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Special Notes: Illustrations are Ref Only ** Not to Scale **

	Application Note	
Baby Formula Water Activity Testing Guide		
<p>Introduction The research and development team for the AquaLab line of instruments is conducting water activity best testing practices research. This is an ongoing study, but we have results available for baby formula and we wanted to present these results.</p> <p>The objectives of this study are:</p> <ol style="list-style-type: none"> 1. Observe the impact of ambient humidity on water activity testing results when using normal testing practices. 2. Compare the water activity average values, test time and repeatability across several water activity instruments. 3. Determine if an advantage in precision is gained by extending read times up to an hour when using dewpoint instruments instead of using the initial value provide in the normal ~3 minute test time. 4. Identify the value of the custom mode testing option in Series 4 instruments and find which setting provides the best precision. 5. Observe the impact of test temperature on water activity test results. <p>Materials and Methods The water activity instruments used for testing included 1 AquaLab Series 3TE Chilled Mirror Water Activity Instrument and 2 AquaLab Series 4TEV Chilled Mirror Water Activity Instruments. Each instrument was verified daily using unaturated salt solutions at 0.25aw, 0.5aw, 0.75aw and 1.00aw. All testing was conducted on 3 replicates taken from 3 independent samples. Humidity was controlled using a glove box and all sampling and testing was conducted in the glove box. Humidity in the glove box was constantly monitored. Sampling was done as quickly as possible with the sample exposed for no more than 5 seconds during sampling. The ambient humidities included in the study were 10% RH, 20% RH and 70% RH. The desiccation study testing was conducted in 3 parts. A description of each part follows:</p>	<p>Part 1 consisted of tests accomplished using just one AquaLab instrument. An initial water activity reading was recorded when the first test ended as indicated by the instrument, but then the instrument was set to continue taking measurements up to approximately 1 hour. The initial and final mean water activity and standard deviation across the 3 samples were compared using ANOVA to see if a significant advantage is gained in the AquaLab instruments by extending the test time. All tests in Part 1 were done at 25°C.</p> <p>Part 2 consisted of utilizing the custom feature in the AquaLab Series 4 instruments. This mode allows setting stability specifications for ending a test, which consists of identifying a water activity range that must be met by a specified number of tests. For example, the custom setting could be 3 tests and 0.003 aw. Once started, the instrument will then continue taking tests until 3 results are within +/- 0.003 aw of each other. To determine the preferred custom mode to achieve the highest combination of repeatability and speed, 4 custom mode settings were compared including: 3 tests within +/- 0.001 aw, 5 tests within +/- 0.001 aw, 3 tests within +/- 0.003 aw, and 5 tests within +/- 0.003 aw. Testing was conducted using 1 Series 4TEV instrument on 3 replicates from 3 samples. The mean water activity and standard deviation across all 3 samples was then compared using ANOVA to determine if one custom mode setting provides significantly better performance than another setting. All tests in this second set were done at 25°C.</p> <p>Part 3 consisted of observing the effect of temperature on the water activity readings of the product of interest. Water activity is temperature dependent, but the level of sensitivity depends on the product. To investigate the effect of temperature, each replicate from each of 3 samples was evaluated for water activity at 15°C, 25°C, and 35°C. Mean water activity and test time were compared for each temperature at each humidity level to determine if temperature resulted in significant differences in water activity.</p>	
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