Getting better all the time

Raymond D. Aller, MD; Robert V. Pierre, MD

The capabilities and reliability of cell counting and differential instruments continue to evolve. We appreciate the investment and dedication of the manufacturers that develop, distribute, and support these valuable additions to our laboratories.

Now that five-part differential leukocyte counts have been available on automated instruments for more than 25 years, the reliability and accuracy of these counts have reached a high level. Therefore, it is rarely appropriate to replace an automated differential count with a manual count, based on a 100-cell slide examination. Each laboratory must establish criteria for reviewing smears, based on instrument flags, but these smear reviews are more often triggered by a need to look at erythrocyte morphology, or at platelets—not on recounting the differential. Reporting a manual differential would be appropriate only when the automated counter is unable to produce a differential.

There is still a need to examine blood films to determine the nature of abnormal leukocyte populations and abnormal red cell and platelet morphology. The CAP Hematology and Clinical Microscopy Resource Committee conducted a definitive study that showed that band and segmented neutrophils cannot be distinguished from each other accurately or reproducibly and recommended against measuring or reporting a band count (CAP TODAY, May 1994). Numerous studies have shown the superiority of the absolute neutrophil count over the band count in detecting infection. (Arden MJ, Westengard JC, Dutcher TF. Am J Clin Pathol. 1994;102:646.) Two indications for the review of a blood film on a patient with a total leukocyte count well above normal are the febrile nonneutropenic patient with suspected typhoid fever and the presence of bandemia with a normal WBC, in these isolated instances, provides significant clinical value.

Another consequence of the continual improvement of instrument flagging capabilities is that we have been able to widen our smear review criteria. For example, if there are no immature or blast flags, we no longer review smears for a neutrophil abnormality unless the neutrophil percentage exceeds 90 percent. Seven years ago in an acute care university hospital, a blood film review was performed on 100 percent of CBCs, whereas today only 13 percent of CBCs have a blood film prepared for review. This dramatic reduction is the result of review criteria and permitting requests of routine differential counts no more frequently than every seven days in a single care period.

It has been several years since the automated reticulocyte count was added to the capabilities of automated counters. In addition to basic reticulocyte counts, many instruments provide estimates of reticulocyte immaturity. These parameters are frequently underused in evaluating anemia and bone marrow recovery from chemotherapy and bone marrow transplants.

Capabilities can be added to a cell counter, to the point of turning it into a stripped-down flow cytometer—capable of assessing differentiation antigens on cell surfaces or lymphocyte markers, or performing bone marrow differential counts. However, for these assays, many favor using a dedicated flow cytometer staffed by highly trained personnel, rather than trying to load volume-specialized assays onto a hematology analyzer located in a highvolume, fast-paced environment and staffed by personnel who have been challenged already in today’s core laboratories to be expert on hematology, chemistry, immunology, and urinalysis analysts.

If reported with every CBC, a number of analytes would add to the medical value of the results the cell counters produce. However, instrument vendors have been unwilling to add them because the market hasn’t demanded them.

Some argue that adding parameters to the routine CBC would confuse clinicians. In the mid-’80s, one of the authors (RDA) championed the clinical use of the hemoglobin distribution width parameter on his lab’s Technicon H-1 instrument. It was reported with all CBCs, and the physician user population was educated about HDW’s usefulness in the differential diagnosis of anemias. Unfortunately, few clinicians caught on to its use. Even today an alarming number of clinicians appear to be unfamiliar with the use of the MCV in evaluating anemia—though that has been well established for several decades.

The lineup of instruments on pages 27–34 profiles 14 instruments from M.A.P.S.S.™ cell-by-cell analysis provides a more complete picture of the cell population for the clinical and research settings. The MCV is a valuable and reliable tool for evaluating reticulocytes, nucleated RBCs, and immature WBCs. These parameters are frequently underused in evaluating anemias and the CD4 lymphocyte counts, many instruments provide estimates of reticulocyte immaturity.
### Name of Instrument

First year sold-installed in U.S./outside U.S.

No. units installed in U.S./outside U.S./list price

<table>
<thead>
<tr>
<th>Instrument</th>
<th>U.S. Sales</th>
<th>Sales outside U.S.</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell-Dyn 3700</td>
<td>300,000</td>
<td>350,000</td>
<td>$125,000</td>
</tr>
<tr>
<td>Cell-Dyn 4800</td>
<td>200,000</td>
<td>250,000</td>
<td>$140,000</td>
</tr>
<tr>
<td>Pentra 600™</td>
<td>10,000</td>
<td>20,000</td>
<td>$125,000</td>
</tr>
</tbody>
</table>

### Test menu

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard menu</strong></td>
<td>(left) plus: RMD, MPV, MCV, MCH, Ht, Hct, NRBC</td>
</tr>
<tr>
<td><strong>Laboratory</strong></td>
<td>(right) plus: RBC, WBC, Ht, MCV, MCH, MCV, %, haemoglobin, MCHC, retic. fraction, page 1999/1999</td>
</tr>
</tbody>
</table>

### Differential menu (used)

<table>
<thead>
<tr>
<th>M.A.P.S.S.™ (Multi-angle Pol. Scatter Sep.)</th>
<th>Optical scatter &amp; fluorescence technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.P.8.S.™</td>
<td>DHSS technology combining cytchemistry, focused flow impedance, &amp; light absorption principles of measurement</td>
</tr>
</tbody>
</table>

### Different lab applications

<table>
<thead>
<tr>
<th>Linear</th>
<th>M.R.C. (Refractive Index), M.H.C. (Molecular Height), M.C.M. (Molecular Mass)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WBC count</strong></td>
<td>0.250–1.0</td>
</tr>
<tr>
<td><strong>RBC count</strong></td>
<td>0.250–1.0</td>
</tr>
<tr>
<td><strong>MCV</strong> (M.R.C.)</td>
<td>50–200</td>
</tr>
<tr>
<td><strong>Precision</strong></td>
<td>2.5–10.0%</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>1.0–9.0%</td>
</tr>
</tbody>
</table>

### Interfering substances

<table>
<thead>
<tr>
<th>Substance</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interfering substances: <strong>WBC</strong></td>
<td>WBC count/platelet count/</td>
</tr>
<tr>
<td>Interfering substances: <strong>RBC</strong></td>
<td>RBC count/</td>
</tr>
<tr>
<td>Interfering substances: <strong>Hct</strong></td>
<td>Hct/MCH</td>
</tr>
<tr>
<td>Interfering substances: <strong>Neut</strong></td>
<td>Neut/</td>
</tr>
<tr>
<td>Interfering substances: <strong>Lymph</strong></td>
<td>Lymph/</td>
</tr>
</tbody>
</table>

### Microscopic evaluation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neut</strong></td>
<td>Neut/</td>
</tr>
<tr>
<td><strong>Lymph</strong></td>
<td>Lymph/</td>
</tr>
<tr>
<td><strong>Mono</strong></td>
<td>Mono/</td>
</tr>
</tbody>
</table>

### Conclusion

- **LIS interface** supported
- **Information transferred on LIS interface**
- **LOD/DO detected with LIS**

### Other parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reportable</strong></td>
<td>RBC count, monoclonal antibody capability, fluorescence, random access retic/</td>
</tr>
<tr>
<td><strong>Reporting</strong></td>
<td>IRF, WBC viability index, Argon laser</td>
</tr>
<tr>
<td><strong>Reliable</strong></td>
<td>5-part WBC diff technology—MTBF over 200 days, small footprint, small sample size of 53 µL</td>
</tr>
</tbody>
</table>

Tabulation does not represent an endorsement by the College of American Pathologists.
### Differential Method(s) used

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cytocentrifuge, Inc.</td>
<td>Flow impedance, light absorption</td>
</tr>
<tr>
<td>Pentra 120 Retic Hematology Analyzer</td>
<td>Perox-Persulfate cytochem. staining w/ light scatter &amp; absorption; Barco-chrom. stripping w/ 2-color laser-light scatter</td>
</tr>
<tr>
<td>Coulter’s S-3 VCS Technology, AccuFlex technology w/ IntelliKits &amp; AccuStat</td>
<td></td>
</tr>
</tbody>
</table>

### Age- and sex-specific reference ranges

<table>
<thead>
<tr>
<th>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</th>
<th>Rec. age range</th>
<th>Rec. sex range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### List of Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Manufacturer</th>
<th>Address</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentra 120 Retic Hematology Analyzer</td>
<td>ABX Diagnostics Inc.</td>
<td>34 Hanson Rd., Irvine, CA 92618</td>
<td>Jim Mulry</td>
</tr>
<tr>
<td>ADVIA 120 Hematology System</td>
<td>Beckman Coulter Inc.</td>
<td>511 Benedict Ave., Tarrytown, NY 10591</td>
<td>Martha M. Diaz/Cellular Analysis Marketing</td>
</tr>
</tbody>
</table>
### Differential Methodology

<table>
<thead>
<tr>
<th>Linearly:</th>
<th>Coulter's 3-D VCS technology</th>
<th>Coulter's 3-D VCS technology</th>
<th>Coulter's 3-D VCS technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC count (10⁹/L); RBC count (10¹²/L)</td>
<td>0–99.9–1.0</td>
<td>0–99.9–1.0</td>
<td>0–99.9–1.0</td>
</tr>
<tr>
<td>Hemoglobin (g/dL)/platlets (10¹²/L)</td>
<td>&lt;2.5%–&gt;2.0%</td>
<td>&lt;1.5%–&gt;2.0%</td>
<td>&lt;1.5%–&gt;2.0%</td>
</tr>
<tr>
<td>MCV or Hct</td>
<td>&lt;1.0%–&lt;1.0%</td>
<td>&lt;1.0%–&lt;1.0%</td>
<td>&lt;1.0%–&lt;1.0%</td>
</tr>
</tbody>
</table>

### Accuracy of Automated Diff. Compared with Manual Diff., per NCCLS H-20A

<table>
<thead>
<tr>
<th>Interfering Substance: WBC</th>
<th>Very high WBC</th>
<th>Very high WBC</th>
<th>Very high WBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCV or Hct</td>
<td>Very high WBC, high conc. of very large Plt, auto-agglut</td>
<td>Very high WBC, high conc. of very large Plt, auto-agglut</td>
<td>Very high WBC, high conc. of very large Plt, auto-agglut</td>
</tr>
<tr>
<td>Platellet</td>
<td>Very small eryth. or leuk., or cell frags. may cause no-fit, Chemotherapy may affect certain samples.</td>
<td>Very small eryth. or leuk., or cell frags. may cause no-fit, Chemotherapy may affect certain samples.</td>
<td>Very small eryth. or leuk., or cell frags. may cause no-fit, Chemotherapy may affect certain samples.</td>
</tr>
</tbody>
</table>

### Interfering Substance: Differential

<table>
<thead>
<tr>
<th>Test</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age- and Sex-specific Reference Ranges</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
<tr>
<td>Max. CBC per shift/Max. CBC per day</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
<tr>
<td>Primary/RBC, WBC, Hb, MCV, Plt, MPV</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
<tr>
<td>4 colors/cell types</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
<tr>
<td>Colors without thresholds</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
<tr>
<td>Color without thresholds</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
<td>Yes (multiple sizes &amp; styles)</td>
</tr>
</tbody>
</table>

### LIS Interface Formatted Support

<table>
<thead>
<tr>
<th>Information types formatted on LIS Interface</th>
<th>Proprietary</th>
<th>Proprietary</th>
<th>Proprietary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical &amp; Flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</td>
<td>Proprietary</td>
<td>Proprietary</td>
<td>Proprietary</td>
</tr>
<tr>
<td>Numerical &amp; Flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</td>
<td>Proprietary</td>
<td>Proprietary</td>
<td>Proprietary</td>
</tr>
</tbody>
</table>

### Time Required for Maintenance by Lab Personnel

<table>
<thead>
<tr>
<th>Onsite maintenance records</th>
<th>Monthly: 2 min</th>
<th>Monthly: 5 min</th>
<th>Monthly: 2 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from communication of problem to engineer on site</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Time from diagnosis/fixing to software problem</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Maintenance can perform diagnosis via modem</td>
<td>Yes/no</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
<tr>
<td>Acquisition program based on cost-per-reportable result</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Distinguishing Features

- For research-use only
- Tests in development
- VCS technology, lowest review rate in class, zero routine daily maint., triplicate counting, opening burn circuit, switchover, autosampler & single sample models
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- For research-use only
- Tests in development

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### High-volume hematology analyzers

**Name of Instrument**
First year sold: 2000 in U.S./outside U.S.
No. units installed in U.S./outside U.S./list price

**Test menu**
- **Charitable Laboratory**
  - Standard menu (left): RDW-SD, RDW-CV, MPV
  - Standard menu (left): RDW-SD, RDW-CV, MPV
- **Color** or **Other**
- **Interfering substances**:
  - WBC, RBC, Hb, Hct, PLT
- **Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A
- **Interfering substances**: WBC, RBC, Hb, Hct, PLT
- **Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A

**Differential method(s) used**
Flow cytometry with semiconductor laser for lymph, mono, neut, eos, baso

**Linearity:**
- WBC count (10^3/L)/RBC count (10^12/L)
- Hemoglobin (g/dL)/platelet (10^9/L)
- MCV or Hct (%)

**Precision:**
- WBC count/platelet
- MCV or Hct

**Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A
- Neutrophils >0.50, lymphocytes <0.05, monocytes <0.08, eosinophils <0.05

**Interfering substances**: WBC
- Cold agglutinin, PLT clumps, MCH, MCHC

**Interfering substances**: MCV or Hct
- Cold agglutinin, severe microcytosis, ferritin, iron, RDW

**Interfering substances**: PLT
- Platelet saturation, PLT clumps, increased microcytosis, giant PLTs

**Interfering substances**: Hb
- Hb, Hct

**Interfering substances**: RBC
- RBC agglutination, RBC clumps, abnormal distribution

**Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A
- Neutrophils >0.50, lymphocytes <0.05, monocytes <0.08, eosinophils <0.05

**Interfering substances**: WBC
- Cold agglutinin, PLT clumps, MCH, MCHC

**Interfering substances**: MCV or Hct
- Cold agglutinin, severe microcytosis, ferritin, iron, RDW

**Interfering substances**: PLT
- Platelet saturation, PLT clumps, increased microcytosis, giant PLTs

**Interfering substances**: Hb
- Hb, Hct

**Interfering substances**: RBC
- RBC agglutination, RBC clumps, abnormal distribution

**Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A
- Neutrophils >0.50, lymphocytes <0.05, monocytes <0.08, eosinophils <0.05

**Interfering substances**: WBC
- Cold agglutinin, PLT clumps, MCH, MCHC

**Interfering substances**: MCV or Hct
- Cold agglutinin, severe microcytosis, ferritin, iron, RDW

**Interfering substances**: PLT
- Platelet saturation, PLT clumps, increased microcytosis, giant PLTs

**Interfering substances**: Hb
- Hb, Hct

**Interfering substances**: RBC
- RBC agglutination, RBC clumps, abnormal distribution

**Accuracy of automated diff.** compared with manual diff., per NCCLS H-20A
- Neutrophils >0.50, lymphocytes <0.05, monocytes <0.08, eosinophils <0.05

**Interfering substances**: WBC
- Cold agglutinin, PLT clumps, MCH, MCHC

**Interfering substances**: MCV or Hct
- Cold agglutinin, severe microcytosis, ferritin, iron, RDW

**Interfering substances**: PLT
- Platelet saturation, PLT clumps, increased microcytosis, giant PLTs

**Interfering substances**: Hb
- Hb, Hct

**Interfering substances**: RBC
- RBC agglutination, RBC clumps, abnormal distribution
**High-volume hematology analyzers**

**Part 6 of 6**

Recke Diagnostics Corp.
Lisa Davis or Mike Clark
1115 Hagar Rd., Indianapolis, IN 46250-0475
800-426-5074
(www.roche.com)

**Frequently asked questions**

- **Q1**: What are the distinguishing features of the instrument?
  - **A1**: Adaptive Cluster Analysis System, random access, discrete testing, immunity information channel, integrated logic

- **Q2**: How is the instrument used for blood analysis?
  - **A2**: Performs differential counts with cell-specific lysis (eos, baso, IMI), DC detection (lymph, monocytes, granulocytes)

- **Q3**: What is the accuracy of automated differential compared with manual differential?
  - **A3**: Yes

- **Q4**: Is the instrument capable of microsample testing?
  - **A4**: Yes (3mL, 5mL, 7mL)

- **Q5**: What is the minimum specimen volume for closed and open samples?
  - **A5**: 100µL/250µL/1mL

- **Q6**: Can the instrument accommodate bar-code placement per NCCLS standard Auto2A?
  - **A6**: Yes

- **Q7**: What is the maximum number of CBCs performed per hour?
  - **A7**: >100

- **Q8**: Is the instrument capable of preparing microscopic slides automatically or flags?
  - **A8**: Yes

- **Q9**: Can the instrument process tube sampling?
  - **A9**: Yes (open/closed, sample dead vol. closed)

- **Q10**: Does the instrument support age- and sex-specific reference ranges?
  - **A10**: Yes

- **Q11**: Are there interfering substances that may affect test results?
  - **A11**: Cold agglutinin, WBC clumps, RBCs, cryoglobulins

- **Q12**: Can the instrument detect and report on immaturity?
  - **A12**: Yes (IMI channel)

- **Q13**: What is the maximum specimen volume for hematocrit analysis?
  - **A13**: 350µL

- **Q14**: Is the instrument capable of storing data for reprocessing or report transmission?
  - **A14**: Yes

- **Q15**: Does the instrument provide enhanced data analysis and management features?
  - **A15**: Yes

- **Q16**: Can the instrument transmit results to LIS while others hold?
  - **A16**: Yes

- **Q17**: Does the instrument support LIS interface formats supported?
  - **A17**: Yes

- **Q18**: Is the instrument capable of performing delta checks?
  - **A18**: Yes

- **Q19**: Can the instrument sort data for reprocessing or report transmission?
  - **A19**: Yes

- **Q20**: Does the instrument support user-defined parameter settings?
  - **A20**: Yes

- **Q21**: Is the instrument capable of generating bar-code symbologies?
  - **A21**: Yes

- **Q22**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A22**: Yes, proprietary

- **Q23**: Is the instrument capable of performing extended linearities?
  - **A23**: Yes

- **Q24**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A24**: Yes

- **Q25**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A25**: Yes

- **Q26**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A26**: Yes

- **Q27**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A27**: Yes

- **Q28**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A28**: Yes

- **Q29**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A29**: Yes

- **Q30**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A30**: Yes

- **Q31**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A31**: Yes

- **Q32**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A32**: Yes

- **Q33**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A33**: Yes

- **Q34**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A34**: Yes

- **Q35**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A35**: Yes

- **Q36**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A36**: Yes

- **Q37**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A37**: Yes

- **Q38**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A38**: Yes

- **Q39**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A39**: Yes

- **Q40**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A40**: Yes

- **Q41**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A41**: Yes

- **Q42**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A42**: Yes

- **Q43**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A43**: Yes

- **Q44**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A44**: Yes

- **Q45**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A45**: Yes

- **Q46**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A46**: Yes

- **Q47**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A47**: Yes

- **Q48**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A48**: Yes

- **Q49**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A49**: Yes

- **Q50**: Is the instrument capable of performing enhanced QC, data archiving, data collation from multiple instruments?
  - **A50**: Yes

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