



Evaluation of Moichor Avian Automated CBC Accuracy and Technical Variability

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Moichor
Research and Development

Introduction

Despite the importance of the Complete Blood Count (CBC) in diagnosing avian patients, the lack of standardization in the manual CBC leads to irreproducible and imprecise Leukocyte estimates.^{1 2} The flaws in the manual CBC protocol stem from 3 factors - (1) limitations in the existing CBC automated instruments (2) cross-species cell morphology variation , and (3) individual pathologist subjectivity in interpreting the avian hemogram.

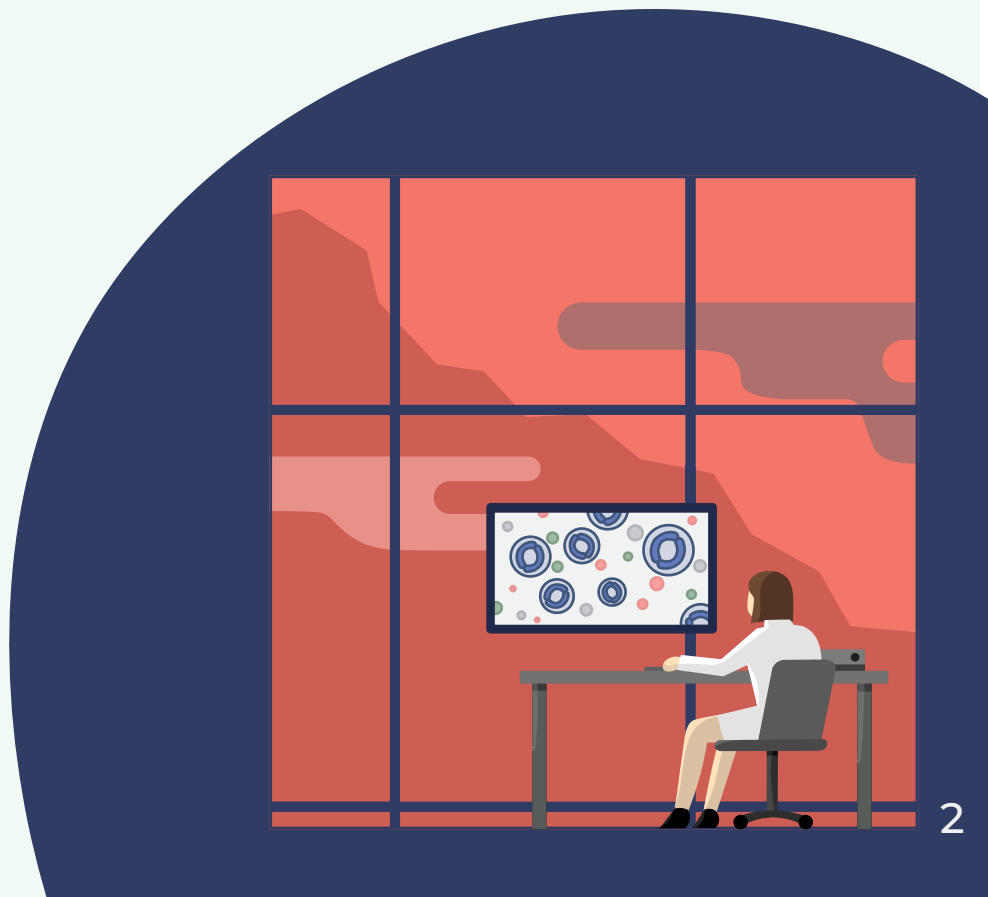
At Moichor, we leverage state-of-the-art microscopy and computer vision technologies to provide the best possible avian CBC. In collaboration with industry experts, premier private and non-profit organizations, pathologists, and technicians, we have built an unprecedented avian hemogram interpretation dataset. This catalog of data encompasses the most common avian species including but not limited to Cockatoos, Cockatiels, Amazons, African Greys, Macaws, Backyard Chickens, and Lovebirds.

In this study, we validated our technology's accuracy and variability in a mixed avian species population to demonstrate Moichor automated CBC significantly reduced the inconsistency and subjectivity present in the manual CBC.



How it works

The Moichor Automated CBC standardizes each step of the avian CBC. After blood smear samples are prepared per our protocol, our proprietary microscopy platform automatically selects and captures the best candidate regions for cell differentiation. Subsequently, our analytic pipeline processes the imaging data and identifies individual cells in every candidate region. As part of Moichor's standard of practice, we transparently present all imaging data for every patient.



Results

Comparison between Moichor Automated CBC and Manual CBC in Avian Subjects

Experimental data from 24 mixed species avian subjects were collected over four weeks at Moichor's partner clinics. A certified technician performed manual absolute cell counting, and the final estimated count was computed using the standard CBC estimate formulation.³ Compared with the Manual CBC, the Moichor's automated count achieved a Pearson Correlation Coefficient⁴ of 0.91 for the total WBC count with detailed per cell type correlations (Figure 1). We compared the distributions of CBC results by manual and Moichor Automated CBC using the 2 Sample Kolmogorov-Smirnov Statistics.⁵ The results (Table 1) demonstrate that the distributional characteristics of the manual and automated count are similar.

CBC result	Pearson R	p-value	KS-Statistics	KS p-value
WBC	0.91	1.1e-09	0.13	0.95
Heterophil	0.96	9.9e-14	0.14	0.94
Lymphocyte	0.74	3.4e-05	0.26	0.54
Monocyte	0.68	2.8e-04	0.21	0.68
Basophil	0.88	1.5e-08	0.16	0.90
Eosinophil	0.65	5.7e-04	0.16	0.90

Table 1 Pearson Correlations and KS-Statistics for each cell type counts between Moichor Automated and Manual Methods. The Pearson R value, which ranges from -1.0 to 1.0, demonstrates the correlation between the methods. The KS-Statistic, which ranges from 0.0 to 1.0, demonstrates the dissimilarity between the distribution of the automated and manual counts the closer the value to 1.0. The p-values show the significance of these tests. The high KS p-values indicate the distribution of manual and automated counts are not significantly different.

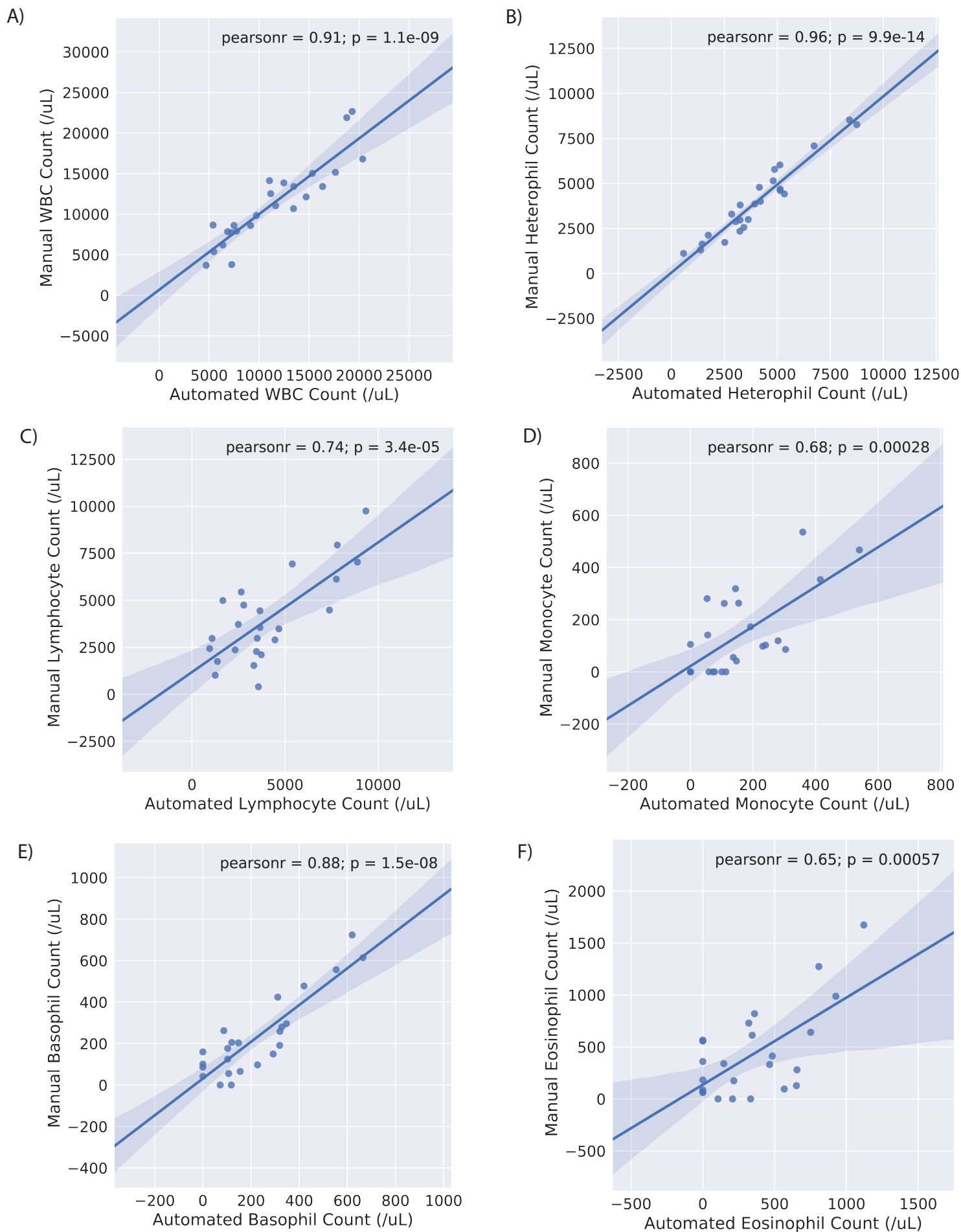


Figure 1 Correlation between Moichor Automated CBC (x-axis) and Manual CBC (y-axis) for (A)WBC, (B)Heterophil, (C)Lymphocyte, (D)Monocyte, (E)Basophil, and (F)Eosinophil. The blue area represents the 95% confidence interval for the regression.

Results (cont.)

Assessing Technical Variability of Moichor Automated Method

We assessed the technical variability of Moichor Automated Method by repeatedly scanning the same sample for seven consecutive days. The results were tabulated, the mean and standard deviation were computed and compared with the manual results. Table 2 demonstrates the technical reliability and reproducibility when performing Moichor Automated CBC on the same sample.

ID	Absolute WBC Count (/uL)	Absolute Heterophil Count (/uL)	Absolute Lymphocyte Count (/uL)	Absolute Monocyte Count (/uL)	Absolute Basophil Count (/uL)	Absolute Eosinophil Count (/uL)	Heterophil differential (%)	Lymphocyte differential (%)	Monocyte differential (%)	Basophil differential (%)	Eosinophil differential (%)	Absolute Thrombocyte Count (/uL)
Replicate 1	18594	987	13575	2632	164	1234	5.3	73	14.1	0.8	6.6	65326
Replicate 2	17800	1145	13064	2750	229	611	6.4	73.3	15.4	1.2	3.4	68988
Replicate 3	16803	1519	11568	1604	422	1688	9	68.8	9.5	2.5	10	69325
Replicate 4	17327	1283	11631	1925	481	2005	7.4	67.1	11.1	2.7	11.5	67865
Replicate 5	17728	1845	11711	2406	481	1283	10.4	66	13.5	2.7	7.2	68587
Replicate 6	17936	2139	12259	1974	82	1480	11.9	68.3	11	0.4	8.2	68864
Replicate 7	17031	1810	10942	1974	411	1892	10.6	64.2	11.5	2.4	11.1	69193
Rep Mean	17602.7	1532.5	12107.1	2180.7	324.2	1456.1	8.7	68.6	12.3	1.8	8.2	68306.8
Rep Std	604.2	418.8	924.2	420.7	163.1	472.4	2.4	3.4	2	0.9	2.8	1399.7
Manual Count	17287	829	12662	2095	130	1571	4.7	73.2	12.1	0.8	9	N/a

Table 2 Detailed Results of Moichor Automated CBC in 7 technical replicates. The last 3 rows in this table compare the mean (Rep Mean) and standard deviation (Rep Std) of the replicates to a manual CBC.

We did not compare Thrombocyte count as the current standard of practice does not enable this measurement.

Conclusion

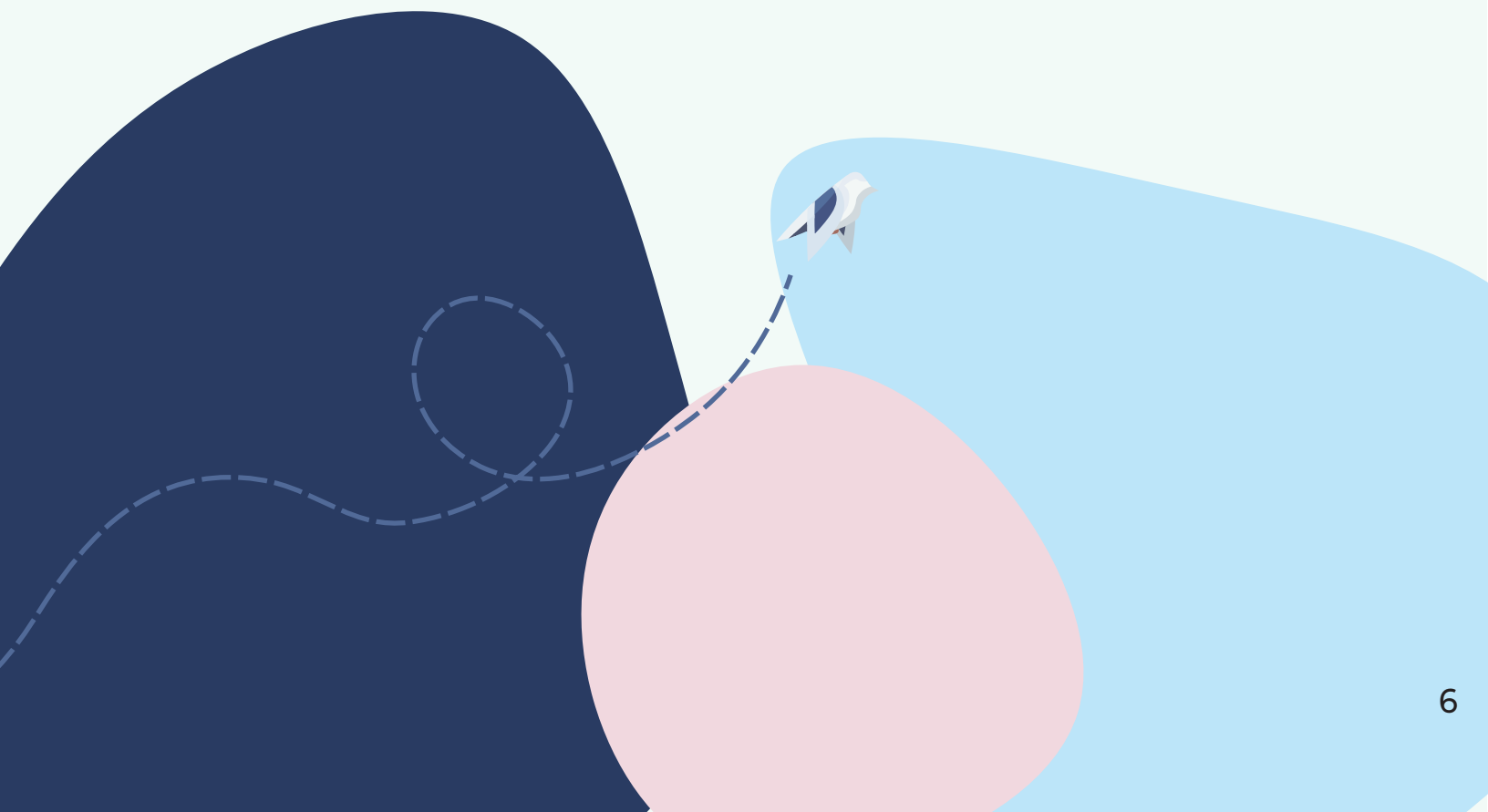
This study provided a comparison between Moichor automated Avian CBC and the Manual CBC. It presented the current state of Moichor's technology in terms of correlation with the manual complete blood count as well as technical variability. Current and future studies will expand the catalog of training and experimental data; in addition, updated results can be found in subsequent white papers. Moichor automated Avian CBC represents an important stepping stone for avian hematology through the development of a novel automated system.

More information

For more information about this study or our standards of practice, please contact skarbasi@moichor.com and/or visit our website www.moichor.com

Note

* This study is an on-going effort and the data may be updated as we expand our subject population, and/or reiterate our models.



References

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