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RESEARCH PAPER

Is routine pre-anaesthetic haematological and biochemical screening justified in dogs?

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Abstract

Objectives To determine if routine haematological and biochemical screening is of benefit in dogs requiring anaesthesia and to establish the most useful tests for pre-anaesthetic risk assessment.

Animals One thousand five hundred and thirty-seven client-owned dogs undergoing surgery at the University of Leipzig between January 2003 and April 2004.

Materials and methods After obtaining a standardized history and a physical examination, all dogs requiring anaesthesia were assigned to an ASA physical status group, their needs for pre-anaesthetic therapy determined and an anaesthetic protocol proposed. Haematological (haematocrit, red blood cell count, white blood cell count, platelet count and haemoglobin concentration) and serum biochemistry tests (plasma urea, creatinine, glucose, total protein, sodium and potassium concentration; serum alanine aminotransferase, alkaline phosphatase and lipase activity) were then performed in all animals. The results of these were then used to: 1) re-define each dog's ASA physical status; 2) determine any altered requirement for pre-anaesthetic therapy; 3) re-determine the suitability of the dog to undergo surgery; and 4) re-examine the suitability of the original proposed anaesthetic protocol.

Results The history and clinical examination in 1293 out of 1537 dogs (84.1%) revealed that haematological and biochemical tests would have been considered unnecessary under normal conditions. Of these, 63.9% were categorized as ASA 1, 28.5% as ASA 2, and 7.6% at higher risk. In some dogs, screening tests showed abnormal results: 16.7% of 1293 dogs had abnormal plasma urea levels, with 5.9% of values above the reference range. However, only 104 dogs (8%) would have been re-categorized at a higher physical status category had the laboratory results been available. Additional screening data indicated that surgery would have been postponed in 10 dogs (0.8%) additional pre-anaesthetic therapy would have been provided in 19 animals (1.5%) and the anaesthetic protocol altered in two dogs (0.2%).

Conclusion The changes revealed by pre-operative screening were usually of little clinical relevance and did not prompt major changes to the anaesthetic technique.

Clinical relevance In dogs, pre-anaesthetic laboratory examination is unlikely to yield additional important information if no potential problems are identified in the history and on physical examination.

Keywords anaesthetic risk, biochemical examination, dog anaesthesia, haematology, pre-operative examination.

Introduction

Pre-anaesthetic laboratory testing as a means of risk assessment remains a controversial subject in both medical and veterinary anaesthesia. In public

debate, the membership of the Association of Veterinary Anaesthetists voted in 1996 that the routine use of pre-operative laboratory tests added nothing to pre-operative risk assessment over thorough history taking and physical examination (Hall et al. 2001) despite published contrary recommendations (Muir & Hubbell 1989; Bedford 1991; Gilroy 1992; Paddleford & Erhardt 1992; Kraft 1998; Henke et al. 2004). The suggested criteria indicating which pre-operative tests should be performed vary, but are usually based on age and, or ASA physical status. Bedford (1991), Gilroy (1992) and Henke et al. (2004) suggested that haematocrit and total protein concentrations were minimal requirements in ASA 1 cases. Haemoglobin estimation was also considered a minimum requirement by both Henke et al. (2004) and Muir & Hubbell (1989) but not Bedford (1991) who favoured plasma urea levels (in both ASA 1 and 2 categories). Gilroy (1992) suggested that an 'extensive blood count and urinalysis' should be performed in all ASA categories >1 while Bedford (1991) additionally required a complete white blood cell (WBC) count and plasma urea estimation in dogs over 6 years. Paddleford & Erhardt (1992) recommended 'the largest possible spectrum of laboratory tests with special attention to [those estimating] function of liver and kidney in older patients' which, according to Kraft (1998), includes complete red and WBC counts, estimates for total protein, plasma urea and creatinine, blood glucose, serum alanine aminotransferase (ALT) and alkaline phosphatase (AP) activity and serum bile acid levels. In contrast, Alef & Oechtering (1998) suggested that laboratory tests should not be performed on animals which appear to be normal on the basis of the history and physical examination, but that definite laboratory tests should be performed when definite indications are present.

Several studies of medical anaesthetic practice fail to support the case for routine pre-anaesthetic haematological and biochemical testing in the absence of abnormalities revealed in the medical history or physical examination. In 23 studies in healthy humans, the red blood count showed abnormal results in 1.1% (median) 0.7–4.0.8% (range) of all cases (Hoare 1993; Macpherson et al. 1993; Close et al. 1994; Kozak & Brath 1994; Munro et al. 1997), which led to changes in the anaesthetic technique or surgery in only 0.2% (0.1–2.7%). Similar results were reported with regard to thrombocytes (median number of cases with abnormal results 0.9%, range: 0–8.0%) and leukocytes (median 0.3%, range 0.1–0.9%). In routine pre-operative serum biochemistry tests, Munro et al. (1997) found abnormal sodium or potassium concentrations in 1.4% of patients, abnormal urea or creatinine concentrations in up to 2.5%, and abnormal glucose concentrations in up to 5.2%; these findings rarely led to changes in clinical management (Munro et al. 1997). Further studies of pre-anaesthetic biochemical data reveal similar results (Kaplan et al. 1985; Turnbull & Buck 1987; Adams et al. 1992; Perez et al. 1995; Dzankic et al. 2001). Despite this, most medical anaesthetists request pre-anaesthetic blood screening in patients, depending on their preference, as well as electrocardiography, thoracic radiography and even spirometry in young healthy adults (Silverstein & Boland 1994; Tarnow 1996; Thöns & Zenz 1997; Larsen 1999; Morgan et al. 2006).

There are few similar studies in veterinary medicine. Toews & Campbell (1997) assessed the value of a complete blood count in 102 healthy horses of which 55 showed abnormalities, mostly mild neutrophilia. Only in eight horses were abnormalities considered important. Many recommendations in small animal medicine appear to be either arbitrary, or based upon the incidence of disease in specific breeds or age groups. However, the patient base of these studies is only a subset of the animals undergoing anaesthesia, and therefore it is not known if conclusions about the necessity for pre-anaesthetic laboratory screening can be drawn from such studies.

There are potential pitfalls in extrapolating conclusions from human studies to veterinary practice, where the risk-predictive value of history and clinical examination might well be less. Veterinarians deal with subjective, 'indirect' pre-operative histories volunteered by the owner, not by the subject and so some abnormalities may remain undetected. Secondly, thorough clinical examination is only possible in co-operative dogs and may have less risk-predictive value when performed in anxious, nervous or aggressive animals. Breed-linked ethological, anatomical and physiological factors might also complicate the evaluation of 'health'. This suggests that pre-anaesthetic laboratory screening might detect more ill animals than is the case with humans.

The aim of our study was to investigate whether pre-operative haematological and biochemical screening tests performed in dogs undergoing anaesthesia provided information that might alter the animals physical risk status and the subsequent management of anaesthesia and surgery.

Materials and methods

All dogs undergoing anaesthesia at the Department of Small Animal Medicine, University of Leipzig, from January 2003 to April 2004 were included in the study. After a standardized history (see Fig. 1) and clinical examination (Fig. 2), all dogs were assigned to an ASA risk group (Appendix 1). The anaesthetist then recorded which laboratory tests he or she would require, as well as the results of pre-anaesthetic clinical examination, ASA physical status assignment and the reasons for ASA group assignment. History, clinical examination and risk assignment were performed by several licensed veterinarians with varying experience in anaesthesia (range: 3 months to 15 years) instructed by a Diplomate of the European College of Veterinary Anaesthesia and Analgesia (ECVAA) with 15 years experience.

Haematological and serum biochemical tests were then conducted on venous blood samples taken from all of the dogs. Haematology consisted of haematocrit, a red blood cell count a WBC count, a platelet count and the haemoglobin concentration (Scil Vet abc Hämatologie®, scil animal care company GmbH, Viernheim, Germany). Serum biochemistry tests were: plasma urea, creatinine, glucose, total protein, sodium, potassium, activity of ALT, AP and lipase (HITACHI 704®, Boehringer Mannheim, Mannheim, Germany).

On the basis of the laboratory results, the anaesthetic risk status was reassessed and re-assigned; a decision to institute pre-operative therapy and, or postpone surgery was made and the degree to which the proposed anaesthetic protocol required modification was determined. This was performed by a single licensed veterinarian with 1 year anaesthetic experience at the beginning of the study acting under the supervision of an ECVAA Diplomate.

The statistical package SPSS (SPSS 10.0.7 for Windows, SPSS GmbH Software, Munich, Germany) was used for data analysis. The Kolmogorov–Smirnov test was used to test data normality (probability of error 40%). Although most data showed non-normal distributions, means and SDs are presented to facilitate comparison with other studies. In

Medical History
Has your dog had anaesthesia in the past**?** If yes, when and why?
Has your dog had any problems with previous anaesthesia?
Has your dog had serious illnesses in the past?
Does your dog receive any medicine or pills at the moment? If yes, what medication? And at what dosage?
Has your dog received any medicine or pills in the past? Any pre-treatment by the referring veterinary surgeon? If yes, when? What medication? And at what dosage?
Does your dog have any problems with eating or drinking like reduced eating, excessive drinking, or vomiting?
Does your dog have any problems with defecation or urination like diarrhoea, blood occurring in faeces or urine, incontinence, increase urine volume, or frequent urination?
Does your dog have exercise intolerance?
Does your dog have any cough or other respiratory problems?
Have you observed any abnormality which might affect anaesthesia like bleeding disorders, pregnancy, allergic reactions?
Did your dog eat or drink within the last 8 hours?

Figure 1 Questionnaire for the standardized medical history used in the study.

Summary of History:			Temp.: °C
Heart Rate:	min^{-1}	Auscultation Heart:	
Pulse Rate:	min^{-1}	Palpation Pulse:	Pulse Deficit: yes / no
Resp. Rate:	min^{-1}	Auscultation Lung:	
CRT:	s	Colour of Mucous Membranes :	
Laborat. Exam: yes / no		Summary Laborat. Results:	
Risk Class:		ASA 1 / 2 / 3 / 4 / 5, for Emergency Cases 6 / 7	
Problem :			Vet:

Figure 2 Form for the preanaesthetic evaluation used in the study.

addition, median, 25th and 75th quartile values are presented to provide additional information on non-normal data. For group comparison of nonparametrical data, e.g. ASA risk group, the H-test according to Kruskal–Wallis (level of significance 5%) was used for multiple comparisons followed by the Mann–Whitney *U*-test (adjusting the probability of error according to Bonferroni). As a precaution against possible non-normal distributions and unequal group size, this conservative statistical approach was also used for group comparison, e.g. age groups, in parametric data.

Results

The history of the 1537 (840 male and 697 female) dogs studied (Tables 1 and 2), i.e. 64%, indicated no evidence of an increased anaesthetic risk while 86.3% proved to be normal based on physical examination. In 58.5%, both history and clinical examination showed no indication of increased anaesthetic risk (Table 3). Most (75%) of the dogs were not receiving any medication. On the basis of history and clinical examination, 1293 dogs (84.1%) would not normally have required haematological and biochemical tests. Of these dogs, 63.9% were categorized as ASA 1, 28.5% as ASA 2, and 7.6% were considered to be a higher risk. The anaesthetic risk category of dogs in which no laboratory tests were performed was significantly lower (Table 4).

Abnormal results in the screening tests were found in several dogs (Table 5, Figs 3–5) but in most cases values deviated only slightly from reference values and were of no clinical relevance.

About 10% ($n = 131$) of 1263 dogs displayed an abnormal red blood count (Fig. 3), but in nearly 2/3rds of these the aberrance was marginal ($\leq 0.5 \times 10^{12}$ L^{-1}). More than 50% (694 dogs) had a haemoglobin concentration outside the reference range, but only in 11.2% of these was the extent deemed to be of any clinical relevance. On the basis of a reference range of 0.40 to 0.55 L L^{-1}, 20% of the dogs showed an altered haematocrit. An abnormally high total WBC count was found in 27% of all dogs which remained high at 165 (10.4%) when the leukocytotic effects of stress are considered (up to 15×10^9 leukocytes L^{-1}, Kraft et al. 2005). Nearly all of the 38% of cases displaying abnormal platelet counts were related to thrombocytosis and characterized by an absence of laboratory signs indicating any potential cause.

Urea values were abnormally high in 216 dogs (16.7%) deemed not to require laboratory tests and abnormally low in 140 (10.8%) (Fig. 4). In 76 dogs (5.9%), values above the reference range were measured, but only 22 of them (1.7%) had a plasma creatinine concentration higher than 106 μmol L^{-1} indicating possible renal dysfunction. Only six (0.5%) had creatinine values in excess of 159 μmol L^{-1}.

Plasma glucose levels were high in 328 dogs (25.4%) with the majority between 6.1 and 11 mmol L^{-1}. It exceeded 11.0 mmol L^{-1} in five dogs (0.4%). Two dogs (0.2%) were hypoglycaemic (<3.05 mmol L^{-1}).

The plasma protein concentration was outside the reference range in 230 dogs, or 17.8% of those considered not to require laboratory testing. Most (196) of these had mild changes with values between 50 and 60 g L^{-1}. Six dogs had plasma protein concentrations just below 50 g L^{-1}, and one had a value of 35 g L^{-1}. A slight elevation (up to 85 g L^{-1}) was found in 18 of 28 dogs with values >80 g L^{-1}. In 10 dogs, protein concentrations exceeded 85 g L^{-1}, and three dogs had values over 100 g L^{-1}. These three animals also had clinical anaemia with haematocrit values between 0.20 and 0.23 L L^{-1}.

Eight per cent of the 1293 dogs ($n = 102$) had abnormal potassium values but only six had raised concentrations and none had values in excess of 6 mmol L^{-1}. Ninety dogs had potassium values between 3.0 and 3.5 mmol L^{-1} and in six dogs

Table 1 Age, body mass and anaesthetic risk in 1537 dogs

	Mean	SD	Minimum	Maximum
Age (years)	5.8	3.6	0.13	17.5
Body mass (kg)	25.6	15.7	0.5	92
Risk group (ASA)	1.65	0.9	1	6

Table 2 Physical risk status (ASA) allocation in 1537 dogs

	ASA 1	2	3	4	5	1&2E	3-5E
n	847	459	176	41	2	12	0
n [%]	55.1	29.9	11.5	2.7	0.1	0.8	0

Table 3 Reasons for an increased anaesthetic risk allocation (history or clinical examination) and requests for laboratory examination

	Indications of increased anaesthetic risk				Laboratory tests requested	
	On history		On clinical examination			
	No	Yes	No	Yes	No	Yes
n	983	553	1327	209	1293	244
n [%]	64	36	86.3	13.7	84.1	15.9

Table 4 Descriptive statistics of ASA status. The results of ASA groupings differentiated according to whether further laboratory tests were required on the basis of history and clinical examination. The Mann–Whitney *U*-test shows significant difference ($p = 0.000$) between ASA designation of the two patient categories

Laboratory examination	25% – percentile	Median	75% – percentile	Mean	SD
Not required ($n = 1293$)	ASA 1	ASA 1	ASA 2	1.5	0.7
Required ($n = 244$)	ASA 2	ASA 3	ASA 3	2.7	1.0

Table 5 Laboratory results from dogs in which laboratory examinations were not required

Variable	Mean	SD	Reference range	Proportion (%) dogs within reference range
Red blood cell count [$\times 10^{12}$ L^{-1}]	6.78	0.9	5.5–8.5	89.9
Haemoglobin [mmol L^{-1}]	9.83	1.36	9.3–10.8	45.9
Haematocrit [L L^{-1}]	0.448	0.07	0.4–0.55	79.6
White blood cell [$\times 10^{9}$ L^{-1}]	10.74	5.04	6–12	66.3
Platelets [$\times 10^{9}$ L^{-1}]	456.4	173.4	150–500	62.3
Urea [mmol L^{-1}]	5.34	2.31	3.3–8.3	83.3
Creatinine [μmol L^{-1}]	78.45	22.8	<106	90.8
Glucose [mmol L^{-1}]	5.77	1.03	3.9–6.7	74.5
Total protein [g L^{-1} L]	66.28	6.8	60–80	82.2
Sodium [mmol L^{-1}]	147.04	3.29	140–155	97.8
Potassium [mmol L^{-1}]	3.93	0.36	3.5–5.1	92.1
Alanine aminotransferase [U L^{-1}]	74.21	119.67	<50	56.2
Alkaline phosphatase [U L^{-1}]	301.84	973.55	<190	64.1
Lipase [U L^{-1} L]	751.96	1221.29	<300	15.3

potassium was <3 mmol L^{-1}. The minimum value was 2.2 mmol L^{-1}. Abnormal plasma sodium concentrations were found in 28 dogs.

In 566 (43.8%) dogs, the alanine aminotransferase (ALT) activity exceeded reference range (Fig. 5), but only 49 dogs (3.8%) showed values which may have been relevant. Unexpectedly, 367 (28.4%) dogs older than 1 year had AP values >190 U L^{-1}, with 221 animals (17%) having values above 300 U L^{-1}. Seventeen per cent of dogs showed lipase activity more than three times greater than the upper reference value.

Eight per cent (±1.5% at a 95% confidence level) of the dogs ($n = 104$) would have been allocated a higher risk category had the laboratory results been available, mainly because of increased enzyme activities and/or reduced or elevated WBC counts. Surgery would have been postponed in 10 dogs

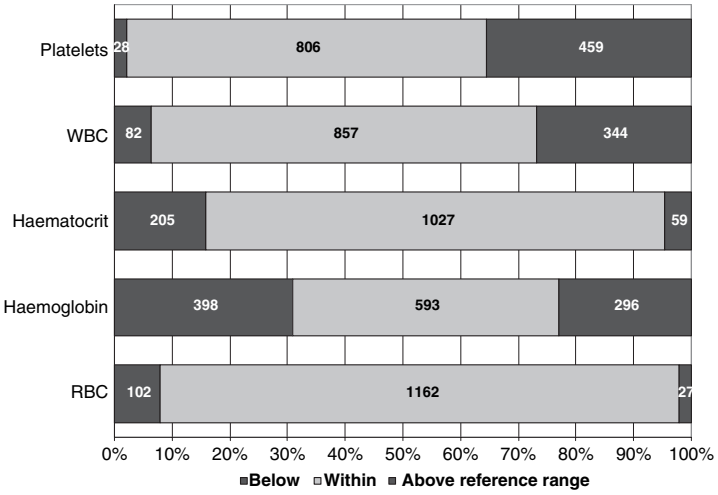

Figure 3 Red and white blood count deviations from reference range: in 1293 dogs. The number of dogs with values below, within or above the reference range is indicated.

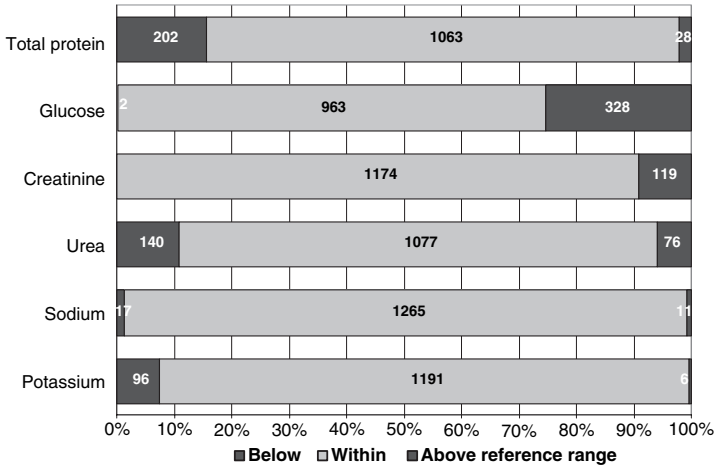

Figure 4 Blood chemical variable deviation from reference range in 1293 dogs. The number of dogs with values below, within or above the reference range is indicated.

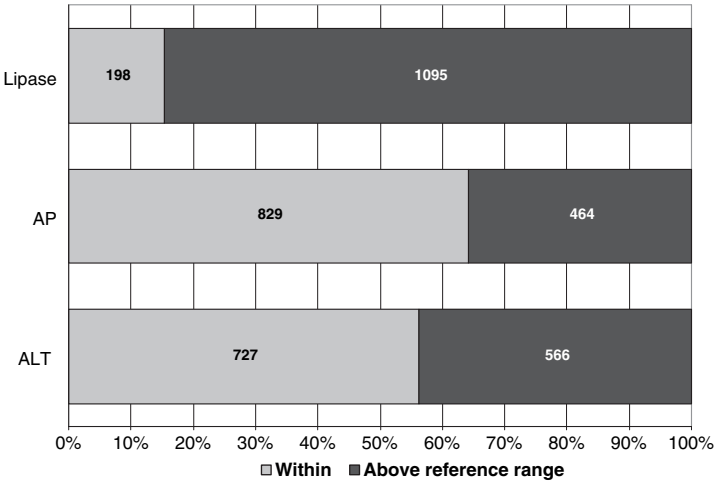

Figure 5 Enzyme activity deviations from reference range in 1293 dogs. The number of dogs with values below, within or above the reference range is indicated.

(0.8%) and in two dogs (0.2%) the anaesthetic protocol would have been changed. Pre-anaesthetic therapy would have been instituted to correct electrolyte imbalances in 12 dogs (nine with hypokalaemia, one with hyponatraemia, hypoalkalaemia and hypoproteinaemia, and two with hypernatrae-

mia) hypoglycaemia in two, polycythaemia in two and hypoproteinaemia in two. Further diagnostic testing and/or therapy would have been initiated in one dog because of anaemia and in another with severe thrombocytopenia.

There were 25 (1.9%) critical events in the 1293 dogs which normally would not have undergone haematological and biochemical testing. Five became hyperthermic (rectal temperature >39.5 °C). Sinus bradycardia (≤50 beats minute^{-1}) developed in eight (and resulted in cardiac arrest in three) while another three had a cardiac arrest, three demonstrated sinus tachycardia, one case developed premature ventricular complexes, one became cyanotic after tracheal intubation and another seizured during recovery. Six of these animals could not be resuscitated.

Discussion

The assessment of anaesthetic risk is subjective, and the need for laboratory test does not have a sound basis. Therefore, the results of the current study may have been influenced by the individual performing the assessment. The animal's history was taken by several veterinarians with different professional experience. The clinical examination and risk assessment were performed by one of several anaesthetists. Despite instruction and supervision by the investigator, this may have been responsible for differences in anaesthetic risk assessment and the perceived need for further laboratory testing. The interpretation of the laboratory results and their implications were performed by only one anaesthetist, retrospectively, and in conjunctions with an ECVAA Diplomate.

One aim of the study was to provide a basis for the provision of recommendations for practising veterinary surgeons in respect to suitable pre-anaesthetic screening tests. For this reason, we performed laboratory tests which are readily available and cost-effective in veterinary practice. Clearly, some tests have a lower sensitivity, specificity or predictive power for anaesthetic relevant diseases than more sophisticated tests such as measurement of urine osmolality, recommended by Moritz (2003) for the detection of compensated renal insufficiency, which, in our opinion, is too sophisticated in animals showing no indication of renal dysfunction in their history or on clinical examination. We believe the situation is similar with the liver function and coagulation tests.

More abnormal results in blood counts and chemistry were found in the current study compared to those performed in humans. One reason may be the broader range of ages encountered in the present study. Age-dependent changes occur in several parameters (Kraft et al. 1995, 1996a,b). Alternatively, excitement and its effect on laboratory values like WBC and glucose (Bush 1998) may have been more important. Toews & Campbell (1997) attributed the mild neutrophilia found in 40% of their equine patients to the stress of transport and handling and Meyer (1994) held transport and food and water deprivation responsible for abnormal pre-anaesthetic laboratory values in healthy dogs.

The high number of small deviations from the reference range encountered in the present study may have arisen from the choice of reference ranges taken from the literature. For example, using a wider haematocrit range from 0.37 to 0.55 L L^{-1} (Bush 1998) would have reduced the cases with abnormal results from 20.0% to 12.4%. Similarly, the number of dogs with subnormal haemoglobin concentration values (over 50% of animals with abnormal haemoglobin concentrations) would have been less had the lower limits of 8.7 mmol L^{-1} (Willard & Tvedten 2004) or 7.4 mmol L^{-1} (Bush 1998) been used. Clinic specific reference values taking into account influences of the population and laboratory methods would facilitate effective interpretation of laboratory values, but are not always available (Bush 1998; Willard & Tvedten 2004).

The high incidence of modestly increased haemoglobin concentrations may have been caused by pre-operative water deprivation (Meyer1994). Mean and SD of the haemoglobin concentration and nearly all other variables in the current study corresponded to the pre-anaesthetic values described by Meyer (1994) in healthy dogs.

The high incidence of thrombocytosis in our study may have been caused by the inaccuracy of automated platelet counts, although Neuerer & Hirschberger 1999) showed good correlation ($r = 0.87$) of the Scil Vet abc with manual counts. In the current study, manual platelet counts were not performed due to high costs.

The assessment of abnormal enzyme activity, their clinical relevance and their risk-predictive value during pre-anaesthetic testing is not straightforward. Enzyme activities depend on numerous factors while their specificity and sensitivity are often imprecise. An increased lipase activity may indicate acute or chronic pancreatitis, but can also

be caused by chronic gastritis or decreased renal function (Willard & Twedt 2004) while ALT activity is increased by factors as benign as otitis or dental calculus. The reference ranges vary considerably. In the current study, an upper limit for lipase activity of 300 U L^{-1} was set and a threefold increase was considered to be clinically relevant. Kley et al. (2003) defined 1329 U L^{-1} as the upper limit resulting in <5% of our dogs exceeding this level. In summary, our study indicated that enzyme activity may be of very limited value as part of a pre-anaesthetic biochemical screen.

Toews & Campbell (1997) reported abnormalities in the preoperative CBC of 53.9% of horses examined although this did not prompt any change in subsequent anaesthetic management. Despite a similarly high number of abnormal results in the current study, the consequences on anaesthesia were comparable to studies involving humans. The number of changes made to the anaesthetic technique depends on the usual techniques used and their alternatives. In our clinic, a 'normal' anaesthetic technique would consist of a benzodiazepine and an opioid drug with isoflurane delivered in oxygen in conjunction with controlled ventilation and IV fluids, which is also suitable for higher risk cases. Consequently, the current study involved a number of animals in which the anaesthetic risk was judged to be higher after testing, but which did not require an alteration in the proposed anaesthetic protocol.

The reported complications were all related to anaesthesia although it is possible that unknown diseases, the duration of surgery and the surgical manipulation were contributing factors. Laboratory test results were within the reference range or interpreted as being clinically irrelevant in 21 of 25 dogs experiencing complications. Relevant laboratory findings were found in only four. The incidence of adverse incidents was 3.8% in dogs with 'abnormal' laboratory results and 1.8% in animals with 'normal' values. Because of the limited number of complications, no statistical difference could be shown between groups. Toews & Campbell (1997) expressed doubt that abnormal CBC results were associated with complications in the peri-operative period.

The effect of age and/or breed on the choice of pre-anaesthetic laboratory testing was not fully elucidated in the current study. However, preliminary results show only statistically significant differences ($p < 0.05$) in platelet count and ALT activity in dogs over 10 years of age. No consistent differences could be found between age groups (<2, 2–7, 7–10 and over 10 years) for the plasma concentrations of glucose, urea and lipase activity. Young dogs (<2 years) showed statistically significant but only slight differences to other age groups in total protein and sodium concentration.

In conclusion, this study indicates that a failure to detect abnormalities in the medical history and upon clinical examination suggests that pre-anaesthetic laboratory examination is unnecessary in dogs. When laboratory testing is performed, detected changes are often of little clinical relevance and do not prompt major changes to be made to the anaesthetic technique.

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Appendix 1

Risk groups according to the ASA (1–5), definitions used in the study

Risk group	Definition
1	A normal healthy patient
2	A patient with mild systemic disease (no functional limitations)
3	A patient with severe systemic disease (some functional limitations)
4	A patient with severe systemic disease that is a constant threat to life (functionality incapacitated)
5	A moribund patient who is not expected to survive without the operation
1E, 2E	For nonelective surgery: Emergency patients (E) of risk group 1 or 2
3E, 4E, 5E	For nonelective surgery: Emergency patients (E) of risk groups 3 to 5

