Instrument Standardization and Monitoring
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Calibrations developed by the Consortium can be transferred to the members only if their instrument spectrally matches the Consortium master. An instrument is defined as standardized when it produces the same prediction values as the master instrument after scanning the same sample.

Scientific evidence (Osborne B.G.et al., 1999, J. Near Infrared Spectrosc. 7, 167; Tillman P. and Paul C., 2000, J. Near Infrared Spectrosc. 8, 101) has shown that standardization can be improved by using sealed cells made of the same product that is used in the network. Currently the Consortium has a 14 cell forage standardization set. We will perform a specific standardization, which will include hay and haylage. For products other than these, a standardization based on a 30 cell characterization set composed of multiple products will be used. For the future, it is possible to develop specific standardizations for each product based on single product standardization sets. This could happen after an evaluation of standardization based on the forage characterization set has been done.

After standardization instruments must be monitored to detect changes in instrument performance and to ensure members will generate accurate NIR predictions consistently. Monitoring is carried out in two steps. First diagnostics are run weekly and it is verified that the instrument meets manufacturer specifications. Second and most importantly, check cell tests are run daily. Check cell results are not only important because they allow us to detect instrument drifting, but also because by using the same check cell in all the network labs, we have a reliable evaluation of the predicting performances of each instrument within the network.

Check cells for the Consortium, made with the same forage sample and sealed, ensure a fair comparison between instruments in the network. It is necessary to replace all NIRS check cells because we know many ISI check cells, particularly the old ones, leak. That means that samples will age quickly and vary in moisture content following changes in air humidity. Such changes make any comparison between instruments unreliable. The two standardization sets, the 30 cell characterization set and the 14 forage cells, used by the Consortium in the past few years have the same problem and need to be repaired before starting any standardization procedure.

After performing the standardization, each instrument must be monitored by using the same sample. For the reasons just explained, this cannot be done using old check cells. Monitoring must be done with a new check cell that has been tested and doesn't leak. Because we are

running a forage network, it would be preferable to have a forage check cell. Predictions of the chemical composition of forages are affected by light absorption at wavelengths that differ from the ones used for soybean. Using a forage check cell associated with a forage check cell equation will allow us to have a better evaluation of the effect of changes in instrument performance on the accuracy of forage predictions. After the Consortium annual meeting, we have started discussions with ISI. The Consortium has been offered new ISI check cells for a low price, which is actually lower than buying empty sealable cells to make our own forage check cells.

Instrument Standardization and Monitoring Proposal

1. Standardization

The Consortium has 2 cell sets that will circulate amongst member labs. Each lab will run the standardizations individually. Each lab will have a forage standardization executed, using the 14 forage cells, and a multi-product standardization using the 30 cell characterization set. This standardization will be run every 2 years at every lab and after repair of an instrument. The circulation of standardization sets is expected to be initiated in June, 2000.

2. Monitoring

Monitoring of instrument performance will consist of two parts: running diagnostic tests and running check cells.

A. Reporting

Members will be asked to send diagnostic and check cell result files via email to Paolo Berzaghi. By mid-summer, members will be able to submit files into a web page that will calculate and report diagnostic limits and pass/fail results. Members will have their own secure user submission and report in which results are cumulatively compared for that member only. If any of the diagnostic or check cell results fail, the member will receive a report with recommended actions to take. If failure continues, the member will be referred to Foss Technical Support.

B. New Check Cells

The Consortium proposes that each member lab buy a new ISI check cell. The consortium could then convert the old ISI check cells into forage check cells, after repairing them for leaks. The result will be that each lab will have 2 check cells: a new ISI check cell and a Consortium forage check cell.

The forage check cell will provide a fair evaluation of the Consortium forage network performance. ISI check cells will be used for evaluating performance on products other than forages. It must also be pointed out that ISI check cells are used by any other NIR lab, and maintaining an ISI check cell scanning routine would allow us to compare the performance of Consortium instruments to any other network. This could be very useful if a proficiency organization like NFTA would require proof of instrument performance in the future.