

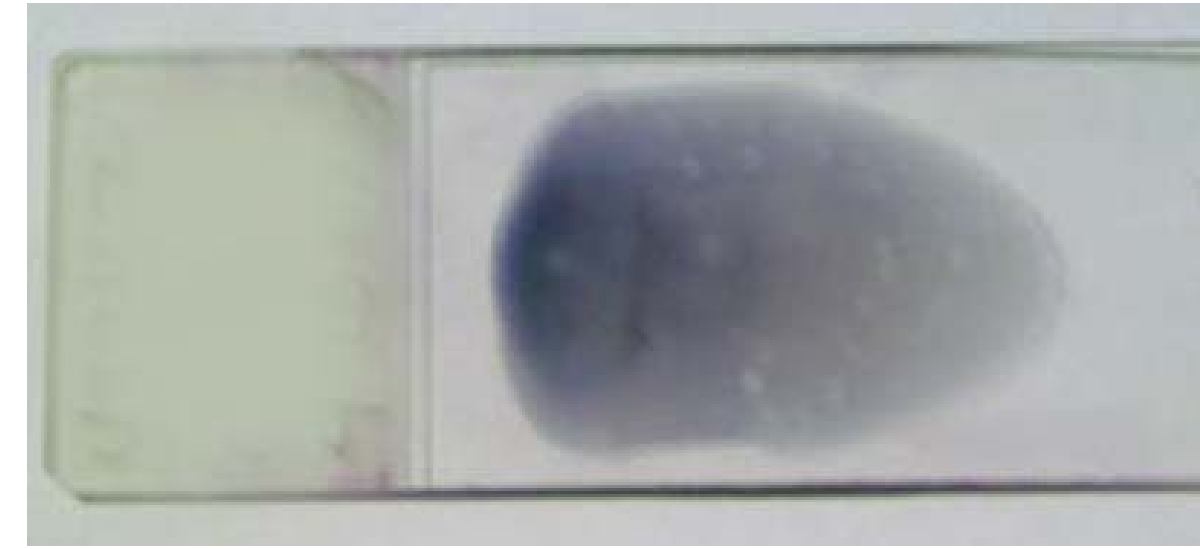
# Blood Smear Examination Alongside Automated Haematology Analysis in First-opinion Practice- How Feasible is it? Online Survey Analysis

Sonal Patel<sup>1</sup>, Balázs Szladovits<sup>2</sup>

<sup>1</sup>Bachelor of Veterinary Medicine Year 5 Student

<sup>2</sup>Department of Pathobiology and Population Sciences

Royal Veterinary College Hawkshead Lane, North Mymms, AL9 7TA, United Kingdom



## Abstract

The practice of microscopic blood smear examination does not appear to be keeping up with the proliferation of in-house automated analysers. Likely causes for the omission include lack of training and available time. An online survey was distributed to first-opinion veterinary clinics across the United Kingdom to investigate the use of haematology analysers, the frequency of blood smear examinations, and the reasons for not utilizing the latter. Majority of respondents (138/182) were veterinary surgeons, with lower numbers being veterinary nurses, technicians, laboratory coordinators. Automated analysers were present in the practices of 89.6% of the respondents. Only about a quarter of respondents look at blood smears in significant numbers; others indicated that smear examination was rare or not part of their haematology analysis. Majority of respondents who don't have a haematology analyser also tend not to examine blood smears. Common reasons to look at blood smears included error flags on haematology analyser, platelet clumping, checking for neutrophil left shift and toxicity, checking for erythrocyte regeneration, and if analyser results did not match clinical picture. Many respondents had an adequate to excellent microscope available, and typically the veterinary surgeons made the smears (vs. veterinary nurses). Main reasons for not examining smears with the automated analysis were lack of time, confidence/skill, and possibility to send samples to external laboratories. There appears to be a need to increase awareness of the importance of smear examination when using automated haematology analysers, in combination with further training in both university and continuing education.

## Introduction

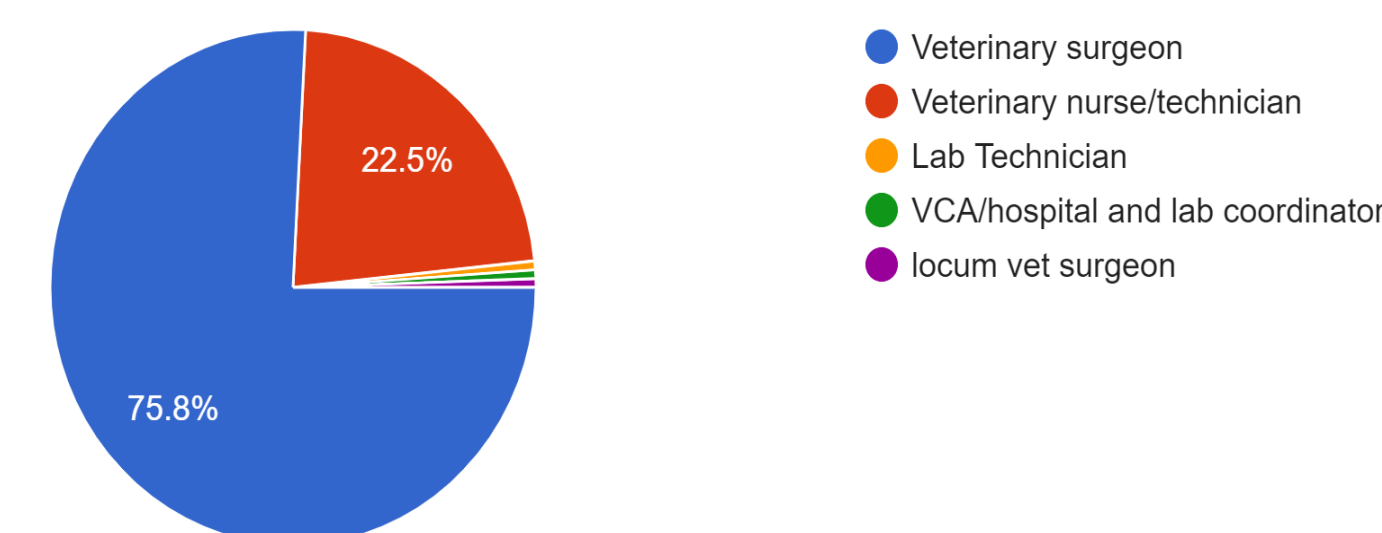
- Automated haematology analysers are wide spread diagnostic tool in UK veterinary practices
- Concurrent blood smear analysis is essential to:
  - Validate machine results, investigate error flags
  - Detect platelet clumping and falsely decreased or increased conc.
  - Check for erythrocyte regeneration and specific morphology changes
  - Validate leukocyte concentrations and differential, detect nRBCs
  - Check for neutrophil left shift and toxicity
  - Check lymphocyte morphology
- Most common errors: uneven distribution of particles (platelet clumping, RBC agglutination), optical interference (lipaemia)
- Concurrent blood smear examination needs training, good microscope, available time
- Goal of the study was to investigate prevalence of blood smear examination and key reasons for their omission

## Material & Methods

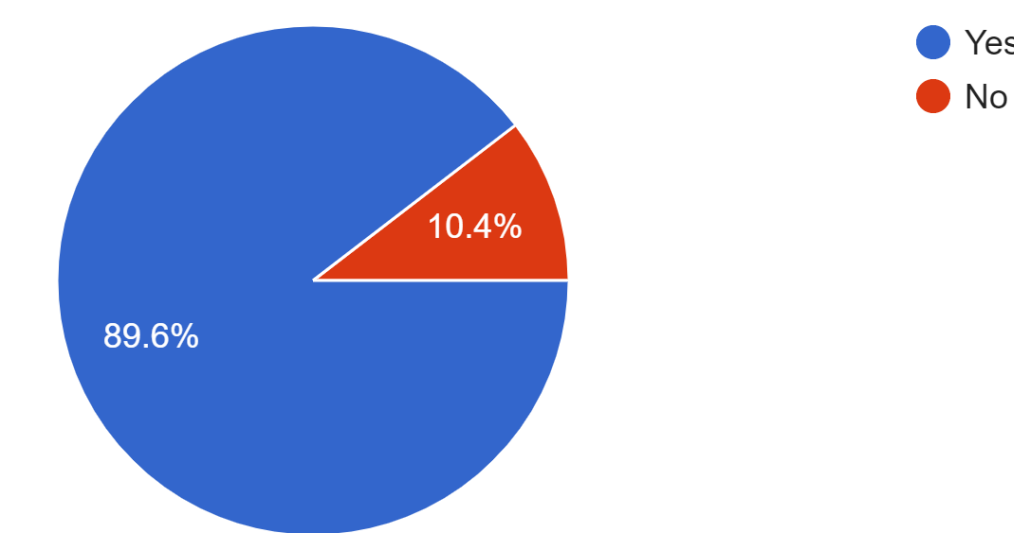
- Survey based study using Google Forms
- Survey was piloted in 5 veterinary clinics before wider distribution
- Distributed via "Veterinary Voices UK" Facebook page and email address in Royal College of Veterinary Surgeons (RCVS) database
  - ~ 9,400 users in the Facebook group
  - ~ 3,170 UK first-opinion clinics from the RCVS database
- Voluntary participation (no incentive offered)
- 12 questions with multiple formats
- Statistics: Chi square and Cramer's V test

## Results - Total of 182 Survey Participants

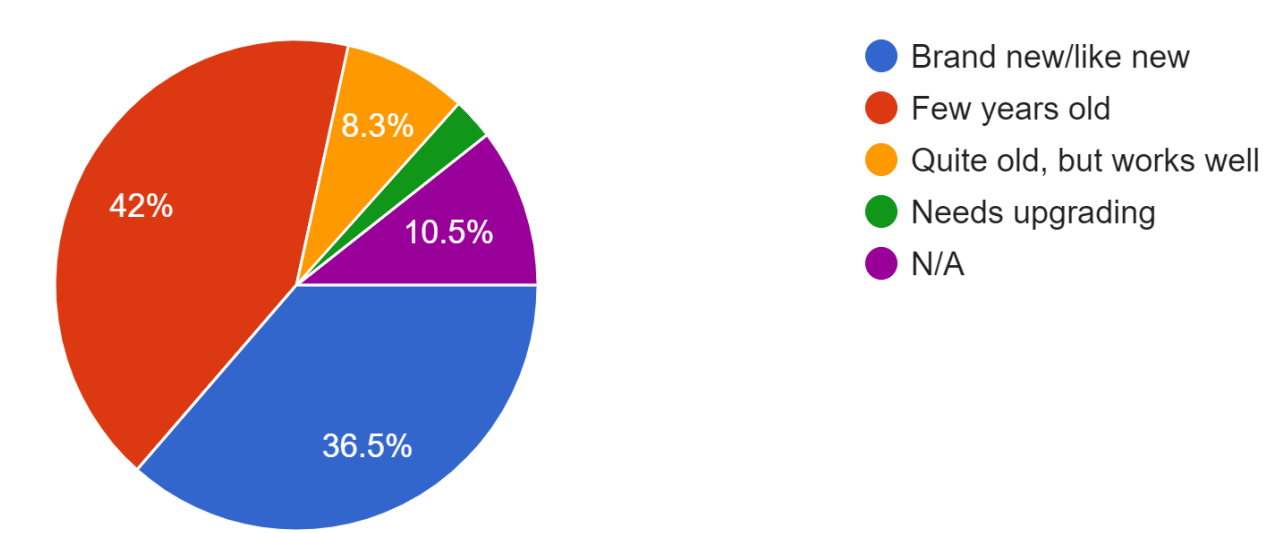
1. What is your role in the practice?  
182 responses



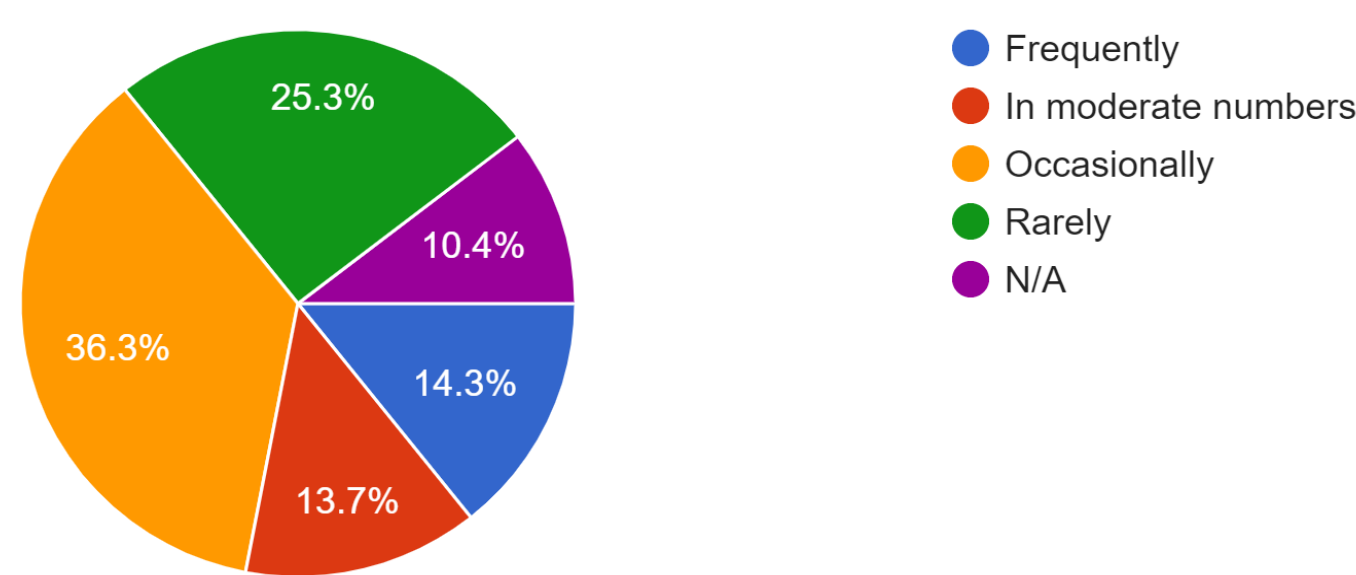
2. Do you have an automated haematology analyser?  
182 responses



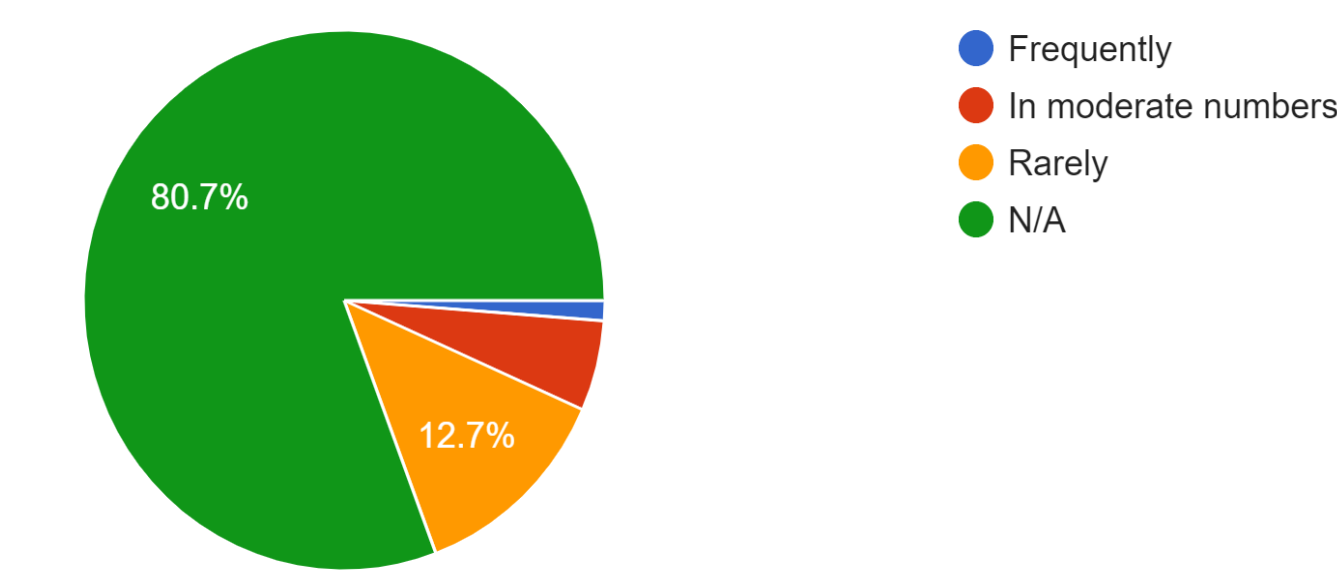
3. How would you rate the condition of your haematology analyser?  
181 responses



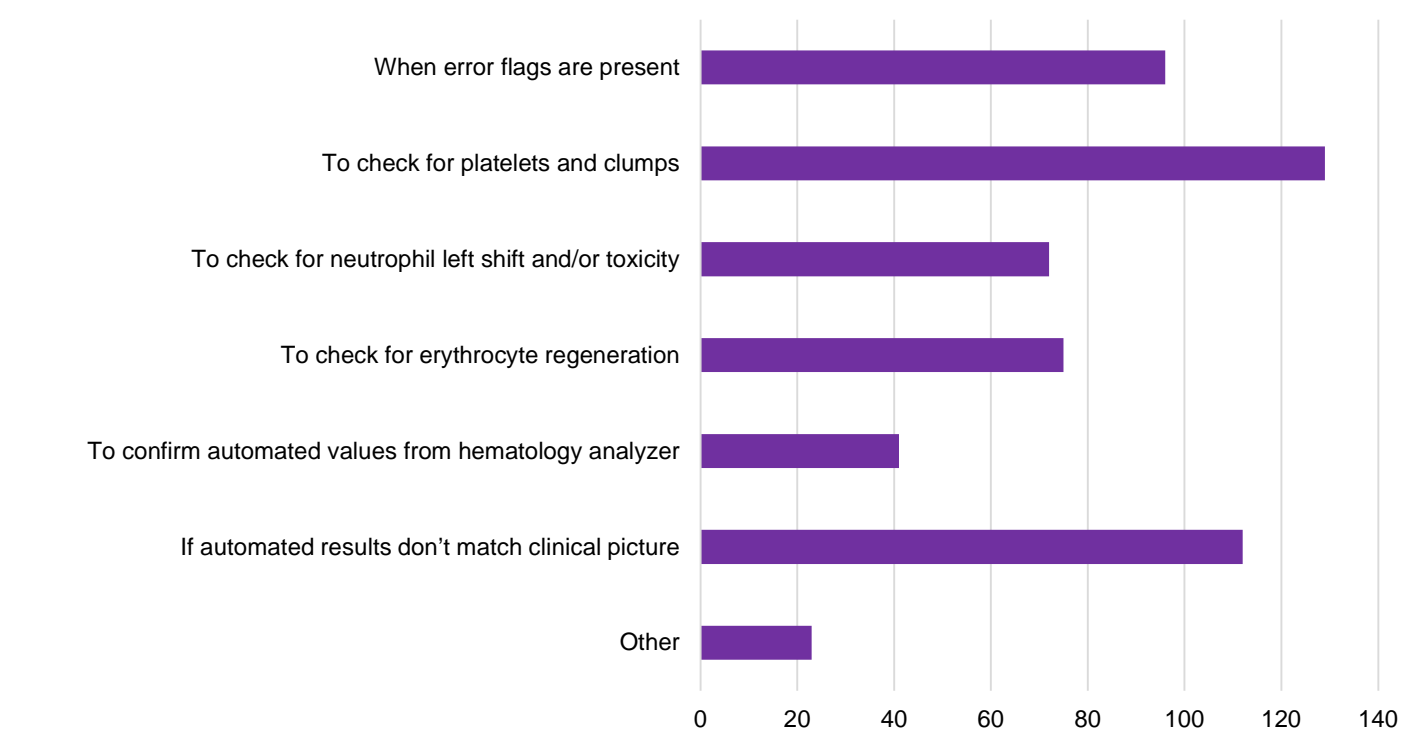
4. If you have an automated haematology analyser, how often do you look at blood smears under the microscope as part of your haematology analysis?  
182 responses



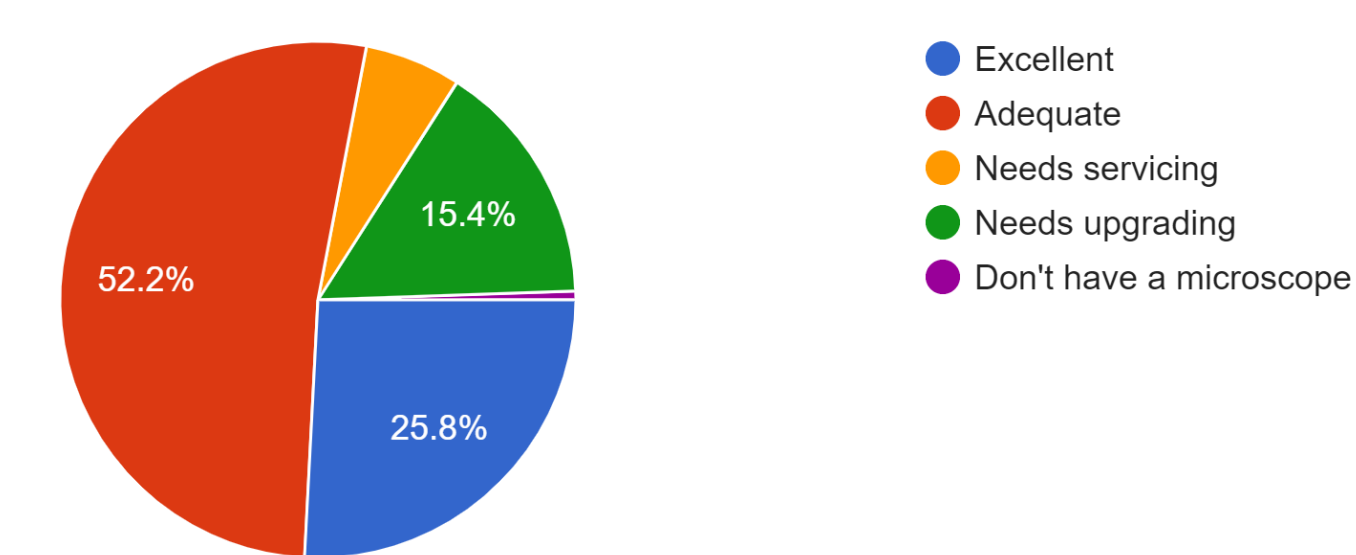
5. If you do not have an automated haematology analyser, how often do you look at blood smears in your practice?  
166 responses



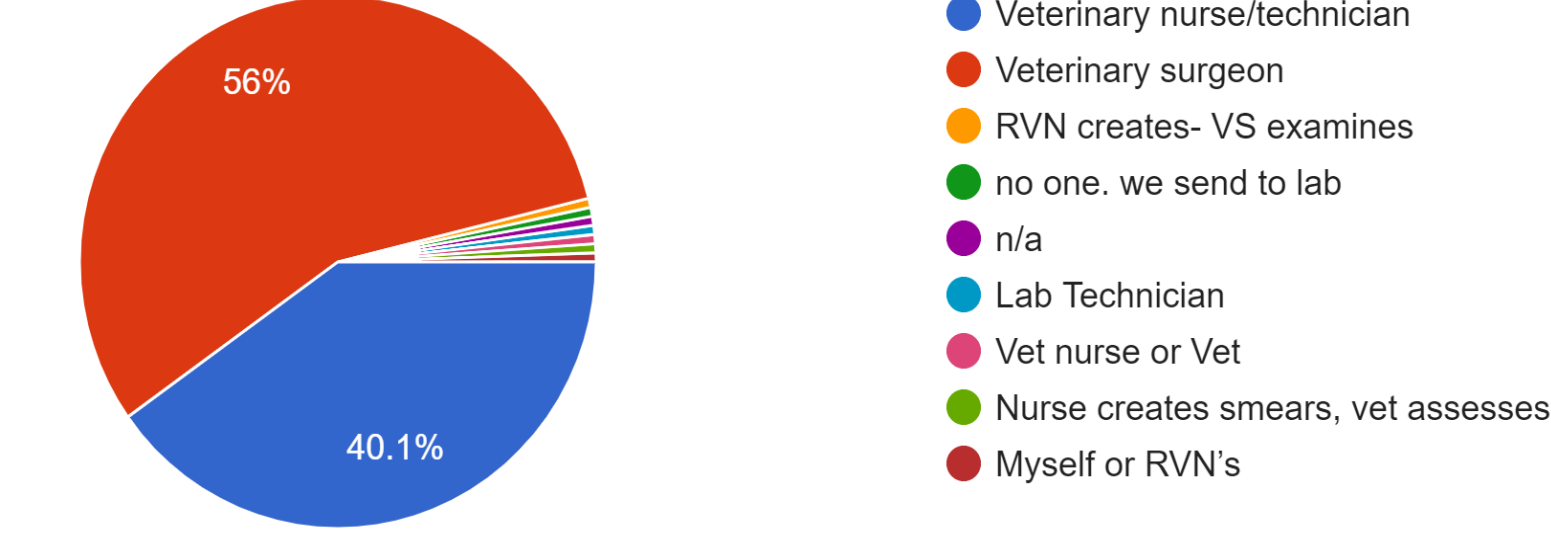
6. In what situation(s) would you look at blood smears? Check as many as applicable.  
177 responses



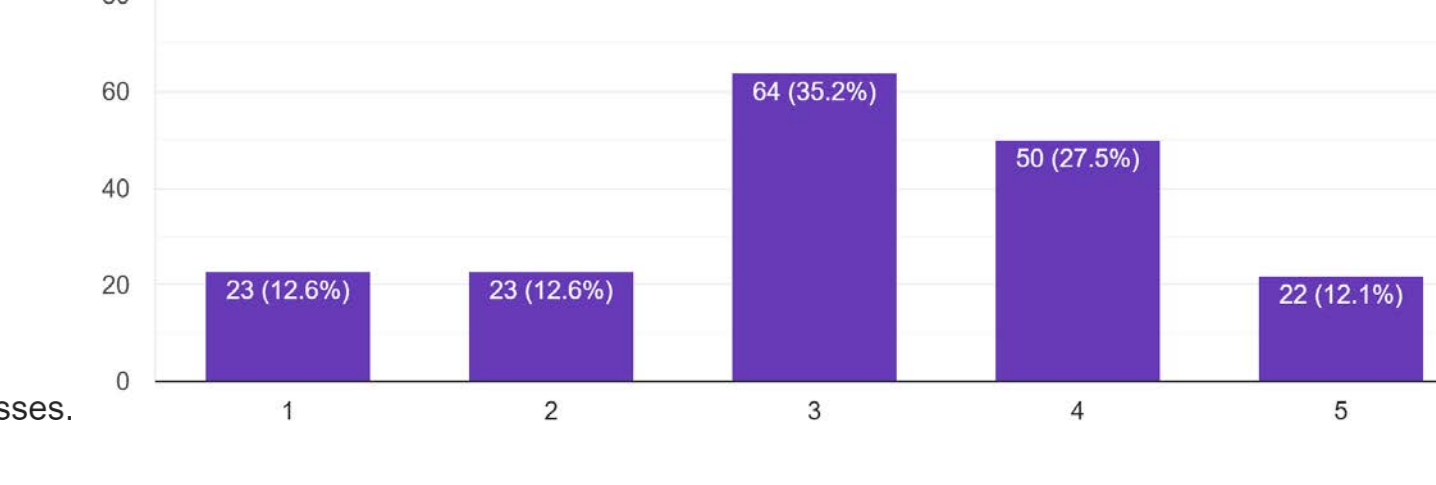
7. How would you rate the quality/condition of your microscope?  
182 responses



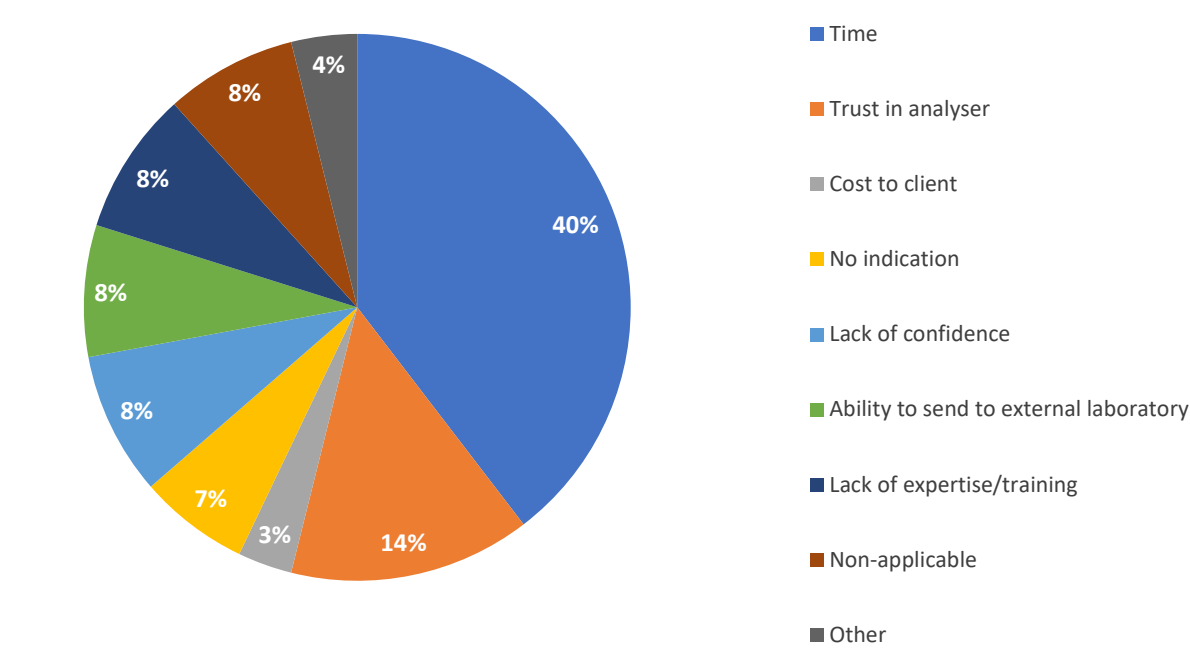
8. Who performs the blood smears most commonly?  
182 responses



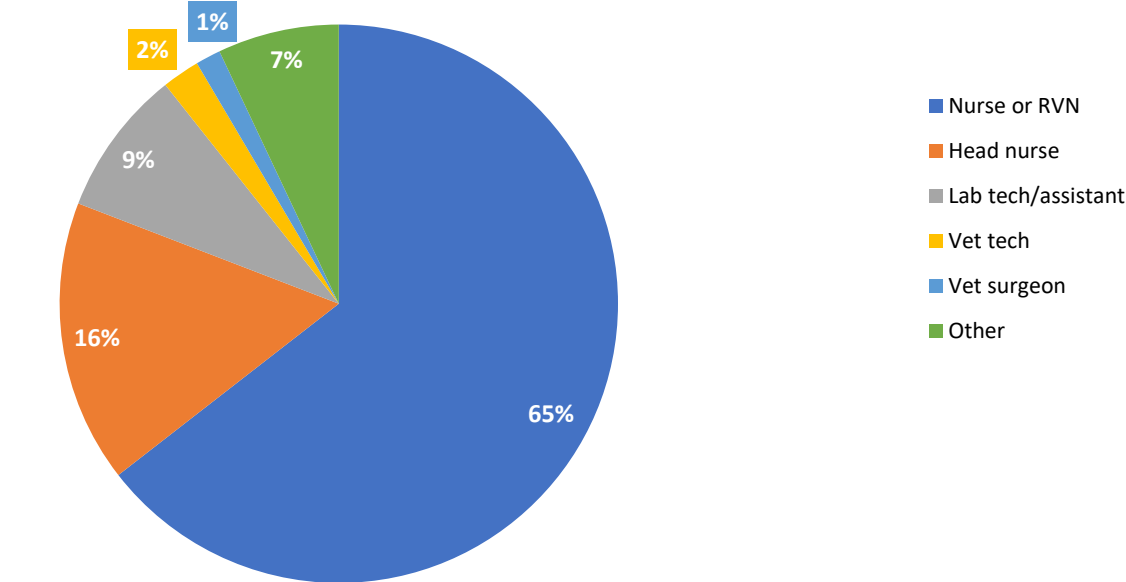
8. How would you rate your confidence level with examining blood smears?  
182 responses



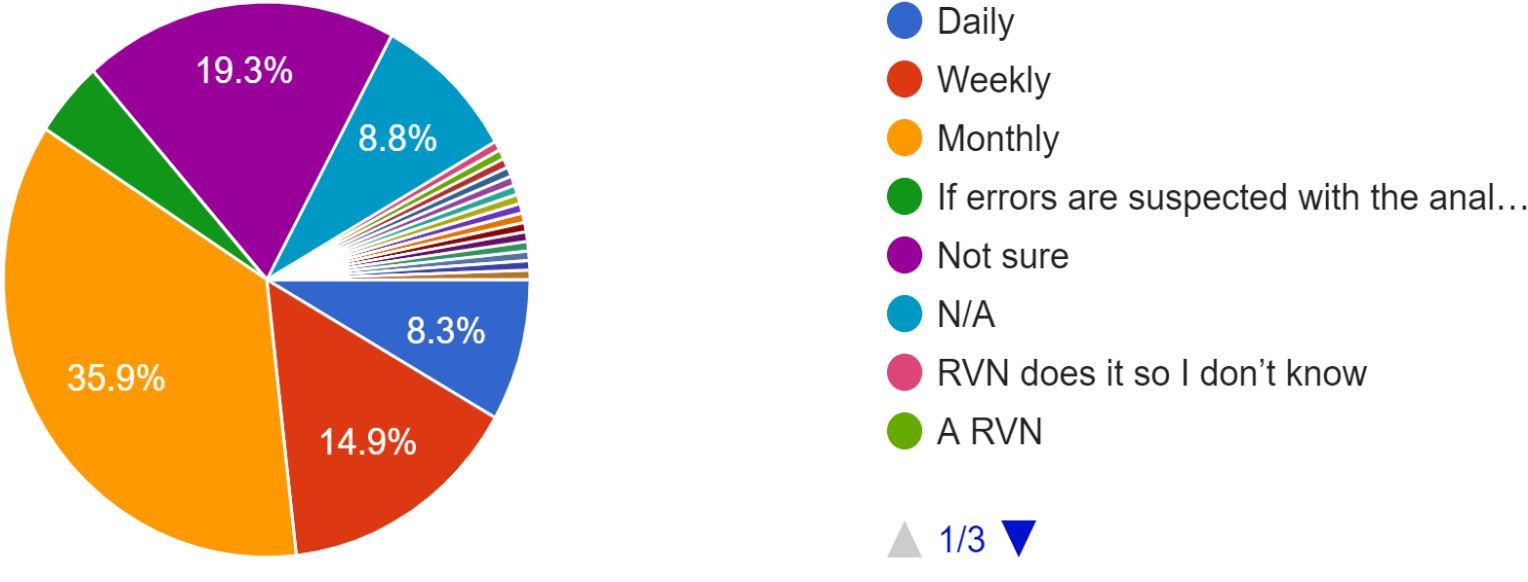
10. If blood smears are not looked at in conjunction with the automated haematology analysis, what is the main reason for not doing so?  
131 responses with 154 individual answers



11. Is there a dedicated person to care for the machine? If so, who?  
164 responses with 171 individual answers



12. How often is quality control done on the haematology analyser?  
181 responses



## Discussion

- Veterinary surgeons were much more likely to respond to the survey than veterinary nurses/technicians
- Haematology analyser use and awareness of maintenance:
  - Most respondents appeared to have modern and well functioning haematology analysers and microscopes
  - Only half reported some degree of regular maintenance, while a significant number of respondents were unsure of the maintenance schedule or if there even was one in place
- Trend between having a haematology analyser and performing blood smear analysis:
  - Surprisingly there was low frequency (25%) of blood smear examination in conjunction with the automated analysis on a regular basis**
  - Respondents without analysers were even less likely to look at blood smears
  - Most common reasons for blood smear exam: checking for platelet clumps, unexpected results and error flags
  - Over 50% did not feel confident with a blood smear exam
    - A smaller percentage reported lack of confidence as a reason for not examining blood smears as part of the analysis
  - Chi-squared analysis demonstrated statistical significance between confidence level and the frequency of blood smear examination
    - Cramer's V test revealed a weak correlation → confidence level has only a partial dependence on how often blood smears were examined.
  - Surprisingly high proportions of blood smears are made by veterinary surgeons (about equal numbers to vet nurses/techs) considering the time constraints
  - Vet nurses were the choice for dedicated personnel to maintain analyser
  - Inadequate frequency of quality control (monthly) was the most common answer; 20% of respondents were unsure of a schedule
  - Expectedly, lack of time, but unexpectedly (inappropriate) trust in the analyser were the top reasons for not performing blood smear examination**

## Limitations

- It was difficult to target practices based on their profiles in the RCVS database
- Selection bias causing possible both over- and underrepresentation
- Response could have been more likely by people who:
  - Own an automated haematology analyser – thus true prevalence of machines could be lower
  - Feel more comfortable with smear examination - true use of concurrent blood smear examination could be lower
- Inconsistency in the total number of responses to certain questions
- Further questions that would have given additional benefit:
  - Profile of the practice (small vs. large animal)
  - Use/understanding of graphs and dot plots generated by haematology analysers
  - Quality of the blood smears they can make
- Lack of an incentive for participation, which could have brought in more participants and thus provided a larger sample for data.

## Conclusions

- There was high prevalence of haematology analysers but low prevalence of blood smear examinations - confirming the widespread inappropriate dependence on the analysers alone**
- There appears to be a lack of awareness of the importance of concurrent blood smear analysis for validating analyser results, and common reasons why analysers can generate erroneous values**
- Available time and confidence are important limiting factors in carrying out the necessary microscopic examination**
- More emphasis is needed in veterinary and nursing schools and in continuing education of the correct use of haematology analysers and importance of quality control and maintenance**
- Time restraints of veterinary surgeons could be alleviated by veterinary nurses/technicians carrying out routine smear exams – more training and rewards could help to promote it**