check app is fully installed and ready to use.

Should you purchase a DAIRY HEALTH CHECK for IPhone 5/5s or choose to use your own iPod. You will need to install the Dairy Health Check app.

Ensure that you have setup your iPhone/iPod Touch with Apple and created an iTunes account to permit you to purchase music, books, and of course, apps. You'll also need a Wi-Fi connection

to the Internet or a cellular data connection via your cellular carrier (you ONLY briefly require Internet to install the app).

To install the App:
- Tap the App Store app button
- Tap '**Search**' at the bottom of the screen and type **dairy health check** and tap Search. You should see the Dairy Health Check app by mpengo Ltd.
- Tap the button that shows the app's price.
- Verify the purchase by tapping ('**Install**' or '**Buy Now**')
- A dialog box should appear asking for your iTunes password. Once you enter your password, the app will download to your iPhone or iPod Touch

App Updates
App updates are available whenever there is a new development. When Wi-Fi is available you will be notified whenever an update is released.
To update the Dairy Health Check app simply go to the App Store and select Updates in the bottom right corner a tap update. Should you be prompted for a password you will need to use either your own password that was created with your own Apple ID or the Dairy Quality password DairyQuality101.

Setting up the Dairy Health Check App

Settings / Contact Information: Enter your farm name, contact name, and email address (useful for technical support)

Settings / Preferences / Cow Selector Preference: If your herd size is under about 50 cows, select Cow List; otherwise, use Keypad Entry – it's more efficient and you just key in the cow tag number instead of selecting from a very large table.

Creating or adding to the Cow File and Sample History
To add cows to your table:
- Tap the large '**+**' to add a cow to the table
- Enter the Cow Tag #

- Notes, Birth Date, Lactation #, and Breeding Date are entirely optional (entry of Breeding Date will calculate for you the cow's 'Dry Date'
- Tap Done to create the new Cow Tag in the table
- Continue adding cows: when finished, return to the main screen

The Dairy Health Check App

Features
SCC Check
Settings
Special Tools
Reports
Cow File and History
Impact Reports
Preg Tracker
Ketosis Check
Help Guide

Using the Dairy Health Check App

Taking a Milk Sample

- Collect the milk to be sampled into a separate clean container
- Insert the tip of the pipette or dropper into the milk sample, and press firmly on the top and release to draw the milk sample into the straw: the pipette is designed to draw only the amount of milk needed for the slide.

- Dispense the milk sample into the Dairy Quality Slide
- Gently shake the slide for approximately 5 seconds to incorporate the reactant into the milk
- Rotate the slide on his side and watch the milk flow into the viewing window
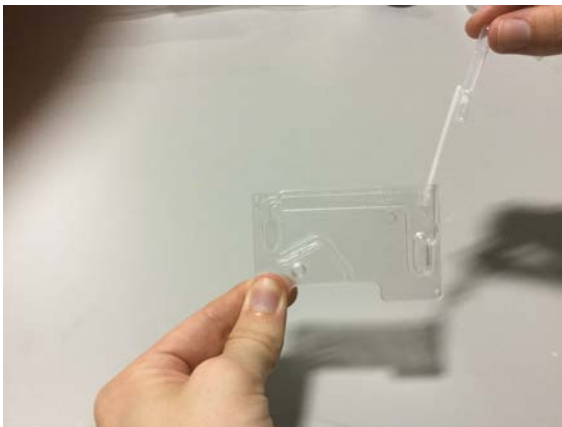
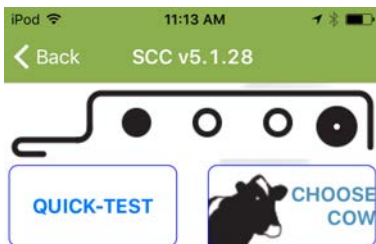(After use, dispose of slide according to local waste management requirements)

**Start the Dairy Health Check app
SCC CHECK**

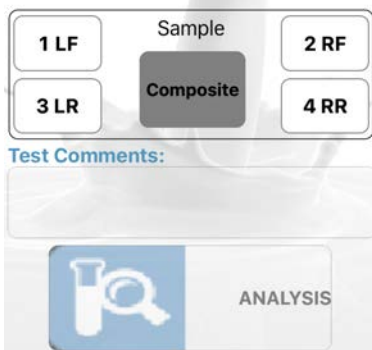- Select SCC Check from the main menu

- Turn the Dairy Quality slide on its side and insert the slide into the DAIRY HEALTH CHECK device and firmly "seat it". When inserted, the device will power on and you will notice a slight green glow inside the slide chamber (make SURE you see the green glow that illuminates the sample)

- Tap **CHOOSE COW** and select the cow. You can also tap **QUICK-TEST** if you do not wish to record the sample against any particular cow.
- Add Test Comments if desired.
- Tap **ANALYSIS**. After a countdown period to permit the milk & reagent mixture to incubate, the iPod will take an image of the sample, review the background, make note of the highlighted cells, and analyze any patterns. A second snapshot may be taken to account for fluid and cell (Brownian) motion. Each will be analyzed for repeatability.
- Within a few seconds, the sample image, the SCC value, and if a high count, a possible indication of type of pathogen appear. You can also **TAP FOR RAW IMAGE** to see the actual image created by the Dairy Health Check device.
- Tap **Save** to keep a record. You will find that over a period of time you'll start to see the relationship of the image to the SCC value and be able to visually confirm the quality of the milk. You'll also learn over time the visual image and the likely pathogen present based on your historic evidence as well as experience & learned knowledge.
- When you tap Save, a record of the sample is placed into cow history along with a low-res copy of the image. You can see this history in **Cow File & History** by selecting the cow, and tapping the row with the desired sampling.

- **Quarter Sampling**: you can record and keep track of individual quarters: quarter info will be stored with all the SCC results
- Indicate the cow, and extra comments as before
- To indicate a specific quarter, tap the appropriate button (they are labeled FL, FR, RL and RR)
- To cancel and return to a standard composite sample, tap the Composite button.

Understanding the results

After the analysis you are presented with an image of the sample and other information:
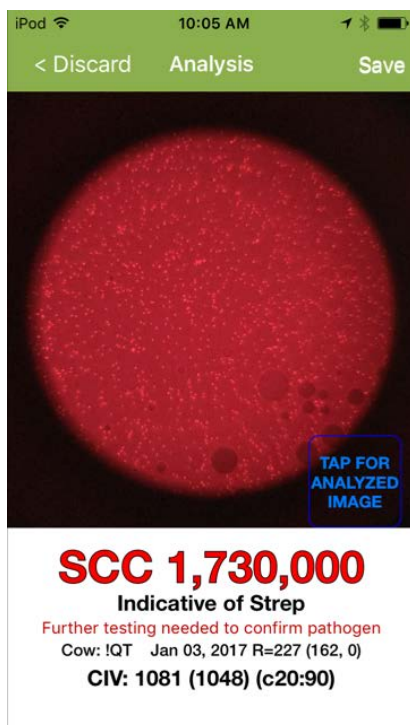
- **Image**: You'll see a circular background of the image from the microscope and the cells highlighted. 2 views are available: Analyzed Image (default) – cells counted are

highlighted in green; Raw Image - the actual image projected by the DAIRY HEALTH CHECK device

- **SCC**: the calculated value of somatic cells / ml
- **Pathogen indication**: if a high SCC value and enough parameters are presented, the app will offer a suggestion of the pathogen present that might account for the high SCC. If the app has (e.g.) 6 indicators (instead of 3), the app will say 'Highly indicative'
- **Cow**: the cow tag number (or QT if a quick-test)
- **Qtr**: If you did quarter sampling, the quarter tested
- **R value**: an indicator of the relative brightness of the image (useful only for technical support)
- **Cells in View**: the number of cells actually counted by the analysis routine in its particular image region. Cells in View provides a direct correlation with the resulting cell count. As a rough rule of thumb, one cell in view equates to about 1,500 SCC (the app refines this extrapolation considering other factors)

Why results sometimes vary (motion of cells)

It is unlikely that you will get exactly the same result twice if you re-analyze the sample. Since cells float and move about in the sample (Brownian motion), a microscopic view of the same sample may contain different numbers of cells. At low SCC counts, one or two cells will make quite a difference (one cell might change a 40,000 count by 1,500): At higher counts, the effect is dramatically reduced. This is true of ALL SCC reading technologies. DAIRY HEALTH CHECK reduces this effect by making several analyses and averaging. Nevertheless, there will be a variance.

The sample degrades rapidly after a few minutes as the cells lose their brightness and are destroyed, so be sure to test your sample within a few minutes of drawing up the milk.

If you try to re-test the same slide later, the SCC will likely be lower due to the degrading cells in the sample.

Tips for best analysis results

- Set the device in a level position prior to starting the test: this will ensure a representative sample and a more even distribution of cells in view
- Make sure that your iPod is set to maximum brightness. Set your brightness in **Settings / Wallpapers & Brightness.**
- Test only relatively fresh milk. Although the DAIRY HEALTH CHECK will successfully analyze milk that has been sitting for a while, eventually the fat separates, and you no longer have a representative sample
- If you have preserved your milk sample with a preservative, don't wait an excessive period to test. Of the common preservatives, bronopol appears to be less invasive on test results than potassium dichromate.

Testing Tip:
- Create a Cow record called **Tank** (or **0000** if you prefer numbers), and periodically check your overall tank reading. This may be interesting historical information for you.

When to reject a test

Blotches – sometimes you will find an uneven distribution of reagent through the milk, resulting in 'blotches' or 'clouds' in the image. Although the app does a good job of ignoring these 'clouds' and reads the cells inside them perfectly, you should consider rejecting the slide result if you find images with large clouds and an extremely high SCC that does not seem to be justified by the number of visible cells in the sample
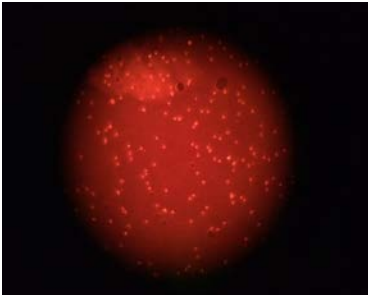
What NOT to do

- Don't shake the milk sample (resulting in air bubbles in the image):
- Don't test the sample with the DAIRY HEALTH CHECK in a peculiar position (on its side, or standing on end). Keep the device horizontal to allow the milk to evenly distribute itself throughout the viewing chamber of the slide
- Don't attempt to put the slide in backwards or force the slide. The slide tip should be pointing <u>out</u>… See the photo on the cover page.

Pathogen Indication

The Dairy Health Check app is excellent at providing an indication whether a milk sample contains Staphylococci or Streptococci, and the display of the SCC image can also help the dairyman to determine other pathogens. In a typical milk sample with high SCC (i.e. high number of somatic cells), the cells tend to align themselves in the general pattern of the bacteria they are attacking, so 'copy' the pattern of the underlying bacteria. It is under this basis that the app provides an indication of pathogen by analysis of the arrangement of somatic cells in the sample

What Pathogen is Indicated?

The app considers Streptococcus when:

- There is an elevated SCC
- The cells are individual, clearly defined
- There are little or no clusters

- In higher counts, organization of some of the cells into chains or snake-like strings
- Depending on frequency of these and other elements, the app will declare 'an indication', 'a high indication', or remain silent (not enough data for a clear answer)

The app considers Staphylococcus when:
- There is a high SCC (statistically, Staph is most prevalent at very high levels)
- A high percentage of the cells are grouped into clusters
- Depending on frequency of these (and other) elements, the app will declare 'an indication', 'a high indication', or remain silent (not enough data for a clear answer)

The dairyman can use these visual clues for reference toward analysis based on historic evidence as well as experience & learned knowledge.
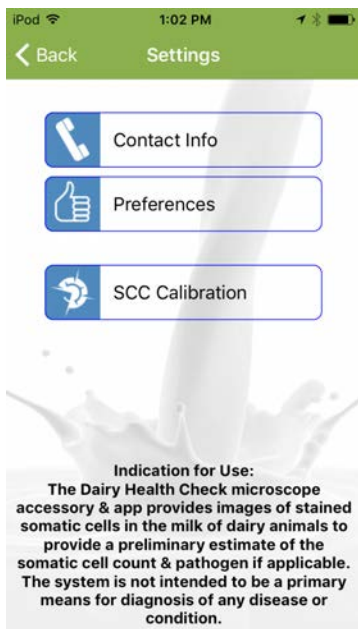
The following images by the Dairy Quality DAIRY HEALTH CHECK device show typical pathogens:
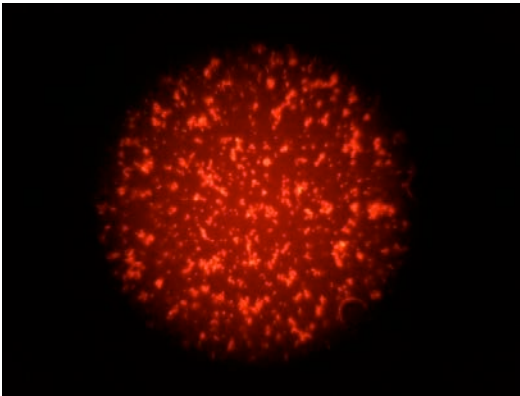
Sample of Staphylococcus - High number of cells,
organized into many clusters
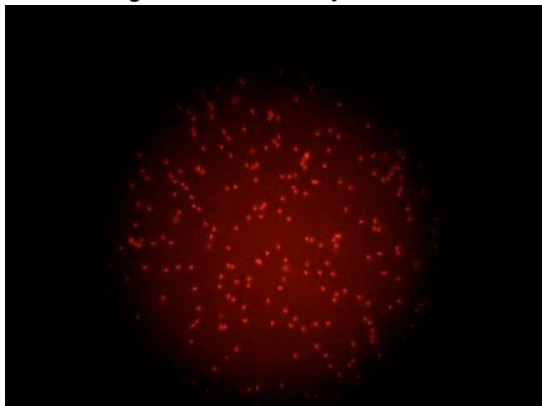
Sample of Streptococcus - Note the clearly defined cells,
and the chaining of cells into strings

Settings

Contact Information: enter the Farm/Company name, address, and your Business ID number or farm registration number. This information will be displayed on reports. Also enter your name, email, and telephone. We need this information only if you have a support question.

In **Preferences**, enter the acceptable SCC (somatic cell count) target (or threshold) for your area. This is used to warn you of readings over this target value.
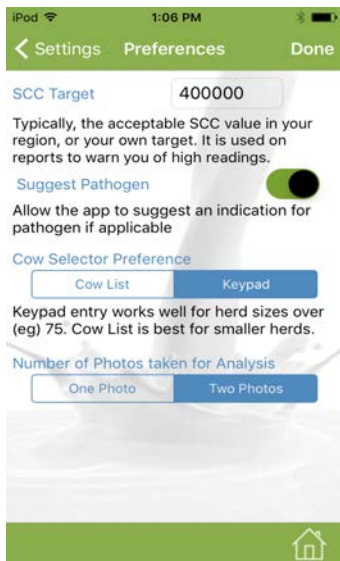
There are two '**Cow Selector'** methods in the Analysis program: Cow List, and Keypad. With Cow List, you pick your cows from a table: with Keypad, you enter the cow tag #. Keypad is faster for larger herds.

Number Of Photos: Automatically set to Two Photos. There is the option to only have one photo analyzed.

SCC Calibration (Advanced): not intended for casual use, the Calibration settings shown are based on the IPod that come with your device and are set to maximize optimal results. It contains settings for acceptable sizes (in pixels) of somatic cells, a general extrapolation ratio (based on the capabilities of the particular iPod camera), reagent mix time countdown, contrast standard deviation, and a cap value for red brightness color. If by accident you cause problems by altering calibration values, reset back by tapping RESET TO DEFAULT

Special Tools

Synchronize Data: If you have more than one Apple device with Dairy Health Check on it, you can sync the data on both devices (to make sure that your 2 herd managers each have the complete Settings and Cow table). The sync will create and email a data file to the other iPhone or iPod. To sync the files, open the email with the file attachment on the second device. Tap and hold the file attachment and the data from the first iPod will be merged.

Import Cow (Herd) Table
If you have your cow herd information already available on your PC or another source (such as in a herd management software system) and would like to use that data for your Cow (Herd) file, use Import.

Use **Excel** to create a table with these columns:
  Col 1 = Cow Tag #

  Optional Information:
  Col 2 = Comments
  Col 3 = Birth date YYYY-MM-DD [e.g., 2010-05-31]
  Col 4 = Breeding date YYYY-MM-DD
  Col 5 = Number of lactations

Click '**Save As**' in Excel to save the file as a tab-delimited text file (**.txt**)

Email the file to your email currently being used by you Dairy Health Check device.

On your DAIRY HEALTH CHECK device iPod open the email message and tap and hold the attachment icon until you see **'Open in Dairy Health Check'.** Tap this option. Dairy Health Check will merge the data into your Cow File

Erase Old History
You can delete old sample history & images for data that may no longer be of any value. Indicate the date range to erase.

Reports and Sending Data
This option lets you produce detailed milk sample and herd reports that can be emailed or printed to an Air Print supported printer, as well as create data files which you can send to your computer, herd management software, or other software.

To create reports, select the following options
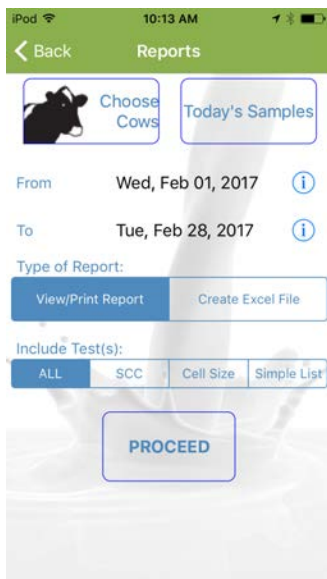
Choose Cows: Tap here to indicate which cows you wish on the report/data file. You can also tap 'Select/Un-Select All'.

Date Range: Tap the dates to set up the range you are interested in.

Type of Report: Indicate if you want a report, or a tab-delimited (*.txt*) Excel file. The report is displayed on the screen, with options to email or print. The Excel file is available for email only

For a quick report, simply tap **'Today's Samples'** to select all cows for the day, and you'll get a report or tab file of just today's samples.

Dairy SCC Cell Analysis
Oct 01 2014 - Oct 31 2014

mpengo Farms Ltd.   SCC Threshold 400,000

Cow Tag	Date	Time	Qtr	Cell Reading	Pathogen	Comments
!QT	Oct 01, 2014	01:34 PM	2 FR	288000		
!QT	Oct 01, 2014	04:03 PM		344000	Strep	
!QT	Oct 02, 2014	12:40 PM		421000	Strep	
!QT	Oct 03, 2014	11:16 AM		333000	Strep	
!QT	Oct 04, 2014	12:38 PM		388000	Strep	
!QT	Oct 04, 2014	02:10 PM		321000	Strep	
003	Oct 03, 2014	11:46 AM		277000		
003	Oct 03, 2014	12:04 PM		288000		
11	Oct 03, 2014	04:39 PM	3 RL	310000	Strep	

Cow File & History

As you sample milk with the DAIRY HEALTH CHECK and the Dairy Health Check app , you are able to store history of each of your samples when you tap Save: a record of the sample is placed into cow history along with a low-res copy of the image. You can see this history later in **Cow File & History** by selecting the cow, and tapping the row with the desired sampling.

SCC Impact Report

The DAIRY HEALTH CHECK device also features a SCC Impact Report. This feature will allow you to monitor the individual contribution each cow is having on your overall bulk tank SCC.

DQ Farms
SCC Impact Report (Top 20 Cows)

Latest Lab Report Sep 22 2016

Bulk Tank SCC Reported was 400

Bulk Tank SCC Calculated is 284

Cow Tag	Milk(kg)	SCC(000's)	% of Tank	This cow removed	Cum. cows removed
444	20.0	5,000	1.7	201	201
387	7.7	1,607	0.6	274	191
1a	32.8	1,137	2.7	253	160
38	10.0	1,064	0.8	276	152
295	35.0	617	2.9	266	134
466a	26.2	594	2.2	271	121
294	19.7	535	1.6	276	113
137	15.0	500	1.3	278	107
795	21.9	395	1.8	277	100
406	21.9	381	1.8	278	94
271	37.2	375	3.1	273	83
1	26.2	373	2.2	276	75
412	28.4	370	2.4	276	67
345	19.7	360	1.6	279	62
296	15.3	338	1.3	280	58
601	19.7	334	1.6	279	53
134	19.7	323	1.6	279	48
337	19.7	271	1.6	280	44
90	16.4	219	1.4	281	41
224	15.0	200	1.3	282	39

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This report is generated by entering your current bulk tank SCC average, individual cows SCC and current milk production in lbs or Kgs. You can generate a whole herd report or just focus in on the op 20 cows in your herd. This information can be collected independently or by using your current herd testing information.

These reports can be printed or emailed directly from the device when Wi-Fi is available.

Preg Tracker

This data feature will track your entire herds breeding program. By entering a breeding date and sire information you will save a breeding to a cow file and will work with common pregnancy testing methods.

- Pregnancy Testing Strips
- ELISA based tests
- Veterinary Preg Checks.

Set up is important as you need to select the method of pregnancy testing you will be using. This can selected in the Test Rules tab.
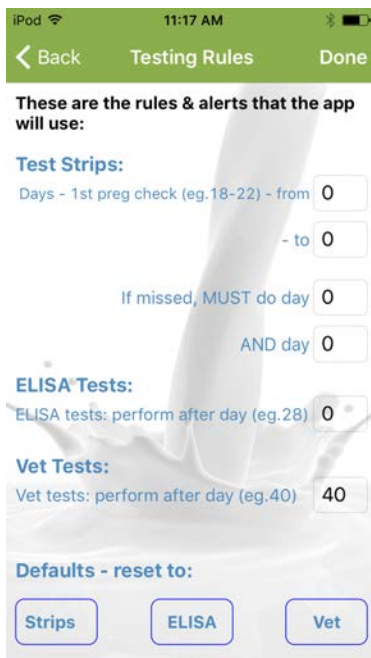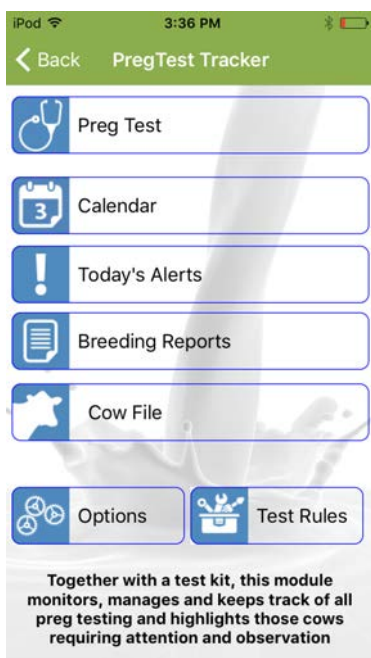
Alerts can also be customized. This can be done in the Options tab. You can select to have alerts added to the Apple calendar, the alerts desired and the length of time they will be saved.
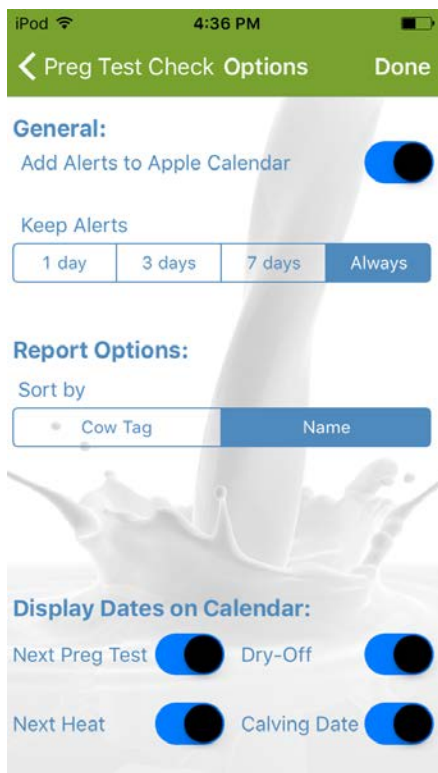
To record a breeding
- Select a cow from the Cow File
- Enter a breeding date
- Enter the desired Sire information
- Start Tracking

A breeding has now been recorded and the alerts have been saved to the alerts tab and the Apple calendar, if selected in set up.

You will receive an alert when a pregnancy test is due.

To record a test result. Tap the Preg Test tab.

Select a cow from the Cow Look Up or by entering her tag number. Complete the pregnancy test and record the results. A confirmed pregnancy can be recorded at any time.
If the cow is confirmed pregnant the alerts will be saved to the calendar and the breeding is recorded as Successful. If the cow is not pregnant the alerts will be deleted and the breeding is recorded as a failed attempt.

Breeding Reports
This feature will also allow you to generate a breeding report.
This can focus on one cow or the herd. It will display all
successful and failed breeding attempts.
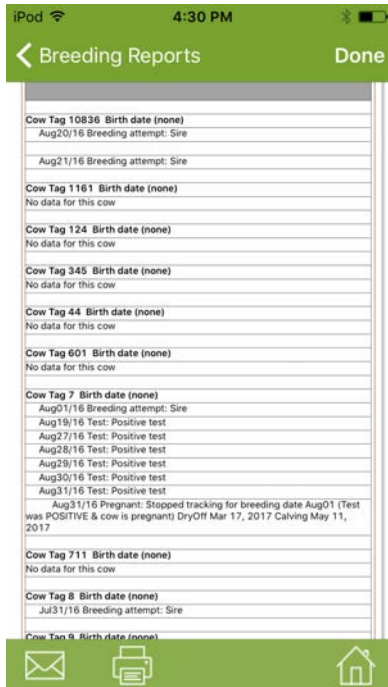
Breeding Reports can be emailed or printed from the device
whenever Wi-Fi is available.

Ketosis Check

Ketosis Check is a milk based test that will help detect even the mildest cases of Ketosis. Identifying ketosis early and addressing nutritional needs of the post calving cow can help to give her the best start to her lactation. This test is currently in production.

Help Guide

The Dairy Health Check app includes a comprehensive Help Guide. This can be accessed at any time and can be a helpful tool for basic troubleshooting and tips.

Customer Support for the App

mpengo Ltd. offers a 24/7 no charge support service for all of their apps, and they pride themselves on very quick response. If you have an issue with the app tap the Support button at the top of the main screen, enter a brief subject, followed by a more detailed description of your problem, and tap Send. The support team will review the issue and your inquiry will be addressed by mpengo if it is an 'app' issue or by the Dairy Quality staff if it is a milk sampling question or DAIRY HEALTH CHECK problem.

Languages

The Dairy Health Check app currently runs in English, Spanish, French, Korean, Turkish and Chinese (Simplified). The language used is based on the settings of your iPhone/iPod. To switch to a different language, go to **Settings / General / International / Language**

Other languages are expected shortly.

Other Details About the Device and Sampling

When to Sample
To help ensure ongoing low SCC, we recommend using the DAIRY HEALTH CHECK, SCC Check in different routines:
- Test bulk tank daily.
- Test fresh cows shortly after calving.
- Monitor treated cows for a quicker return to production when an acceptable level of SCC has been obtained and milk clear date is reached.
- Easily check SCC level for cows at auction
- Test suspicious cows anytime:
  - when milking equipment shows high milk temperature, or when physical changes are noted: for example, swelling, redness, hardness of the udder or other abnormalities, when milk has a watery appearance, flakes, or clots

Re-Testing a Slide

Because it is so easy to do so, the dairyman is often tempted to re-test a slide that is already inserted in the device. Your first analysis should always stand as the test result for the following reasons:

- The sample deteriorates quickly as the reagents break down the cell, and subsequent or further testing will result in different cell count readings caused by residual fluorescing and cell deterioration. The loaded sample should be analyzed within 3 minutes of loading
Cells in liquid float about and cells will move in and out of the field of view of the microscope (Brownian motion). Slight variation from time to time will occur

Quick-Test

Quick-Test provides a quick way to test a sample of milk without having to go through all the steps. The major differences are:

- The analysis results are stored in a Cow labeled QT
- Tapping Quick-Test will immediately proceed to countdown and analysis

Why the timer countdown?

By default, there is about a 30 second delay between tapping Analysis and actually taking an image of the milk sample and performing the cell count. This time has been calculated to be the optimal period to allow the chemical reagents in the slide to interact with the raw milk, break down the nuclear DNA, and stain the cell.

The Battery/Cell

The average 9-volt battery used in the DAIRY HEALTH CHECK can supply 500 mAh. At a 35 mAh draw, the battery will last continuously for 12 to 14 hours (if, for example, you left the slide in mistakenly). You can expect around 1400 tests on one good battery under normal use.

The DAIRY HEALTH CHECK does not have a battery low indicator. However, the Dairy Health Check app has a routine that

monitors light levels and the contrast of the cells against the background. If the contrast and light levels are too low, the app will display the advice that the battery should be replaced.

Re-Focusing
Although the DAIRY HEALTH CHECK has been carefully assembled and focused, it might become necessary to refocus the lens and image:

- Use a small screwdriver to loosen the locking setscrew along the side of the device near the lens assembly
- Insert a loaded milk sample slide and your iPhone into the device, and use Apple's Camera app to view the image
- Slide out the iPod a few inches/centimeters, and adjust the outer lens ring in or out with the screwdriver (there is an inner and an outer ring), re-inserting the iPod to see if the adjustment is sufficient: repeat as necessary (it shouldn't be necessary to turn the lens more than 1/3 of a turn, and if turned 'in' too far, the lens will block the slide area, and the slides will not load)
- When you are happy with the image, use the screwdriver again to lock the lens assembly

For more help, watch the re-focusing video in the link below.

Using Apple's Camera App
Although you won't get the benefits of analysis of the Dairy Health Check app, Apple's Camera App can also be used to display raw

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sample results. The Camera App can also help you focus (or re-focus) the lens.

Links to Other tools

RT10 PLATINUM Demonstration Video
http://youtu.be/KIEmFpCiLkI

mpengo Dairy SCC app Demonstration Video
http://youtu.be/lfWNlpvJtm8

Quick-Start Guide (English)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide7.2014%28ENG%29.pdf

Una Guia Rapida (Espanol)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide%28SPA%29.pdf

Guide de Demarrage(Francais)
http://dairyquality.com/pdf/quickstartguides/DQInc._QuickStartGuide7.2014%28FRE%29.pdf

Refocusing a device
http://youtu.be/VGmfE4NDhAw

If You Have Questions

If you have any questions, problems, suggestions, or more sections you'd like to see added to this guide, please contact us at **info@dairyquality.com**