This thesis is presented primarily as a contribution to preventive medicine. It was undertaken to determine how far it was possible to supplement by a study of blood films clinical examination as a means of preventing lead poisoning among shipbreakers, and the conclusions reached have proved to be of practical value in this connection. In the course of the investigation certain points of scientific interest have emerged.

I am indebted to Dr. T. Ferguson for providing me with the clinical material on which this study is based.

M. D. 1934

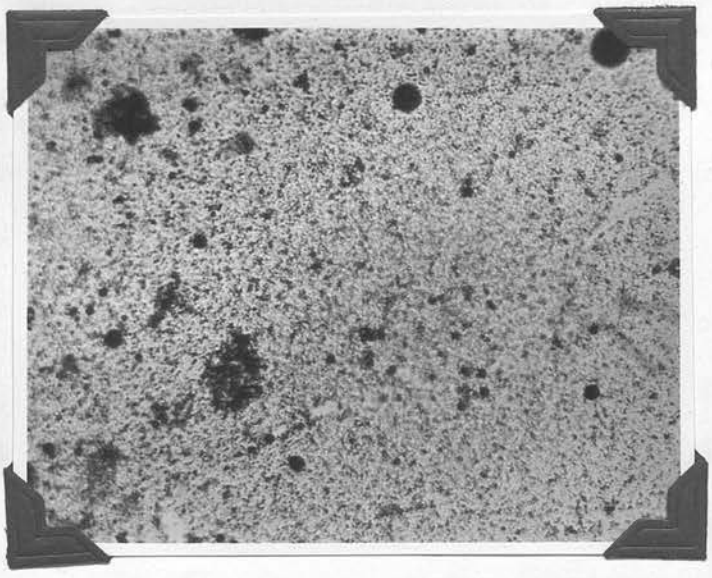
THE EXAMINATION OF BLOOD FILMS IN RELATION TO THE PREVENTION OF PLUMBISM AMONG SHIPBREAKERS.

The control of the lead risk among shipbreakers presents problems of great practical difficulty. Measures for the prevention of plumbism applied successfully in other industries are here impracticable, with the result that the breaking-up of a heavily leaded ship is almost invariably responsible for a considerable crop of gross cases of lead poisoning and a large mass of ill-health stopping just short of incapacity for work.

The work of the oxy-acetylene burner in shipbreaking involves inhalation of volatilised lead in greater or less degree. With the lead, which is chiefly derived from paint or from the use of red lead as a filling agent, there may in the case of armour plate be traces of fume of nickel and chrome. The paint on German battleships generally contains zinc rather than lead, and several cases of zinc ague have come to light from this source: but lead poisoning is the great industrial hazard of the shipbreaker.

The type of plumbism met with in this industry is, in comparison with others, a more acute intoxication, probably on account of the readiness

with/



Micro-photograph showing fume inhaled by shipbreakers x 600.

with which lead gains access to the blood stream when inhaled. Animal experiments by TANQUEREL, GOADBY and BLUMGART have proved conclusively that lead is absorbed rapidly by the whole extent of the respiratory tract from the nasal passages downwards, GOADBY demonstrating that when animals were confined in an atmosphere of lead dust toxic symptoms developed more quickly than when ten times asmuch lead was administered by the mouth. Ingestion is a possible, though secondary contributor to theetiology of lead poisoning among shipbreakers.

In view of the difficulty of controlling the causative fume and the high prevalence of plumbism any prophylactic assistance which can be derived from medical examination of the workmen is specially valuable. Works doctors often find clinical examination inadequate for the early detection of cases of plumbism in the industry, and this research has been undertaken in the hope of finding some simple laboratory procedure which might supplement such clinical examination. Complicated technique is out of the question in field work, and this consideration rules out such aids as the quantitative estimation of lead excreted in the urine and total blood counts. Before the recent work of JONES made possible the estimation of reticulate cells in blood from examination of an ordinary film

it even restricted the practical use of reticulocyte counts, with the specially prepared slides which they involved.

With these restrictions in view this investigation has been kept as uncomplicated as possible, and has been confined to ascertaining what useful evidence, if any, is obtainable from the examination of simple blood films. Films were taken at intervals of one month from one hundred burners, and after staining by Leishman's method, examined on the following points:- the degree and type of punctate basophilia, the presence or absence of polychromasia, nucleated red cells and irregularity of the red blood corpuscles in size or shape, while a differential count was also made of the white cells. It was then attempted to correlate these findings with the symptoms presented at each clinical examination, and particularly to observe how the blood condition altered with the changing clinical picture from month to month.

As the work progressed it was found more practicable to discontinue the monthly examinations after five readings had been taken, and to concentrate on a more intensive study at weekly intervals of a smaller number of cases exposed to specially heavy lead risk. During this latter phase reticulocyte estimations were made in some cases. Other basic stains were used in the earlier months as well as Leishman's/

Leishman's but as they did not appear to have any marked advantage their use was discontinued.

The hundred burners forming the industrial population studied worked in two shipbreaking yards on the Firth of Forth. They represented all the workers employed in these two yards, and were in no way selected except that a particularly high incidence of lead poisoning had focussed attention on the yards in question. Actually, rather more than half of the men had been off work from this cause at one time or another before the investigation was set afoot, so that they represent a thoroughly heavily leaded population. The age distribution of the men and their duration of employment in the industry at the beginning of the research have been summarised below:

Age		Duration of Employment.	
15-20	3.	Under 1 year	53.
20-25	36.		
25-30	31.	1- 5 years	18.
30-35	19.		
35-40	8.	5-10 years	22.
40-45	3.		
		10-15 years	7.

The group is composed of young adults, and the duration of employment is for the most part short, a commentary on the undesirable nature of the work.

It/

It was found that the risks involved fell into three categories which have been designated A, B and C. A represents the risk of shipbreaking a British war vessel, and is the greatest of the three: C, that of a scuttled German battleship salved after some fifteen years' immersion in the sea at Scapa - easily the least dangerous of the three, while B represents the risk of work on a merchant vessel, liable to show more variation in lead content than the others, but with a risk somewhere between them, probably generally nearer A than C.

In all 560 films have been examined, and the results are summarised on the accompanying case sheets. The fact that all the blood examinations have been carried out by one observer enhances their comparative value. So far as possible the films were collected under similar conditions at the several examinations.

The first of the two figures following the worker's initials refers to his age in years, and the second to his exposure:-

CASE No. 1.....J.F..... (20yrs.): (2 yrs) exposure.

Twice off work on account of lead poisoning: 3 months ago and 1 year ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May A	800	F.	-		S & S	61.	2.	0.5	2.	28.	7.5	-	-	-	+	-	
June A	1425	Fc.	Sl	1	S & S	42.	1.5	-	3.	30.	23.5	-	-	-	+	-	I.S.Q.
July A	3660	FC	+	1	-	65.5	2.	0.5	1.5	11.	19.5	+	+	+	+	+	Worse.
Aug C	1960	F.	+	5	-	53	5.	-	2.	21.5	18.5	-	+	+	+	-	Better.
Sept C	30400	F.	+	3	-	71.	0.5	-	-	19.	9.5	-	+	-	+	-	Back to work 5 days after 11 days' holiday. Sick last week. Now better.
Oct C	3000	F.	-	2	-	47.	1.5	-	0.5	39.	12.	+	+	-	-	-	Better.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 2....A.W..... (21yrs) (3 mos).

No.history.of.lead.poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	2550	FC	+	1.	-	62.	0.5	-	1.	17.	19.5	+	+	+	+	-	
June A	9640	FC	Sl	7.	-	62.	5.	1.	1.	10.	21.	-	+	+	+	-	I.S.Q.
July A	6900	FC	+	8.	S & S	40.	6.	1.	4.5	17.	31.5	+	+	+	+	-	Not so well.
Aug A	4000	Fc	+	-	S	45.5	6.	-	1.5	33.5	13.5	+	+	+	-	-	Back to work after 11 days' holiday;better. I.S.Q.
Sept B	2600	Fc	+	3.	S & S	36.	3.5	-	4.	33.	23.5	+	+	+	+	-	I.S.Q.
Oct B	1700	F	-	1.	-	56.5	5.5	-	1.5	26.5	10.	+	+	-	-	-	I.S.Q.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 3. W.A. (35): (10yrs.) exposure, though with some alternation of employment.

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	15300	C	+	2	-	55.	1.	-	1.	14.	32.	+	+	+	-	+	Obviously ill.
June A	140	C	-	-	-	65.	2.5	1.	1.5	20.	10.	-	-	-	+	+	Improved.
July B	2040	F	-	4	S & S	65.5	3.5	1.	1.5	18.5	10.5	-	-	-	-	+	Better.
Aug C	3700	FC	+	1	-	69.	2.5	0.5	1.	19.	8.	-	-	-	-	-	I.S.Q.
Sept C	28100	FC	+	3	-	57.	0.5	0.5	1.5	29.	11.5	-	-	-	-	-	I.S.Q. Back to work 5 days after 11 days' holiday.
Oct C	9400	F	+	-	-	59.5	2.	0.5	1.5	16.5	20.	-	-	-	-	+	Better.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 4. T. O'N. (30yrs.): (4 wks.) exposure.

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.						
May A	2200	FC	+	-	-	49.	1.	1.	3.	33.	13.	-	+	-	-	-	
June A	5000	F	Sl	-	-	60.	2.5	0.5	1.5	11.	24.5	-	+	+	-	-	Has been off work(colic) one week since last exam
July A	6500	Fc	+	-	-	50.	3.	-	4.5	30.5	12.	-	-	+	-	-	Better.
Aug A	31425	F	+	4	-	54.5	2.	-	6.	23.5	14.	-	+	+	+	-	AP. 2 weeks ago: Not quite so well.
Sept C	4700	Fc	+	1	-	57.5	0.5	-	5.5	27.	9.5	-	-	-	-	-	Improved.
Oct C	1650	F	-	1	-	36.	1.5	-	2.	38.5	12.	-	+	-	-	-	Improved.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.5....W.S:..... (30yrs):(2¾)years' exposure.

Off work for three weeks on account of lead poisoning: back five weeks.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	500	FC	-	-	-	65.	-	1.	3.	12.	20.	-	-	-	-	+	
June A	2200	Fc	-	-	-	50.	1.	-	2.	36.	11.	-	-	-	-	+	Improved.
July A	8500	F	+	-	-	49.5	3.5	-	3.5	30.	13.5	-	-	-	-	+	Better.
Aug A	4600	Fc	+	-	S & S	47.5	2.	-	3.5	20.	27.	-	-	-	-	+	I.S.Q.
Sept A	3100	F	-	-	-	36.5	1.	-	2.	51.5	9.	-	-	-	-	+	Improved.Back to work 5 days after 11 days holiday.
Oct C	8300	F	Sl	1.	-	26.5	1.	-	3.	59.	10.5	-	-	-	-	+	I.S.Q.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.6 ..... S.C. ..... (26 yrs): (3 mos.) exposure.

No history of lead poisoning .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
						N.	E.	B.	M.	Lymphocytes							
	per million	Type								L.	S.						
May B	2400	Fc	-	3.	-	63.	2.	1.	2.	21.	11.	-	-	-	-	+	
June B	8400	C	Sl	3.	-	55.5	0.5	-	5.5	28.5	10.	-	-	-	-	+	I.S.Q.
July C	17100	Fc	+	2.	-	64.	1.	-	2.	26.	7.	-	-	-	-	+	I.S.Q.
Aug C	9900	F	-	1.	-	63.	2.	-	1.5	23.	10.5	-	-	-	-	+	Improved. Back 1 day after 11 days' holiday
Sept B	20300	FC	+	-	-	59.	0.5	-	1.	34.	5.5	-	-	-	-	+	I. S. Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.7.....A.F:.... (27 yrs (2¼)years' exposure.

Lead poisoning twice, 4 months and 8 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.						
May B	3600	F	-	2.	-	66.5	-	0.5	2.	18.5	12.5	-	-	-	-	+	
June B	7350	Fc	+	-	-	55.5	0.5	-	3.5	23.	17.5	-	-	+	-	+	
July C	28800	Fc	+	-	-	71.	0.5	-	2.	20.5	6.	-	-	-	-	+	Slight improvement.
Aug C	3500	F	+	1.	-	75.	1.	-	-	9.	15.	-	-	-	-	+	Back 1 day after 11 days' holiday.
Sept C	5800	F	Sl	-	-	67.	2.	-	2.5	24.5	4.	-	-	-	-	+	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.8.....T.F..... (21 yrs):(6 mos) exposure.

No history of lead poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May B	800	Fc	-	-	-	61.	1.	-	4.	23.	11.	-	-	-	-	-	
June B	8100	Fc	+	6.	-	48.	3.5	1.5	9.5	14.5	23.	-	-	-	-	-	Not so well.
July C	14100	Fc	+	4.	-	66.5	2.5	-	3.5	20.	7.5	-	-	-	-	-	Improved.
Aug C	18300	F	Sl	3.	-	60.5	2.5	1.	1.	11.5	23.5	-	-	-	-	-	I.S.Q. 2 days back after 11 days' holiday
Sept C	6500	Fc	+	1.	-	42.	0.5	-	7.5	45.	5.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.9.....J.B:..... (36 yrs) (2 yrs)

Off work for 3 months on account of lead poisoning; back 3 months.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.						
May B	1370	F	-	7.	-	59.5	0.5	-	3.	26.	11.	-	-	-	-	+	
June B	11000	F	+	5.	-	61.	2.	1.	3.5	16.5	16.	-	-	-	-	-	Better.
July C	13700	Fc	+	2.	-	72.	1.5	-	3.5	20.	3.	-	-	-	-	-	I.S.Q.
Aug C	2500	FC	Sl	3.	-	51.	2.	-	3.	40.5	3.5	-	-	-	-	-	I.S.Q. Back to work 1day after 11 days' holiday
Sept C	5100	F	+	-	-	46.5	2.5	-	3.	39.	9.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 10....C.H:..... (24yrs):(8 mos)

Off work for 3 weeks with lead poisoning; back 3 weeks.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	2800	F	+	3.	S.	60.5	-	-	0.5	6.	33.	+	-	-	+	-	Obviously ill.
June B	5000	F	+	5.	-	52.5	2.	0.5	5.5	32.5	7.	+	-	-	+	+	Slight improvement.
July C	7800	FC	+	1.	-	70.	0.5	-	1.5	23.5	4.5	-	-	-	-	-	Improved.
Aug C	5800	Fc	Sl	2.	-	52.5	1.	-	2.	35.5	9.	-	-	-	-	-	I.S.Q. Back to work 1day after 11 days' holiday
Sept B	5700	F	+	1.	-	30.	1.5	-	2.5	42.	24.	-	-	-	-	-	Off work "Cold".
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 11 ..... A.D. ..... (21 yrs) (8 mos).

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Jount (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May B	1500	Fc	+	2.	-	55.	1.	.5	4.	21.5	18.	-	-	-	-	-	
June B	6400	Fc	+	4.	-	63.	-	1.	5.5	16	14.5	-	-	-	-	-	I.S.Q.
July C	10800	Fc	+	3.	-	65.5	-	-	4.	27.5	2.5	-	-	-	-	-	I.S.Q.
Aug C	8500	Fc	+	-	-	73	0.5	-	0.5	9.	17.	-	-	-	-	-	Back 1 day after 11 days holiday.
Sept C	17900	Fc	+	-	-	45.5	0.5	-	5.5	44.	4.5	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 12...J.McL..... (29 yrs) (2 yrs)

.Off.one.month.lead.poisoning.5.months.ago.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	3400	F	Sl	3.	S & S	67.	-	-	2.	12.5	18.5	-	-	Sl	-	Sl	
June B	1600	F	+	-	S & S	68.	1.5	.5	3.	8.	19.	-	-	Sl	-	+	Off 3 days AP 2 weeks ago.
July C	4800	F	+	-	-	54.5	1.5	.5	3.	29.5	11.	-	-	-	-	Sl	Improved.
Aug C	5400	Fc	+	1.	-	67.5	-	-	1.5	21.	10.	-	-	-	-	Sl	Improved. 1 day back after 11 days holiday.
Sept C	7500	F	+	1.	-	39.	2.	-	4.5	45.5	9.	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 13...R.H..... 50 yrs) (8 mos)
Off work on account of lead poisoning for 5 weeks 3 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May B	4100	Fc	-	-	-	59.	3.	1.	3.	18.	15.	-	-	-	-	Sl	
June B	12500	F	+	2.	-	61.	2.5	-	4.5	21.	11.	-	-	-	-	Sl	I.S.Q.
July C	9500	Fc	+	1	-	52.5	5	-	3.5	31.	8.	-	-	-	-	Sl	I.S.Q.
Aug C	6600	Fc	Sl	3.	-	65.	2.5	-	2.	23.5	7.	-	-	-	-	Sl	I.S.Q.
Sept C	6500	F	+	2.	-	54.5	2.	-	3.	30.5	10.	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 14. D.R. (42 yrs) (5 yrs)

Lead poisoning 2 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	1600	Fc	-	2.	-	54.	0.5	-	4.	29.5	12.	-	-	-	-	-	
June B	8200	Fc	+	3.	-	54.	-	-	3.	24.	19.	-	-	-	-	-	I.S.Q.
July C	7900	FC	-	2.	-	60.	-	-	6.	29.	5.	-	-	-	-	-	I.S.Q.
Aug C	6200	Fc	Sl	-	-	64.	25.	-	2.	24.	7.5	-	-	-	-	-	I.S.Q. Back today after 11 days holiday.
Sept B	15200	F	Sl	-	-	54.	0.5	-	3.5	29.	13.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 15. ... R.McD. ... (25yrs) (6 yrs).

Lead poisoning one year ago. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
						Differential Count (%)											
	Punctate Basophils		P.	NR.	Irreg Size or Shape	N.	E.	B.	M.	Lymphocytes		H	C	AP	An		
	per million	Type								L.	S.						
May B	4800	F	-	1.	-	56.	4.5	3.	3.	23.5	10.	-	+	-	+	Sl.	
June A	5300	Fc	+	2.	-	57.5	1.	1.	3.5	14.	23.	-	+	-	Sl	Sl	Chest pain.
July A	3500	Fc	+	-	S. & S.	66.5	1.	-	4.5	10.5	17.5	Sl	Sl	-	Sl	Sl	I.S.Q.
Aug A	7000	Fc	+	-	-	57.5	2.	-	0.5	33.	7.	-	-	-	Sl	Sl	I.S.Q. 5 days back after 11 days holiday.
Sept C	6800	F	+	9.	-	58.5	2.	1.	5.	13.	20.5	-	+	-	Sl	Sl	Off 6 days "influenza" and septic finger.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 16. E.S. (35 yrs) (7 yrs).

Lead poisoning 6 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.						
May B	3400	Fc	+	2.	S & S	69.	3.	2.	1.	6.5	18.5	Sl	Sl	-	Sl	+	Chest pain.
June B	4100	F	+	3.	-	62.5	1.5	-	2.5	25.	8.5	+	Sl	+	-	+	Chest pain. Off 4 days 2 weeks ago - AP.
July C	4200	Fc	+	1.	-	72.5	0.5	-	4.	18.5	25.	-	Sl	-	-	+	Much improved.
Aug C	6200	Fc	+	-	-	75	-	-	-	22.	3.	Sl	Sl	-	-	+	Improved. Back 2/52 after 2/52 holiday.
Sept C	5100	F	+	-	-	69.	1.	-	2.	18.	10.	-	-	-	-	Sl	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 17: ..... T.H. .... ( ) (3 mos.

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May B	7400	Fc	+	5.	-	73.5	1.5	1.	3.	10.	11.	-	-	+	-	-	
June B	2300	F	-	2.	-	70.5	2.5	0.5	4.	9.	13.5	-	-	-	-	-	Better. Has done no burning for 2 weeks.
July C	32800	Fc	+	-	-	72.	3.	-	4.5	18.5	2.	-	-	-	-	-	I.S.Q.
Aug C	7500	Fc	+	1.	-	66.5	1.5	-	1.	25.5	5.5	-	-	-	-	Sl	I.S.Q. Back 1 day after 11 days holiday.
Sept B	10300	F	Sl	-	-	54.	2.	-	6.5	29.5	8.	-	-	+	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 18. L.R. (26yrs) (7 yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	3900	Fc	+	3.	-	52.	4.	1.	3.	27.	13.	-	-	-	-	-	
June A	12800	Fc	+	6.	-	71.5	-	0.5	2.5	18.5	7.	-	-	-	-	-	
July C	4300	Fc	-	5.	-	70.5	0.5	1.	3.	13.	12.	-	-	-	-	-	I.S.Q.
Aug C	10300	Fc	Sl	6.	-	58.	-	-	2.	32.	10.	-	-	-	-	-	Improved. Back 1 day after 15 days holiday.
Sept C	6000	Fc	Sl	-	-	55.	0.5	0.5	2.5	34.	7.5	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 19. ..... J.J. ..... (28yrs) (6 yrs)

Had lead poisoning on two occasions four years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	9100	Fc	Sl	3.	-	74.5	1.	0.5	4.	12.	8.	-	-	Sl	+	-	
June A	4200	F	+	-	-	54.	2.5	0.5	8.	22.5	12.5	-	-	Sl	-	-	I.S.Q.
July B	41300	Fc	+	5.	S	70.	3.	0.5	3.	14.	9.5	-	-	Sl	-	-	Slight improvement.
Aug B	22300	Fc	+	-	-	55.5	1.5	0.5	3.	35.5	4.	-	-	Sl	-	Sl	Slight improvement. 5 days back after 11 days holiday.
Sept B	2700	Fc	Sl	-	S & S	52.	2.5	-	2.	16.5	27.	-	-	+	Sl	Sl	Worse.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 20. W.A. (33yrs) (10 yrs).

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
						Differential Count (%)											
	Punctate Basophils		P.	NR.	Irreg Size or Shape	N.	E.	B.	M	Lymphocytes		H	C	AP	An		
	per million	Type								L.	S.						
May B	33000	FC	+	-	S	51.	1.	-	3.	11.	34.	Sl	-	-	-	-	Looks ill.
June B	45200	Cf	+	4.	-	66.5	0.5	-	4.	24.5	4.5	-	-	-	-	-	Off 2 weeks on account of foot injury. Back 2 weeks.
July C	4400	Fc	Sl	8.	S	56.	0.5	-	3.5	22.	18.	-	-	-	-	-	I.S.Q.
Aug C	25900	F	+	-	-	33.5	-	-	7.5	52.5	6.5	-	-	-	-	-	Improved. Back 5 days after 11 days holiday.
Sept C	7700	FC	-	-	-	45.5	-	-	1.5	37.	16.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 21 ..... M.E. ..... (29 yrs) (3 yrs)

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.						
May A	5400	F	+	1.	-	47.	2.	-	3.	23.	25.	-	-	Sl	-	-	Dyspnoea
June A	6600	Fc	+	1.	S & S	63.5	0.5	0.5	4.5	20.	11.	Sl	Sl	-	-	-	Slightly worse.
July B	11400	Fc	+	5.	-	71.5	-	-	2.5	23.5	2.5	-	-	-	Sl	-	Improved.
Aug B	11500	Fc	+	2.	-	75.5	-	-	1.	17.	6.5	-	-	-	Sl	-	I.S.Q. Slight improvement. 5 days back after 11 days holiday.
Sept B	3800	F	Sl	2.	-	46.	0.5	-	1.	39.5	13.	Sl	-	-	Sl	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No 22. ....J.S..... (21 yrs) (6 mos.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May A	3700	F	-	-	-	54.5	2.	1.	5.	23.5	14.	-	-	-	-	-	
June A	4100	Fc	Sl	2.	—	48.5	4.	-	7.5	31.5	8.5	-	-	-	-	-	
July B	5400	Fc	+	5.	-	57.	2.	-	4.	21.5	15.5	-	-	-	-	-	I.S.Q.
Aug B	4400	Fc	+	-	S & S	66.5	1.	-	1.	14.	17.5	-	Sl	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept B	7800	Fc	+	-	-	57.	6.	-	2.5	26.5	8.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 23: G.F. (20 yrs) (3 mos)

Off work on account of "colic" 1 day 1 month ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	26840	F	+	-	-	57.5	1.	-	2.	18.	21.5	-	-	Sl	-	-	General condition not good.
June A	28320	FC	+	5.	S & S	52.	1.5	-	6.	13.	27.5	-	-	Sl	+	-	Slightly better.
July C	5800	FC	+	3.	-	70.5	2.	-	1.5	13.	13.	-	Sl	-	-	-	Improved. Back today after 11 days holiday.
Aug C	26900	Fc	+	2.	-	56.	2.	-	2.5	31.5	8.	-	Sl	-	-	-	I.S.Q.
Sept B	1050	Fc	-	-	-	24.	-	0.5	4.	59.5	12.	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 24. W.N. ..... (28yrs) (4 mos)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.						
May A	3100	F	+	-	-	60.5	0.5	-	3.5	20.	15.5	Sl	-	-	-	-	Occasional pain in chest.
June B	25100	F	+	-	-	50.	1.	1.	7.	31.	10.	Sl	Sl	-	-	-	I.S.Q.
July A	1700	Fc	+	-	-	46.5	.5	-	6.	32.	15.	-	-	-	-	-	Improved.
Aug A	28900	Fc	+	3.	-	51.	2.5	-	1.5	37.5	7.5	-	-	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept C	12400	F	Sl	1.	-	53.	1.5	.5	3.	28.5	13.5	-	-	-	-	-	Off 2 days last week on account of chest pain.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 25:...A.McG.... (20yrs) (2 mos)
No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Jount (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes		H	C	AP	An		
										L.	S.						
May A	16000	Cf	+	2.	-	57.	2.5	-	25.	12.	26.	Sl	-	-	-	Sl	
June B	13800	Fc	+	2.	-	60.	0.5	0.5	6.5	15.	17.5	Sl	-	-	-	+	Improved.
July A	3800	Fc	+	-	S	56.	2.	-	2.	25.5	14.5	-	-	-	-	+	Improved. Back 2 days after 11 days holiday.
Aug C	4100	F	-	1.	-	44.5	-	-	1.5	40.5	13.5	-	-	-	-	Sl	Improved.
Sept C	4200	F	-	1.	-	54.	-	-	3.	30.5	12.5	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 26. D.K. ..... (27 yrs) (5 mos.); previously also 3 years, away for interval of 5 years.

No history of lead poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lymphocytes L.	S.	H	C	AP	An		
May A	6900	Fc	+	13.	S & S	44.5	1.	0.5	2.	16.	36.	-	-	-	-	-	Dyspnoea and general condition not good.
June B	18800	Fc	Sl	6.	-	61.	2.	-	3.	18.	16.	-	+	-	+	-	Feels slightly better.
July A	5000	F	+	-	S	51.5	2.5	-	3.	22.5	20.5	-	-	-	Sl	-	Back 2 days after 11 days holiday. Feels worse: pain in back and chest - ? "cold". I.S.Q.
Aug B	3600	Fc	Sl	1.	-	47.	-	-	2.5	43.	7.5	+	Sl	-	-	-	
Sept B	7800	Fc	+	-	-	43.5	3.	-	3.5	40.	10.	-	+	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 27. J.McD. ..... (22yrs) (4½ yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	5200	Fc	+	4.	S & S	61.	0.5	1.	2.	21.5	14.	-	-	-	-	-	
June A	1825	Fc	-	-	-	70.	3.	-	1.5	21.5	4.	-	Sl	Sl	-	-	Chest pain. Off 2 weeks with AP; back 1 day.
July C	58900	F	+	2.	-	69.	1.5	-	2.5	20.5	6.5	-	-	-	-	-	Improved.
Aug C	6900	Fc	+	4.	-	70.5	0.5	0.5	-	15.5	13.	-	-	-	-	-	I.S.Q. Back 1 day after 11 days holiday.
Sept C	2000	F	+	-	-	35.	1.	-	9.	48.	7.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 28 ..... P.K. ..... (20yrs) (8 mos)

Was off work for 1 week with AP 2 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	6500	Fc	-	5.	S&S	63.	0.5	-	1.	9.5	26.	Sl	-	-	+	-	
June B	19400	Fc	+	3.	S	41.	1.	0.5	12.	13.5	32.	-	-	-	-	-	I.S.Q.
July A	8200	Fc	+	-	-	55.	0.5	0.5	3 .5	29.5	11.	-	-	-	-	-	I.S.Q.
Aug A	11100	FC	+	-	S	42.	1.	-	3.5	46.5	7.	-	-	-	-	-	Improved. Back 5 days after 11 days holiday.
Sept C	20500	F	+	2.	-	45.5	-	-	3.5	38.5	12.5	-	-	-	-	-	Occasional dyspnoea. I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 29, W.McI. ..... (28 yrs) (1yr 2mds.

Was off work for 2 weeks on account of lead poisoning 5 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	8300	Fc	-	-	-	63.	1.	0.5	3.	18.	14.5	-	-	+	+	Sl	
June B	12600	Fc	+	1.	S & S	59.	3.	-	3.5	17.	17.5	-	+	+	+	-	Better now, but was off work for 2 weeks with AP 1 week ago.
July A	11750	Fc	-	1.	-	57.	0.5	-	4.5	31.	6.	-	-	-	-	Sl	Improved.
Aug A	7200	Fc	+	-	-	43.5	0.5	-	3.5	42.5	10.	-	-	-	-	-	Back 5 days after 11 days holiday.
Sept C	4200	F	Sl	2.	-	53.	2.5	-	1.	27.	16.5	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 30:....G.D..... (19 yrs) (2½ yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes		H	C	AP	An		
										L.	S.						
May A	13900	Fc	+	8.	-	59.5	2.5	-	1.	5.	32.	Sl	-	+	-	-	
June B	3700	Fc	Sl	1.	-	56.5	2.5	-	7.5	20.	13.5	-	-	-	-	-	Better.
July A	9000	FC	+	9.	-	56.	-	-	3.5	14.5	26.	-	-	-	-	-	Improved. Back today after 3 weeks holiday.
Aug A	10000	Fc	+	2.	-	36.	1.5	-	1.5	49.	12.	-	-	-	-	-	
Sept C	8100	F	-	-	-	47.5	1.	-	2.	39.	10.5	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No 31:.....D.S..... (31yrs) (8 mos)

Off work with lead poisoning 1 month ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
						N.	E.	B.	M.	Lymphocytes		H	C	AP	An		
	per million	Type								L.	S.						
May B	12500	Cf	-	-	-	52.5	1.5	1.	2.	28.5	14.5	-	-	-	-	-	
June A	8100	Fc	+	-	-	67.5	1.5	0.5	2.5	14.	14.	-	-	-	-	-	
July A	4000	Cf	+	3.	-	65.	2.5	-	1.	16.5	15.	-	-	-	Sl	Sl	I.S.Q.
Aug A	4000	Fc	Sl	1.	-	53.5	1.5	-	2.	31.	12.	-	-	-	-	-	Improved. 5 days back after 11 days holiday.
Sept C	12600	Fc	-	4.	S & S	37.	1.	-	1.	34.	27.	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 32. ... A.A. ..... (34 yrs) (3½ yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	4900	F	Sl	1.	-	61.5	1.5	-	4.	24.	9.	-	-	Sl	-	-	
June B	3600	F	+	-	-	39.	2.	-	13.5	36.5	9.	-	-	-	-	-	Improved.
July A	8000	Fc	Sl	1.	-	63.	1.5	-	3.5	16.	16.	-	-	-	-	-	Improved. Back today after 3 weeks holiday.
Aug A	3700	Fc	Sl	3.	-	26.	-	-	4.	57.	13.	-	-	-	-	-	I.S.Q.
Sept C	9100	F	Sl	1.	-	35.5	0.5	-	5.5	48.5	10.	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 33. . J.McI. . . . . (22yrs) (6 mos).

Off work for few days on account of colic 2 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	3100	F	-	2.	-	53.	-	-	3.	31.	13.	-	Sl	-	-	-	Chest pain.
June B	7900	Fc	+	6.	-	52.5	1.5	-	2.	3.5	40.5	+	+	+	-	-	Worse.
July C	8300	Fc	-	4.	S & S	57.	1.	1.	3.5	23.	14.5	-	+	Sl	-	-	Improved.
Aug C	16700	FC	Sl	-	-	67.	1.	-	2.5	25.5	4.	Sl	Sl	-	-	-	Back 1 day after 11 days holiday.
Sept A	7200	F	+	1.	-	50.5	1.5	1.	2.5	27.5	18.5	+	Sl	-	-	-	Chest pain.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 34 : ....G.T:..... (26 yrs) (3 days)

.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
A																	
May 4th	2400	F	-	-	-	61.	3.	0.5	2.5	9.	24.	-	-	-	-	-	
" 11th	7000	F	-	-	-	41.	1.5	-	6.	34.	17.5	-	-	-	-	-	
June A	1500	Fc	Sl	-	-	61.	3.5	0.5	5.	11.5	18.5	-	-	-	-	-	I.S.Q.
July B	6700	Fc	+	2.	-	58.5	1.5	0.5	4.	24.5	11.	-	-	-	-	-	
Aug B	5100	F	+	-	-	46.5	3.5	-	2.	39.	9.	-	-	-	-	-	5 days back after 11 days holiday.
Sept B	4300	F	-	-	-	45.	2.	-	3.	39.5	10.5	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 35 : ....A.S..... (20yrs) (3 days)

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Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
A																	
May 4th	2200	F	-	-	-	69.	1.5	-	1.5	12.	16.	-	-	-	-	-	
"11th	5600	F	-	-	-	46.5	1.5	0.5	2.5	24.	25.	-	-	-	-	-	
June A	2300	F	-	1.	-	62.	3.	1.	2.	20.5	11.5	-	-	-	-	-	I.S.Q.
July C	7000	Fc	Sl	1.	-	51.	1.	1.	4.5	34.5	8.	-	-	-	-	Sl.	Off 10 days on account of injury; back 1 week
Aug C	7600	Fc	Sl	1.	-	55.	1.	0.5	3.	33.	7.5	-	-	-	-	-	Back 5 days after 11 days holiday.
Sept C	900	F	Sl	1.	-	48.	0.5	-	1.5	42.	8.	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 36..... J.C..... (32 yrs) (9 yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	7400	F	+	-	-	52.	-	-	5.	37.	6.	-	-	-	-	-	Looks fit,
June A	8300	Fc	-	8.	-	69.5	0.5	-	5.	20.	5.	-	-	-	-	-	I.S.Q.
July C	14800	F	-	5.	-	62.	-	-	4.	27.	7.	-	-	-	-	-	
Aug C	36200	Fc	Sl	2.	-	65.5	1.	-	1.5	27.	5.	-	-	-	-	-	
Sept C	2700	Fc	-	-	-	57.	1.5	-	4.5	28.	13.5	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 37. ... J.B. ..... (26 yrs) (4 mos.)

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	6100	F	+	-	-	64.	3.	-	2.	24.	7.	-	-	Sl	-	+	
June B	6400	Fc	-	3.	-	61.5	2.5	-	2.5	23.	10.5	-	-	Sl	-	+	I.S.Q.
July A	11100	Fc	+	4.	-	80.	2.	-	1.	6.5	11.5	-	-	-	-	+	Back 2 days after 11 days holiday.
Aug B	14600	F	Sl	-	-	56.	-	-	.5	37.	6.5	Sl	-	-	Sl	Sl	
Sept B	2900	Cf	Sl	1.	-	68.	-	-	1.5	18.5	12.	-	-	-	-	Sl	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 38....A.R..... (23 yrs) (2 mos)

No history of lead poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	3900	F	-	-	-	52.5	0.5	-	5.	23.	19.	-	-	-	-	Sl.	
June																	Off work on account of abdominal pain.
July A	6800	Fc	+	-	-	63.	0.5	0.5	2.5	21.	12.5	-	-	-	-	Sl	Off work for 2 weeks "colic" - back 10 days
Aug	24300	Fc	+	-	-	66.	1.5	.5	5.5	21.	5.5	-	-	-	-	Sl	Has been off work on account of injury since last examination
Sept C	7400	F	+	2.	-	51.5	1.5	.5	6.	32.5	8.	Sl	-	-	-	Sl	
Oct B	4200	F	Sl	1.	-	60.5	2.	1.	1.	23.5	12.	-	-	Sl	-	Sl	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 39. J.C. (21 yrs) (1 7/12 yr.

Back 1 month after 3 months illness from lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	1300	F	+	-	-	66.	0.5	-	3.5	17.	13.	-	+	-	-	-	
June A	8800	Fc	+	7.	-	63.5	1.	-	8.	15.	12.5	-	+	-	-	-	I.S.Q.
July C	5800	F	+	5.	S	76.	-	-	1.5	11.	11.5	-	+	-	-	-	I.S.Q.
Aug C	7100	F	+	-	-	66.	-	-	-	22.5	11.5	-	+	-	-	-	I.S.Q. 5 days back after 11 days holiday.
Sept C	1600	Fc	-	-	-	64.	-	-	4.5	27.	4.5	-	+	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No 40..... R.McG..... (21 yrs) (7 mos)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	9100	F	-	-	-	53.	-	-	7.5	29.	10.5	Sl	-	Sl	-	Sl	
June A	3900	F	Sl	1.	-	58.5	3.	-	10.	20.	8.5	-	-	-	-	-	
July A	9300	Fc	+	4.	-	52.	.5	-	5.5	32.	10.	-	-	-	-	-	I.S.Q.
Aug A	2000	Fc	Sl	-	-	65.	.5	.5	1.5	24.5	8.	Sl	-	-	-	-	I.S.Q.
Sept C	2500	F	Sl	-	-	68.5	1.	.5	4.5	20.5	5.	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 41.....A.N..... (20 yrs) (4 mos)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	2200	F	-	-	-	67.	0.5	-	2.	25.5	5.	SL	-	-	-	-	Anaemia
June A	4100	FC	-	1.	-	57.	1.5	0.5	3.	24.	14.	-	-	-	-	-	Improved.
July A	11600	F	+	-	-	48.5	2.5	0.5	1.5	34.5	12.5	-	-	-	-	-	I.S.Q. Back 2 days after 10 days holiday.
Aug C	7000	F	+	4.	-	33.5	-	-	5.	52.5	9.	-	-	-	-	-	I.S.Q.
Sept B	10200	F	+	1.	-	46.5	1.	-	2.	38.5	12.	-	-	+	-	-	Worse.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No.42:..... (20yrs) (2¼ yrs)

Off work on account of abdominal pain for two weeks; back two weeks.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May B	1200	F	-	-	-	63.5	1.5	-	2.5	24.	8.5	-	-	-	-	-	
June B	2700	Fc	-	3.	-	59.	3.5	0.5	2.5	27.5	7.	-	-	-	-	-	Improved.
July B	8900	Fc	+	13	-	50	0.5	-	2.	32.	15.5	-	-	-	Sl	-	
Aug B	14900	Fc	+	2.	-	51.	0.5	0.5	1.5	36.5	10.	-	-	-	Sl	-	
Sept B	1000	Fc	+	-	-	42.5	2.	0.5	5.	41.	9.	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 43. W.McG ..... (23 yrs.) (6 yr.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	4200	F	+	3.	-	69.5	-	-	4.	13.	13.5	+	-	-	-	-	
June A	5300	FC	+	4.	-	56.	1.	-	9.	18.5	15.5	-	-	-	-	-	Has had to give up burning for two weeks since last examination.
July C	14600	F	-	-	-	71.	1.5	-	3.5	14.5	9.5	-	-	-	-	-	Improved.
Aug C	5300	F	+	1.	-	44.5	-	-	0.5	37.5	17.5	Sl	-	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept C	6800	Cf	Sl	2.	-	56.5	2.5	-	2.	30.5	8.5	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 44. J.S. (25 yrs) (9 yrs.)

Off work for considerable time (colic) 2 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	6000	F	+	-	-	70.	0.5	-	3.	21.	5.5	+	-	-	+	Sl	
June A	10300	F	+	-	-	64.5	1.5	1.	3.	24.	6.	+	-	-	+	Sl	Improved.
July B	11200	F	+	3.	-	72.5	1.	-	2.	18.5	6.	+	-	-	Sl	Sl	I.S.Q.
Aug B	8700	F	+	2.	S & S	61.	1.	0.5	1.	25.	11.5	-	-	-	Sl	Sl	Improved.
Sept B	3100	Fc	-	-	-	80.5	1.	1.5	1.	41.	5.	-	-	-	-	Sl	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 45. W.N. (32 yrs) (7yrs.)

Off on account of lead poisoning for 5 weeks 4 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
						Differential Count (%)											
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May A	400	Cf	-	1.	-	61.5	1.5	1.	3.	15.	18.	Sl	-	-	-	Sl	General condition not good.
June A	4500	FC	Sl	5.	-	60.5	0.5	1.	2.	19.	16.5	-	+	+	-	+	Off work ill for 1 week since last examination.
July C	7100	Fc	Sl	7.	-	51.5	1.5	1.5	5.5	31.5	8.5	-	-	-	-	+	Improved.
Aug C	14900	F	+	-	-	56.	1.5	-	1.5	34.	7.	-	-	-	-	Sl	I.S.Q. 5 days back after 11 days holiday.
Sept B	11100	F	+	-	-	59.5	2.	0.5	4.	26.5	7.5	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 46. A.McG ..... (19 yrs) (1½ yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May A	7600	Fc	Sl	-	-	61.5	1.5	-	3.	26.	8.	-	-	Sl	-	-	Does not feel well.
June A	3500	CF	+	3.	-	72.5	2.	0.5	-	16.	9.	-	+	-	-	-	I.S.Q.Has been off burning for 2 weeks (malaise)back 1 week.
July C	8400	Fc	+	2.	-	71.	1.5	0.5	2.5	18.5	6.	-	-	-	-	-	Improved.
Aug C	17400	Fc	+	2.	-	73.	-	-	2.5	19.	5.5	-	-	-	-	-	I.S.Q. 5 days back after 11 days holiday.
Sept C	2200	Fc	-	2.	-	77.5	0.5	-	3.	8.	11.	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 47....A.Q..... (27 yrs) (3 mos)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	6100	F	Sl	5.	-	61.	2.5	0.5	2.	18.	16.	-	-	Sl	-	+	
June	Not working but not ill.																
July C	5900	Fc	+	1.	-	62.5	1.5	0.5	3.	27.	5.5	-	-	-	-	-	Improved.
Aug C	22900	Fc	+	-	-	64.	1.5	-	2.	26.5	6.	-	Sl	-	-	-	I.S.Q. Back 1 day, after 11 days holiday.
Sept C	9400	F	Sl	3.	-	58.	.5	-	3.	30.5	8.	-	-	-	-	-	I.S.Q.
Oct C	7400	F	+	1.	-	46.	0.5	0.5	1.	36.5	15.5	-	Sl	-	-	-	I.S.Q.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 48. J.S. (36 yrs) (5 yrs)

Has been off this work for past year, resumed 5 days ago. No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.						
May																	
June																	
July																	
Aug C	11300	Fc	Sl	3.	S & S	52.	-	-	1.	28.	19.	-	-	-	-	-	
Sept B	4400	Fc	-	-	-	61.5	-	-	3.	29.	6.5	-	-	-	-	-	
Oct C	6000	F	Sl	-	-	49.	1.5	0.5	3.	33.5	12.5	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 49:...M:F:..... (19yrs) (1 day)

.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
						Differential Count (%)											
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May																	
June																	
July																	
Aug B	14200	F	Sl	-	-	43.5	1.	-	3.5	29.	23.	-	-	-	-	-	
Sept B	6400	F	Sl	-	-	64.	1.5	-	1.5	26.	7.	-	-	-	-	-	
Oct B	7100	Fc	+	1.	-	53.	1.	-	0.5	37.5	8.	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 59:...W.W..... (20yrs) (1 wk.)

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July																	
Aug B	14200	F	Sl	1.	-	59.	1.5	-	3.	25.	11.5	-	-	-	-	-	
Sept B	7200	Fc	+	1.	-	62.5	4.	-	3.5	23.	7.	-	-	-	-	-	
Oct B	7400	F	+	-	-	56.5	4.5	-	1.5	27.	10.5	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 51.... J.P..... (24yrs) (3¾ yrs)
No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	7500	Fc	-	-	-	60.	1.5	0.5	3.	21.	14.	-	-	-	-	-	General health not so good as formerly.
June A	22200	Cf	-	3.	-	49.5	1.	0.5	3.	24.	22.	-	-	+	-	-	Off (colic) for 1 week. Back 2 weeks.
July C	3800	Fc	-	-	-	45.	2.	-	3.	38.5	11.5	-	-	-	-	-	Improved.
Aug C	7900	Fc	Sl	1.	-	57.5	1.	-	1.	27.5	13.	-	-	-	-	-	I.S.Q. Back 1 day after 11 days holiday.
Sept C	16000	Fc	+	3.	-	44.	6.	-	5.	33.	12.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 52 ... A.T. ..... (27 yrs) (10 yrs)

Repeated lead poisoning; now labouring - has not been able to work as burner for past 3 months.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.						
May	33000	Fc	+	2.	-	78.	-	-	3.	5.	14.	-	+	-	-	-	Anaemic and ill. Long an 'A' risk.
June	9200	Fc	+	7.	-	47.	0.5	0.5	6.	28.5	17.5	Sl	+	+	-	-	Feels worse. Still labouring.
July C	6900	Fc	+	-	-	67.	1.	0.5	3.	25.	3.5	Sl	+	Sl	+	-	Improved.
Aug C	26400	Fc	Sl	-	-	56.5	2.5	-	3.5	26.	11.5	Sl	+	Sl	+	Sl	Improved. Back 1 day after 11 days holiday.
Sept C	61500	Fc	+	-	-	36.	1.	-	3.5	51.5	8.	+	Sl	-	Sl	Sl	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 53..... J.S..... (28yrs) (9mos)

Off on account of lead poisoning for three months. Back to work for four months.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	10900	F	Sl	-	-	73.5	-	1.	2.5	14.	9.	Sl	+	Sl	-		No teeth.
June A	11400	Fc	+	5.	S & S	75.	1.5	-	2.	5.5	16.	+	Sl	-	-		Worse
July A	24600	Fc	+	5.	S	57.5	6.	0.5	2.	12.5	21.5	Sl	Sl	-	-		Slight improvement. Back 2 days after 11 days holiday.
Aug B	2600	Fc	Sl	-	-	58.	6.	1.	1.5	26.	7.5	+	Sl	Sl	Sl		I.S.Q.
Sept B	2500	Fc	Sl	1.	-	38.5	5.	0.5	3.5	37.5	15.	+	+	Sl	Sl		I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 54....T.J..... (9 yrs) (1 yr.)

.No.history.of.lead.poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	10100	F	+	1.	-	73.	-	-	3.	14.	10.	-	-	-	-	-	
JuneB	4500	Fc	Sl	1.	-	64.	3.	1.	5.	17.	10.	-	-	-	-	-	I.S.Q.
JulyA	5100	F	+	-	-	54.	3.	5.	3.	30.	9.5	-	-	-	-	-	
Aug A	2 500	F	Sl	-	-	35.	1.	0.5	2.5	52.5	8.5	-	-	-	-	-	5 days back after 11 days holiday.
SeptC	8000	Fc	Sl	-	-	71.	1.5	0.5	0.5	20.	6.5	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 55....T.S..... (22yrs) (2 days

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July																	
Aug B	5700	F.	-	5.	-	60.	0.5	-	2.	25.5	13.5	-	-	-	-	-	
Sept B	5000	F.	Sl	1.	-	43.5	2.	0.5	2.	47.	5.	-	-	-	-	-	
Oct B	8200	F.	Sl	-	-	61.	1.	-	1.5	25.	11.5	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 56. ..... J.L. ..... (26 yrs) (2½yrs)

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May B	12300	F	+	-	-	58.	4.	0.5	2.	18.5	17.	+	-	-	-	-	
June B	4500	Fc	+	-	-	53.5	1.	0.5	5.	26.	14.	-	-	-	-	-	I.S.Q.
July A	5400	F	+	2.	-	43.	1.5	-	3.5	33.5	18.5	+	+	-	+	Sl	Worse.
Aug A	2000	Fc	+	1.	-	61.	1.5	-	0.5	27.5	9.5	-	Sl	-	-	-	Improved. Back 5 days after 11 days holiday.
Sept B	3300	Fc	-	2.	-	50.5	5.5	-	2.5	30.	11.5	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 57. A.S. ..... (35yrs) (3 mos.)

Was off work with lead poisoning for 2 weeks 6 weeks ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	5000	F.	-	2.	-	65.5	1.	-	0.5	6.	27.	-	-	-	-	-	
June B	1500	F.	-	-	-	68.5	1.5	0.5	3.	14.5	12.	-	-	-	-	-	Slight improvement.
July A	3300	Fc	Sl	2.	S	50.	-	-	4.	32.5	13.	-	-	-	-	-	Improved.
Aug A	4100	F	Sl	-	-	60.	3.5	-	1.5	27.5	7.5	-	-	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept C	19000	Cf	Sl	1.	-	53.5	5.	1.5	2.5	25.5	12.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 58. P.M. ..... (27yrs) (4 mos.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Jount (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	13400	Fc	+	1.	-	66.5	-	0.5	1.	10.5	21.5	Sl	-	-	-	-	Chest pain.
June B	3060	Fc	+	3.	S & S	54.5	2.	-	3.5	19.5	20.5	Sl	-	+	-	-	Worse.
July A	8000	F	-	1.	S & S	60.5	2.	0.5	0.5	21.	15.5	-	-	-	-	-	Improved. 2 days back after 11 days holiday.
Aug C	24900	Cf	+	3.	-	54.	1.	0.5	4.	36.	4.5	-	-	-	-	-	Improved.
Sept B	8300	F	+	-	-	64.	0.5	0.5	5.5	25.	9.	-	-	+	Sl	-	Worse.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 59:....L.S:..... (34yrs) (7mos.)

No history of lead poisoning:.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.						
May B	6000	Fc	-	6.	-	67.	-	-	1.	18.	14.	Sl	Sl	-	-	+	
June B	17800	Cf	+	1.	-	68.5	1.5	-	2.5	23.5	4.	Sl	Sl	-	-	+	I.S.Q.
July A	6000	F	+	5.	S	50.	2.	1.5	1.5	30.5	14.5	Sl	Sl	-	-	+	I.S.Q. 2 days back after 11 days holiday.
Aug B	20000	F	+	-	-	47.	-	-	3.5	38.	11.5	+	-	-	Sl	Sl	
Sept B	4400	Fc	Sl	-	-	43.5	3.	0.5	2.	41.5	9.5	Sl	-	-	-	+	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 60...C.T..... (42yrs) (11yrs)

No history of lead poisoning; but has had several "spells" off burning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.						
May B	11700	Fc	Sl	-	-	56.	0.5	0.5	4.5	30.	8.5	-	-	-	-	Sl.	
June B	7300	Fc	+	2.	-	61.	1.5	1.	5.	21.	10.5	-	-	-	-	Sl	
July A	3500	Fc	+	-	-	34.5	-	-	8.	36.	21.5	-	-	-	-	Sl	I.S.Q.
Aug A	7700	Fc	+	1.	-	32.5	2.	-	4.	53.5	8.	-	-	-	-	Sl	Back 5 days after 11 days holiday.
Sept C	12800	Fc	Sl	-	-	50.	0.5	-	4.	34.5	11.	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 61. P.McA. ..... (28yrs) (3½yrs)

Off for 1 month on account of lead poisoning. back 2 months.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	15600	FC	-	-	-	63.	3.	0.5	1.5	15.	17.	Sl	-	-	-	-	
June B	14800	Fc	-	-	-	60.5	2.5	-	7.5	13.	16.5	-	-	-	-	-	
July A	4600	FC	+	5.	S & S	64.5	1.5	-	2.	11.	21.5	-	-	-	-	-	
Aug A	5300	Fc	Sl	2.	-	57.5	0.5	0.5	1.5	33.5	6.5	-	-	-	-	-	Back 5 days after 11 days holiday.
Sept C	6000	F	Sl	-	S & S	53.5	5.	0.5	1.	26.	14.	-	-	-	-	Sl	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 62. A.F. ..... (31yrs) (5yrs)

Was off work with lead poisoning for 1 month 2 months ago.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	22900	F	-	1.	-	64.5	2.5	-	3.	23.	7.	-	-	-	-	Sl	
June B	6700	Fc	+	1.	-	59.5	2.5	-	4.	22.	12.	-	Sl	-	-	+	I.S.Q.
July A	570	F	-	1.	-	50.5	4.	0.5	1.5	24.	19.5	Sl	-	-	-	Sl	I.S.Q.
Aug A	3500	F	-	1.	-	38.	1.5	-	1.	45.	14.5	-	-	-	-	Sl	I.S.Q. Back 5 days after 11 days holiday
Sept C	6100	F	-	1.	-	63.	1.5	0.5	1.5	24.5	9.	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 63. P.M. ..... (35yrs) 14yrs)

History of having been off work on account of lead poisoning several times, the last 4 months ago..

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	17600	F	+	-	-	66.	-	-	3.	23.	8.	-	-	-	-	-	
June B	4100	Fc	+	-	-	65.	0.5	-	4.	25.	5.5	-	-	-	-	-	Slight improvement.
July A	3900	Fc	+	-	S & S	51.	1.	-	2.	35.	11.	-	-	-	-	-	I.S.Q.
Aug A	4400	Fc	Sl	1.	S & S	62.	-	-	1.	25.5	11.5	-	-	-	-	-	Improved. Back 5 days after 11 days holiday.
Sept C	4700	F	Sl	-	-	40.5	-	-	4.	45.	10.5	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 64:...R.B:..... (27yrs) (4 mos)

No history of lead poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May B	18100	Fc	Sl	1.	-	68.	0.5	-	2.5	19.	10.	-	-	-	-	-	
June B	19400	FC	+	-	-	60.	0.5	-	4.	26.5	9.	-	-	-	-	-	I.S.Q.
July A	5100	Fc	+	2.	-	48.	3.5	0.5	3.5	26.5	18.	-	-	-	-	-	I.S.Q.
Aug A	4200	Fc	+	2.	S	38.	1.	0.5	0.5	37.5	22.5	-	-	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept C	10000	F	Sl	-	-	46.	2.	-	3.	32.	17.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 65 ... R.P. ..... (38yrs) (10yrs)

... Was off work for 9 months with lead poisoning; back 2 months. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M.	Lympho-cytes L.	S.	H	C	AP	An		
May B	11800	Fc	-	-	-	63.	1.5	1.5	2.5	13.	18.5	Sl	Sl	-	Sl	-	Looks ill.
June B	3000	Fc	-	1.	-	60.5	2.	0.5	2.	16.5	18.5	-	+	+	+	-	I.S.Q.
July C	29600	Fc	+	7.	-	61.	-	-	3.	15.5	20.5	Sl	-	-	-	-	
Aug C	18900	Fc	+	1.	-	63.5	2.	-	1.5	23.5	9.5	-	Sl	-	-	-	I.S.Q. Back 5 days after 11 days holiday.
Sept C	1500	F	Sl	1.	-	59.5	0.5	-	1.	27.	12.	Sl	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 66. R.H. (27yrs) (6yrs)

Off one week on account of headache and colic last year.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Jount (%)											
	per million	Type				N.	E.	B.	M.	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May B	11900	Fc	Sl	6.	-	64.	4.	0.5	1.5	16.	14.	-	+	-	-	-	
June B	4300	F	Sl	3.	-	74.	1.	-	2.5	12.	10.5	Sl	+	-	+	+	Worse.
July C	4800	Fc	+	5.	S & S	59.	1.	-	2.	15.	23.	-	+	Sl	Sl	+	
Aug C	20500	F	+	5.	-	70.	2.5	0.5	2.	14.5	10.5	-	-	-	-	Sl	Improved. Back 5 days after 11 days holiday.
Sept C	1250	F	-	-	-	64.	1.	-	1.	18.5	15.5	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 67:...D.B:..... (28yrs) (2mos.)

Off on account of "colic" for three days. Back three days.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June B	5700	F	+	3.	-	69.	1.5	-	2.	15.	12.5	Sl	-	+	+	-	
July B	5600	Fc	Sl	1.	-	69.5	1.5	0.5	2.5	14.	12.	-	-	-	-	Sl.	Back 1 day after 3 weeks illness - lead poisoning.
Aug C	3300	Fc	+	2.	-	75.5	1.	-	1.	14.5	8.	-	-	-	-	Sl	Back 1 day after 11 days holiday.
Sept C	23200	F	+	-	-	33.5	.5	-	5.	57.5	3.	-	-	-	-	Sl	I.S.Q.
Oct C	3700	Fc	Sl	2.	-	53.5	2.	-	0.5	28.	16.	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 68.... W.M..... (22yrs) (4mos.)

Off 1 day on account of 'colic' 7 weeks ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May																	
June A	10100	F	+	2.	-	71.	-	0.5	4.5	18.5	5.5	-	-	-	-	-	
July A	5400	F	+	3.	-	44.5	1.	-	3.	30.	21.5	-	-	-	-	Sl	I.S.Q.
Aug A	6100	F	Sl	-	-	40.	3.	-	1.	49.	7.	-	-	-	-	Sl	I.S.Q. Back 5 days after 11 days holiday.
Sept C	9600	Fc	Sl	2.	-	32.5	1.	-	3.5	46.5	16.5	-	-	-	-	-	I.S.Q.
Oct B	6100	Fc	Sl	-	-	63.5	1.	1.5	2.	22.	10.	-	-	-	-	-	I.S.Q.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 69:....J.C:..... (24yrs) (5mos.)

Back to work for 1 day after 5 weeks absence on account of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June B	6000	FC	+	2.	S & S	67.5	-	-	4.5	17.	11.	-	-	-	+	-	
July C	12600	FC	+	-	-	68.	-	-	4.	22.5	5.5	-	-	-	-	-	Improved.
Aug C	34200	F	+	-	-	64.	-	-	1.	31.5	3.5	-	-	-	-	-	Back 1 day after 11 days holiday.
Sept B	6600	F	+	2.	-	57.	0.5	0.5	2.	28.	12.	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. .ZQ.....A.C..... (39yrs) (6yrs)

No history of lead poisoning but was operated on for "stoppage of the bowels" in February and only returned to work 10 days ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June B	9200	F	+	6.	S & S	57.5	2.5	-	1.	8.5	30.5	Sl	Sl	Sl	-		No teeth.
July C	4300	Fc	+	1.	-	63.5	1.	-	4.	24.	7.5	-	Sl	Sl	-		No teeth.
Aug C	16200	F	+	-	-	59.5	1.5	-	1.	30.	8.	-	-	Sl	-		No teeth. Back 1 day after 11 days holidays.
Sept C	11900	F	+	-	-	47.	1.	-	7.	35.5	9.5	-	Sl	+	-		No teeth.
Oct C	7500	Fc	Sl	2.	-	45.	1.5	.5	2.	35.	16.	-	Sl	+	-		No teeth.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 71:...W.H:..... (21yrs) (9days)

.No.history.of.lead.poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lympho-cytes		H	C	AP	An		
										L.	S.						
May																	
June																	
July C	6500	F	+	3.	-	67.	2.	0.5	1.	17.5	12.	-	-	-	-	-	
Aug C	6700	Fc	+	3.	-	78.	0.5	-	3.	11.	7.5	-	-	-	-	-	Back 1 day after 11 days holiday.
Sept B	10100	F	+	1.	-	46.	2.	0.5	2.5	38.5	10.5	-	-	-	-	-	
Oct B	5700	Fc	+	2.	-	78.	-	-	0.5	16.	5.5	Sl	Sl	-	-	Sl	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 72.... P.M..... (22yrs) (9days)

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.						
May																	
June																	
July 3 C	3150	F	Sl	2.	-	65.5	0.5	-	3.	21.5	9.5	-	-	-	-		No teeth.
13	3300	Fc	+	-	-	67.	0.5	-	3.	20.	9.5	-	-	-	-		No teeth.
Aug C	4300	Fc	Sl	-	-	65.5	1.	-	2.5	24.	7.	-	-	-	-		No teeth. Back 1 day after 11 days holiday.
Sept C	3500	F	Sl	1.	-	58.	1.5	-	4.5	30.	6.	-	-	-	-		No teeth.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 73. J.C. (20yrs) (2weeks)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.						
May																	
June																	
July B	4700	Fc	-	-	-	61.5	1.	-	1.5	24.	12.	-	-	-	-	-	
Aug B	12500	Fc	Sl	1.	-	53.	1.	1.	1.	37.	7.	-	-	-	-	-	Back 3 days after 11 days holiday.
Sept B	24100	Cf	Sl	2.	-	36.	2.	-	6.	47.	9.	-	-	-	-	-	
Oct B	6700	Fc	+	1.	-	31.5	0.5	-	1.	53.	14.	-	-	-	-	-	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 74....G.W..... (22yrs) (5½yrs)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Jount (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July C	4600	Fc	Sl	2.	-	57.	1.	-	3.	24.5	14.5	-	-	-	-	-	
Aug C	11000	Fc	-	2.	-	73.	-	-	1.5	21.	4.5	-	-	-	-	Sl	1 day back after 11 days holiday.
Sept B	6500	F	-	1.	-	53.5	0.5	-	2.	35.	9.	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 75. H.G. ..... (39yrs.) (11yrs.)

Off on account of lead poisoning for 7 months. Back 1 month.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July C	37400	Fc	+	2.	-	64.	-	-	2.5	16.	17.5	-	Sl	Sl	Sl		No teeth.
Aug C	2500	F	+	-	S & S	64.	1.5	-	-	14.5	20.	-	Sl	-	-		No teeth. I.S.Q. Back 5 days after 11 days holiday.
Sept C	1600	FC	-	-	-	52.	1.5	-	2.	27.	17.5	-	-	-	-		No teeth. I.S.Q.
Oct B	4300	Fc	Sl	-	-	41.5	0.5	-	7.	34.	17.	Sl	-	Sl	-		No teeth. Worse.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 76 ... G.K. ..... (30yrs) (2 weeks; previously 1½ years, away for 7 years.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July B	6100	Fc	+	2.	-	50.5	1.	-	1.	11.5	36.	-	-	-	-	-	
Aug B	7400	F	Sl	5.	-	61.5	-	-	1.	25.5	12.	-	-	-	-	-	I.S.Q. 5 days back after 11 days holiday.
Sept B	3000	F	-	-	-	57.5	2.5	-	4.5	23.	18.5	-	-	-	-	-	
Oct B	5900	Fc	+	-	-	35.	2.5	-	1.5	43.	17.5	-	-	-	-	-	I.S.Q.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 77...H.S..... (24yrs) (3 years; has been at other work for 4 months; back 13 days).
No history of lead poisoning.
.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June																	
July A	5200	Fc	Sl	-	-	40.	1.	-	1.	44.	14.	-	-	-	-	-	
Aug A	8500	F	+	-	-	58.	0.5	0.5	2.	30.	9.	-	-	-	-	-	5 days back after 11 days holiday.
Sept B	3200	Fc	-	2.	-	49.5	1.5	-	4.	34.	11.	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 78...D.S..... (29yrs) (7yrs.)

History of "ulcerated stomach" 4 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	3100	Fc	-	1.	S	55.	8.	1.	2.	19.	15.	-	-	Sl	-	Sl	
June A	21700	Fc	Sl	2.	-	68.	0.5	-	2.	18.	11.5	+	-	-	+	+	Has been off burning 2 weeks; back 8 days.
July B	5000	Cf	+	6.	S	55.	1.	-	1.5	18.	24.5	-	-	+	-	+	Improved.
Aug B	7100	Fc	Sl	6.	-	57.	2.5	-	2.5	32.5	5.5	-	-	-	-	Sl	I.S.Q. 6 days back after 10 days holiday.
Sept A	2800	Cf	+	-	-	70.5	5.	0.5	4.	11.	9.	+	-	Sl	-	Sl	Worse.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 79... C.M..... (52yrs) (7yrs.)

History of repeated lead poisoning. Back today after 2 weeks absence.....

Month and Risk	RED BLOOD JELLS					WHITE BLOOD JELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes		H	C	AP	An		
	per million	Type								L.	S.						
May A	14200	Fc	+	14.	S & S	50.5	1.5	0.5	3.	21.	23.5	-	-	-	-	-	
June B	3500	F	+	-	S & S	55.5	2.5	-	4.	27.	11.	-	-	Sl	-	-	Off work 3 days, pains in limbs and dyspnoea.
July B	7900	Fc	+	5.	-	55.	1.	-	3.	25.	12.	-	-	-	-	Sl	Improved, but not burning yet. Dyspnoea.
Aug B	6400	Fc	+	-	-	45.5	-	-	7.	45.	2.5	-	-	-	-	Sl	Dyspnoea. Improved. Still labouring.
Sept C	10800	F	+	-	-	59.	0.5	-	5.	31.	4.5	-	-	-	-	Sl	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 80. ... J.A. ..... (32yrs) (6mos.)

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	6500	Fc	+	-	-	81.5	-	-	2.	8.	8.5	-	-	-	-	Sl	
June B	2600	Fc	+	1.	S & S	70.5	0.5	0.5	1.5	7.	20.	-	Sl	+	-	Sl	
July B	2600	Fc	+	-	-	60.	-	-	2.5	30.	7.5	-	Sl	Sl	-	Sl	I.S.Q.
Aug B	16300	Fc	+	-	-	46.5	0.5	-	5.	43.	5.	-	-	-	-	Sl	6 days back after 10 days holiday. Improved.
Sept B	5300	Fc	-	6.	-	69.	-	-	1.5	16.	13.5	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 81...A.N..... (22yrs) (4yrs)

Was off work with lead poisoning for 2 weeks; back 3 weeks.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lymphocytes L.	S.	H	C	AP	An		
May A	2600	F	+	-	-	58.5	0.5	1.	3.	19.5	17.5	-	-	-	-	+	
JuneB	3900	F	+	-	S	59.5	0.5	-	4.	22.5	14.5	-	-	-	-	Sl	I.S.Q.
JulyB	6100	Fc	+	2.	-	33.5	3.	-	3.	49.	11.5	-	-	-	-	Sl	Better.
Aug B	18900	F	+	-	-	39.5	2.	-	3.	50.5	5.	-	-	-	-	Sl.	Improved. 6 days back after 10 days holiday.
SeptB	7000	Fc	+	-	-	41.5	2.	-	3.	40.	13.5	-	-	-	-	Sl	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 82.... J.H..... (24yrs) (1½ yrs), previously 2 years).

History of lead poisoning 3 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.						
May A	17850	Cf	Sl	-	-	75.5	1.5	0.5	2.5	15.	7.	+	+	Sl	Sl	-	
June B	6300	F	+	1.	S & S	63.	2.	1.	2.5	12.	19.5	+	+	+	Sl	-	Off work 2 weeks on account of lead poisoning; back 1 day.
July C	2500	Fc	+	-	-	59.5	2.5	-	5.5	25.5	7.	-	Sl	-	-	-	Improved.
Aug C	29100	Fc	-	1.	-	68.	2.	1.	2.5	18.	8.5	-	Sl	-	-	-	I.S.Q. Back 1 day after 10 days holiday.
Sept B	8100	Fc	+	-	-	53.	1.	2.	3.	33.	8.	-	Sl	Sl	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 83. T.E. (35yrs) 5yrs)

Off on account of lead poisoning for 2 weeks 5 months ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May A	5800	Fc	Sl	-	-	56.	2.5	1.	3.5	27.	10.	-	+	-	-	Sl	
June B	6000	Cf	+	4.	-	45.5	1.	-	3.5	27.5	22.5	Sl	+	-	-	+	
July B	3800	F	Sl	2.	S	49.5	1.	-	2.5	30.	17.	Sl	+	-	-	+	Slight improvement.
Aug B	11400	F	+	3.	S & S	54.	1.5	-	0.5	23.	21.	-	Sl	-	-	+	Back 6 days after 10 days holiday.
Sept B	4000	F	+	2.	S & S	37.5	1.	-	0.5	43.	18.	-	Sl	-	-	+	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 84. J.S. ..... 26yrs) (5½yrs)

Lead poisoning 4 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	14900	F	+	-	-	67.	0.5	-	2.5	16.	14.	-	+	-	-	Sl	
JuneB	6100	F	+	-	-	62.	0.5	-	2.5	23.	12.	Sl	+	-	-	Sl	
JulyB	4400	Fc	+	-	-	56.	0.5	-	4.	35.	4.5	-	+	-	-	-	I.S.Q.
Aug B	11200	Fc	+	3.	-	47.5	-	-	2.5	44.5	5.5	-	-	-	-	-	Back 6 days after 10 days holiday.
SeptB	10700	F	+	-	-	54.	2.	-	1.	30.5	12.5	-	+	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 85....R.S..... (32yrs) (3mos.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Jount (%)											
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May A	5700	F	+	-	-	50.	-	-	2.5	37.	10.5	-	+	-	-	+	
JuneB	8400	Fc	+	1.	S	64.	0.5	-	2.5	13.	20.	-	+	+	-	+	Off on account of 'colic' for 2 weeks. Back today.
JulyB	3800	F	-	2.	S & S	44.	1.	1.	2.	30.5	21.5	-	+	-	-	-	
Aug B	14300	Fc	+	-	-	58.	-	-	1.	33.5	7.5	-	Sl	-	-	-	Back 6 days after 10 days holiday.
SeptB	5400	Fc	+	-	-	60.	0.5	-	2.5	27.	10.	-	+	-	-	Sl	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 86.... C.M..... (40yrs) (3mos)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.	H	C	AP	An		
May A	11700	Fc	Sl	-	-	67.5	1.	-	2.5	22.	7.	+	-	Sl	-	+	
JuneB	4200	Fc	+	-	-	59.5	0.5	-	2.5	19.	18.	+	-	Sl	-	+	Chest pain.
JulyB	9000	F	+	-	-	71.5	0.5	0.5	2.5	20.5	4.5	-	-	Sl	+	+	Chest pain slight. Improved.
Aug B	7700	F	+	+	-	72.	1.5	-	2.5	22.	1.5	-	-	Sl	-	-	6 days back after 10 days holiday.
SeptB	5400	F	Sl	2.	-	45.	0.5	-	3.	29.	22.5	-	-	-	-	-	Improved.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 87....F.B..... (23yrs) (8 yrs.)

Repeated attacks of lead poisoning; last 2 years ago.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lymphocytes L.	S.	H	C	AP	An		
May B	3300	F	Sl	-	-	61.	4.	-	1.5	17.	16.5	-	-	Sl	-	-	
June B	6500	Fc	Sl	-	-	58.5	1.5	-	2.5	28.	9.5	-	-	-	Sl	-	
July B	2800	Fc	-	2.	-	45.	1.5	1.	2.5	28.5	21.5	Sl	-	Sl	-	-	I.S.Q.
Aug B	24300	F	+	-	-	57.5	3.	-	2.5	34.	8.	-	-	-	-	-	I.S.Q. Back 6 days after 10 days holiday.
Sept A	5100	Fc	+	-	-	57.5	3.	-	3.	19.	17.5	+	-	+	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 88. ... H.P. ..... (29yrs) (6mos.)

No history of lead poisoning

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)											
	per million	Type				N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May B	5000	F	+	1.	-	74.	-	0.5	1.5	12.5	11.5	-	-	-	-	Sl	
June B	5200	F	+	-	-	81.5	1.	-	2.5	11.	4.	-	-	-	-	-	I.S.Q.
July B	5700	Fc	+	-	-	60.5	1.	-	4.	29.	5.5	-	-	-	-	-	I.S.Q.
Aug B	6100	F	+	-	-	44.5	0.5	-	3.5	48.5	3.	-	-	-	-	-	I.S.Q. Back 6 days after 10 days holiday.
Sept B	7000	F	+	2.	-	58.	1.	-	3.	22.	16.	-	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. .89...A.B..... (31yrs) (9mos.)

Was.off.work.with.lead.poisoning.for.3.weeks;.back.2.weeks.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May																	
June B	5100	F	+	1.	S	48.5	0.5	-	5.	32.5	13.5	-	-	+	-	Sl.	
July B	10800	FC	+	1.	-	51.5	1.	-	2.5	31.	14.	-	-	-	-	Sl	Improved.
Aug B	16900	F	+	-	-	39	-	-	1.5	50.5	9.	-	-	-	-	Sl	Back 6 days after 10 days holiday.
Sept C	12300	F	+	-	-	54.5	-	-	9.5	28.5	7.5	-	-	-	-	Sl	
Oct C	3500	FC	+	1.	-	49.	0.5	-	1.	33.5	16.	-	-	-	-	Sl	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 90.. J.M. ..... (26yrs) (15mos.)

Was off work with lead poisoning for 1 month, ; back 1 month.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May A	7000	Fc	+	1.	-	61.5	-	-	1.	29.	8.5	-	-	-	+	-	
June A	12400	Fc	+	5.	-	69.	0.5	-	0.5	18.	12.	-	-	-	Sl	-	Better.
July B	6000	F	-	2.	-	73.5	-	-	2.5	17.5	6.5	-	-	-	Sl	-	I.S.Q.
Aug 1st B	11400	F	+	-	-	44.	1.5	0.5	3.	44.5	6.5	-	-	Sl	-	-	Back 6 days after 10 days holiday.
21st A	1900	Fc	+	-	S & S	41.5	-	0.5	2.	38.5	17.5	-	-	-	-	-	On 'A' for 3 days.
28th A	3400	Fc	+	-	-	57.	1.	-	0.5	27.5	14.	-	-	-	-	-	
Sept 5th A	3900	Fc	+	-	-	50.	1.5	1.	2.	15.	30.5	-	-	-	-	-	
14th B	12600	F	+	1.	-	73.	1.	-	1.	16.5	8.5	Sl	Sl	Sl	-	-	Worse. Off 'A' 6th September.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 91:....D.B.... (27yrs) 4 mos.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	5900	F	+	-	-	55.5	0.5	-	3.	29.5	11.5	-	-	-	-	-	
June B	4500	F	+	3.	-	56.5	1.5	-	4.5	16.5	21.	Sl	-	-	-	-	I.S.Q.
B July 3rd	5000	Fc	+	3.	S & S	50.	1.	-	4.	31.5	13.5	-	-	-	-	-	I.S.Q.
31st A	11800	F	+	-	-	45.	-	-	1.5	47.5	6.	-	-	-	-	-	Back 6 days after 10 days holiday. I.S.Q
Aug 12th	6100	Fc	+	-	-	58.5	1.	-	4.5	29.	7.	-	-	-	-	-	On 'A' 1 day.
" 17th	33500	FC	+	-	-	60	-	-	7.5	23.5	9.	-	-	-	-	-	
" 25th	3200	Cf	+	2.	-	72.	0.5	-	2.5	17.	8.	-	-	-	-	-	I.S.Q.
Sept 5th A.	3400	Fc	+	1.	-	70.	2.	1.	2.	8.5	16.5	+	+	-	-	-	Worse.
"14th A.	6600	F	+	-	-	67.	0.5	-	2.	18.5	12.	-	-	-	-	-	I.S.Q. Off 'A' 6th Sep.
"30th B. Oct	7500	Fc	+	-	-	60.	0.5	0.5	2.5	25.5	11.	-	-	-	-	-	Improved.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. .92. R.A. ..... (30yrs) (7yrs)

History of 2 attacks of lead poisoning; returned 7 weeks ago after 1 month's illness.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lymphocytes L.	S.	H	C	AP	An		
May B	2600	F	-	2.	S & S	63.5	2.	0.5	1.5	9.	23.5	-	+	-	-	-	
June B	6500	F	+	1.	S	60.	7.	1.5	3.	9.5	19.	-	+	-	-	-	I.S.Q.
B																	
July 3rd	14400	Fc	Sl	-	S	53.	7.	1.	1.	29.5	8.5	-	-	-	-	-	
"31st	11900	F	+	-	-	55.5	5.	-	4.	29.	6.5	-	-	-	-	-	Back 6 days after 10 days holiday.
A																	
Aug 12th	11100	F	-	-	-	56.5	4.	0.5	2.5	31.	5.5	-	-	-	-	-	Transferred to 'A' Aug 11.
" 17th	4600	Fc	-	2.	-	67.5	0.5	-	1.5	26.5	4.	-	-	-	-	-	
" 25th	4600	FC	+	1.	-	56.5	3.5	-	2.5	22.5	15.	-	-	-	-	-	
Sept 5th A	5600	Fc	+	6.	-	63.5	4.	-	3.	14.	15.5	-	-	-	-	-	
"14th B	17300	F	+	2.	-	50.5	0.5	-	1.5	40.	7.5	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 93. . I.McD. . . . . (24yrs) (9yrs)

Lead poisoning repeatedly; last off for three weeks; back 6 weeks.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	2800	F	+	2.	-	55.	0.5	1.	2.	26.5	15.	-	-	-	-	-	
June B	3100	F	+	2.	S	55.	1.5	-	3.5	23.	17.	-	-	-	-	-	I.S.Q.
B																	
July3rd	3400	Fc	-	-	-	60.	-	-	4.	28.5	7.5	-	-	-	-	-	I.S.Q.
"31st A	44200	Fc	Sl	-	-	58.5	0.5	-	1.5	36.5	3.	-	-	-	-	-	6 days back after 10 days holiday.
Aug12th	9600	Fc	Sl	-	-	45.	1.5	-	3.	39.5	11.	-	-	-	-	-	Transferred to 'A'
" 17th	5800	F	Sl	-	-	60.	2.	-	3.5	23.5	11.	-	-	-	-	-	Aug.12th.
" 25th	4500	Fc	-	-	-	63.5	2.	0.5	2.	14.	13.	-	-	-	-	-	I.S.Q.
Sept A																	
"5th	7900	Fc	Sl	7.	-	56.5	2.	0.5	4.	19.	18.	-	-	-	-	-	I.S.Q.
"14th Oct	7900	Fc	Sl	6.	S & S	67.	1.5	-	2.	14.5	15.	-	-	-	-	-	I.S.Q. Off 'A' Sept. 6th.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

K E Y

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 94. D.D. ..... (32yrs) (11yrs)

Lead poisoning repeatedly; last off for 1 month; back 2 months.

Month and Risk	RED BLOOD CELLS: Punctate Basophils per million	Punctate Basophils Type	P.	NR.	Irreg Size or Shape	WHITE BLOOD CELLS: Differential Count (%) N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.	SYMPTOMS H	C	AP	An	BL	REMARKS
May B	1800	Fc	+	-	-	73.	1.5	-	1.	11.5	13.	-	-	-	-	-	
June B	7800	F	+	-	-	62.5	1.5	1.	3.	22.5	9.5	-	-	-	-	-	I.S.Q.
B																	
July 3rd	14400	Fc	Sl	4.	-	62.5	1.	-	3.5	23.	12.	-	-	-	-	-	I.S.Q.
"31st	9200	F	Sl	4.	S & S	58.5	1.	-	2.5	29.	9.	-	-	-	-	-	Back 6 days after 10 days holiday.
A																	
Aug 12th	32400	Fc	+	-	-	60.	1.5	-	1.5	27.5	9.5	-	-	-	-	-	Transferred to 'A'
" 17th	10500	Fc	+	-	-	70.5	2.5	1.	1.	16.5	8.5	-	-	-	-	-	Aug. 8th.
" 25th	6000	Cf	+	2.	-	53.5	-	-	1.5	31.	14.	-	-	-	-	-	
Sept 5th A	4500	Cf	Sl	1.	-	64.5	2.5	1.5	2.5	21.5	7.5	-	-	-	-	-	
"14th B	13400	F	+	-	-	77.5	4.	1.	0.5	14.5	2.5	-	-	+	-	-	Off 'A' 6th September. Off work sick 4 days last week.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 95. M.G. (23yrs) (2mos.)

Was off work with lead poisoning 2 weeks; back 2 weeks.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils		P.	NR.	Irreg Size or Shape	Differential Count (%)						H	C	AP	An		
	per million	Type				N.	E.	B.	M	Lympho-cytes L.	Lympho-cytes S.						
May B	8000	F	+	-	-	66.	1.	-	2.	19.	12.	Sl	-	-	-	Sl.	
June B	3600	F	+	-	S	51.	2.	-	3.5	28.5	15.	Sl	+	-	-	-	Better.
July 3rd B	9600	F	-	-	-	56.	0.5	-	5.5	34.5	3.5	Sl	+	-	-	-	I.S.Q.
Aug 12th B	12200	Fc	+	-	-	65.	2.	0.5	4.	22.	6.5	-	-	-	-	-	(weeks holiday. Back 11 days after 3
"17th A	2200	F	+	4.	-	58.5	2.	-	4.5	22.	13.	-	-	-	-	-	
"25th A	2100	Fc	Sl	-	-	48.	1.5	-	5.	33.	12.5	-	-	-	-	-	
Sept A " 5th	6400	Fc	Sl	2.	-	54.5	0.5	-	1.5	25.5	18.	-	-	-	-	-	Off on holiday for 3 days; back 2 days.
"14th B Oct	8400	Fc	+	-	-	57.5	1.5	-	0.5	33.5	7.	-	-	-	-	-	Improved. Off 'A' September 6th.

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 96. G.S. (21yrs) 6 mos)
No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	5600	F	Sl	-	-	68.	2.5	-	1.	19.5	9.	-	-	-	-	-	
June B	7100	F	+	1.	-	77.5	2.	-	1.5	15.5	3.5	-	+	Sl	Sl	-	I.S.Q.
July B	4200	Fc	Sl	-	-	73.	3.	-	2.5	17.	4.5	-	-	Sl	-	-	Slight improvement.
Aug B	13000	Fc	Sl	1.	S	45.5	3.	-	-	42.5	9.	-	-	-	-	-	Slight improvement. 6 days back after 10 days holiday.
Sept A	7900	Fc	+	-	-	73.5	2.5	-	1.5	18.	4.5	-	-	-	-	-	
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY
N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 97. J.R. ..... (24yrs) (5mos.)

No history of lead poisoning.

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	1600	F	-	1.	-	64.	1.5	-	2.5	22.	11.	-	-	-	-	-	
June B	1400	F	Sl	1.	S & S	70.	0.5	-	2.5	17.	10.	-	-	-	-	-	I.S.Q.
B																	
July3rd	3500	FC	Sl	-	S & S	65.	-	-	4.	17.5	13.5	-	-	-	-	-	I.S.Q.
"31st	2300	F	-	-	-	57.	1.	0.5	2.5	35.	4.	Sl	-	-	-	-	I.S.Q.
A																	
Aug12th	4900	Fc	-	-	-	54.	-	-	2.5	24.	19.5	-	-	-	-	-	
" 17th	3000	FC	Sl	-	-	52.	1.	-	4.	32.	11.	-	-	-	-	-	
" 25th	3600	F	+	-	-	65.	0.5	-	3.	20.5	10.5	-	-	-	-	-	
Sept																	
"5th A	4800	Fc	+	-	-	53.5	2.5	0.5	3.5	33.5	6.5	-	-	-	-	-	
"14th B	8500	F	-	-	-	52.	1.	-	3.	37.	7.	-	-	-	-	-	Off 'A' 6th Sep.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 98.....T.D.... (24yrs) (6mos.)

No history of lead poisoning.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	5100	F	+	-	S	62.5	2.	0.5	3.	25.	7.	-	-	-	-	-	
June	No reading.		Off work - foot injury.														
B																	(Back two weeks
July 3rd	12706	Fc	+	-	-	63.	1.	-	3.	27.	6.	-	-	-	-	-	I.S.Q.Slight dyspnoea.
"31st	35000	Fc	+	1.	-	51.5	1,5	-	1.5	35.5	11.5	-	-	-	-	-	I.S.Q. 6 days back
A																	after 10 days holiday.
Aug 12th	9800	Fc	+	-	-	66.5	0.5	-	3.	23.	7.	-	-	-	-	-	To 'A' 11th Sep.
" 17th	4100	Fc	+	-	-	60.5	2.	-	3.5	29.	5.	-	-	-	-	-	
" 25th	6000	FC	+	-	-	66.	-	-	1.5	23.5	9.	-	-	-	-	-	I.S.Q.
Sept A																	
" 5th	3200	Fc	+	3.	-	56.	0.5	-	2.	13.5	28.	-	-	-	-	-	I.S.Q.
"14th	No reading.		Off ill.														
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 99..... J.D..... (22yrs) (3mos.)

.....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	Differential Count (%) N.	E.	B.	M	Lympho-cytes L.	S.	H	C	AP	An		
May B	6100	Fc	+	10.	-	64.5	1.	-	3.	17.	14.5	-	-	-	-	-	
June B	8000	Fc	+	1.	-	51.5	2.	-	6.	19.5	21.	-	-	Sl	-	-	I.S.Q.
July 3rd B	6800	Fc	+	-	-	40.5	2.	-	3.5	21.	13.	-	-	+	-	-	I.S.Q.
"31st	23900	F	+	3.	-	69.	1.5	-	1.5	25.5	2.5	-	-	Sl	-	Sl	I.S.Q. 6 days back after 10 days holiday.
Aug 12th B	10300	F	-	-	-	52.5	2.	-	2.	26.	17.5	-	-	-	-	-	
"17th A	2800	F	Sl	-	-	61.5	-	-	3.5	21.	14.	-	-	-	-	-	
"25th A	2900	F	+	4.	-	32.5	6.	-	-	38.5	23.	-	-	-	-	-	I.S.Q.
Sept 5th A	3700	Cf	Sl	2.	-	41.5	3.	-	1.5	28.	26.	+	+	+	-	-	Worse. (September
"14th B	7900	F	+	1.	-	58.5	3.	0.5	2.5	29.	6.5	-	-	-	-	-	Improved. Off 'A' 6th
"30th B	4100	Fc	+	-	-	58.	2.	-	4.5	24.	11.5	Sl	-	-	-	-	I.S.Q.
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
M : Monocytes.
L : Large Lymphocytes.
S : Small Lymphocytes.

H : Headache.
C : Constipation.
AP : Abdominal Pain.
An : Anorexia.
BL : Blue Line.

CASE No. 100 ... S.N. ..... (23yrs) (5mos.)

No history of lead poisoning. .....

Month and Risk	RED BLOOD CELLS					WHITE BLOOD CELLS						SYMPTOMS				BL	REMARKS
						Differential Count (%)											
	Punctate Basophils per million	Type	P.	NR.	Irreg Size or Shape	N.	E.	B.	M	Lymphocytes L.	Lymphocytes S.	H	C	AP	An		
May B	4300	F	+	1.	-	55.5	2.	-	3.	31.5	8.	-	-	-	-	-	
June B	5900	F	+	-	-	45.	1.	-	7.	29.5	17.5	-	Sl	-	Sl	-	
July 3rd B	3200	F	Sl	-	-	63.5	1.	-	3.5	27.	5.	-	Sl	-	+	-	I.S.Q.
"31st	13900	Cf	Sl	-	-	55.5	-	-	3.	39.	2.5	-	-	-	+	-	Improved. Back 6 days after 10 days holiday.
Aug 12th A	6100	Fc	Sl	-	-	61.5	1.5	-	1.5	29.	6.5	-	-	-	+	-	To 'A' 12th August.
" 17th	1400	Fc	Sl	-	-	38.	-	-	1.5	51.	11.5	-	-	Sl	+	-	Not so well "Cold"
" 25th	2500	Fc	Sl	-	-	48.	0.5	-	2.5	35.5	13.5	-	-	-	Sl	-	I.S.Q.
Sept A																	
" 5th	3700	FC	Sl	1.	-	30.5	1.5	-	2.	45.	21.	-	-	Sl	Sl	-	I.S.Q. (September
"14th	6100	Fc	Sl	1.	-	52.5	-	-	1.	32.5	13.5	-	-	-	Sl	-	Improved. to 'B' 6th
Oct																	

Type of Punctation: C - Coarse, F - Fine.
P : Polychromasia.
NR : Nucleated cells.

KEY

N : Neutrophils.
E : Eosinophils.
B : Basophils.
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H : Headache.
C : Constipation.
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BL : Blue Line.

In considering these reports it is proposed to deal first with changes in the red blood cells.

CHANGES IN RED BLOOD CELLS.

Punctate Basophilia:

Punctate basophilia was found to be present in every slide examined during the course of the investigation.

Following the description of punctate basophilia by EHRLICH in 1885 and the recognition of its association with lead poisoning by BEHREND in 1899, LUTOSLAWSKY in 1902 reported that he had found 90 cases of punctate basophilia among 107 persons suffering from chronic lead poisoning. On the other hand, BIONDI, at the Congress of Industrial Diseases in Milan in 1906 said he had not found punctate basophilia in the blood of persons suffering from severe lead intoxication. RUSSELL in 1915 gave the results of examination of a hundred cases of lead poisoning from the pottery district: 28% had no punctate basophilia. OLIVER gives it as his opinion that punctate basophilia is present in 30% to 70% of cases of lead poisoning.

SELLERS in 1926 published the results of examination of the blood of workers in various industries where a lead hazard was present, and his figures/

figures for punctate basophilia ranged from a 5% incidence in scrap lead workers to 88% in metal foundry workers (melting and dressing lead). He specifically mentioned a group of 26 oxy-acetylene burners employed by a firm of shipbreakers; 61.5% of the men had punctate basophilia. Sellers asserted that comparison as regards the lead risk could be made between factories engaged in the same or different kinds of industry by means of a sufficiently large number of blood tests and that there was abundant evidence that the incidence of punctate basophilia in the different factories followed very closely the amount of danger incurred by the workmen. In 1931 LANE declared that punctate basophilia was present in all workers exposed to a lead hazard. This opinion was based on the examination of about 4,000 films from workers engaged in the electric accumulator trade.

The cause and significance of punctate basophilia are not yet fully understood. While stippling is notably associated with lead poisoning it occurs also in other diseases, among them pernicious anaemia, leukaemia, malaria and malignant cahexia. Opinions differ as to whether it ever exists in the normal subject: KEY says that there is no punctate basophilia in normal adult blood: SABRAZES found it

in/

in healthy adults, as did also TELEKY, while HAWES and KONIG have found it present in normal infants. LANE found punctate basophilia present to a slight extent in approximately half of 223 normal persons of no known lead exposure.

The frequent association of punctate basophilia with nucleated red cells led some observers to believe that the granules originated from fragmentation of the nucleus. This view is still held by a few haematologists (including PINEY) but the weight of evidence is in favour of the cytoplasmic origin of the granules, as propounded by PAPPENHEIM and SCHILLING TORGAU, whose studies led them to the conclusion that polychromasia, punctate basophilia and reticulation demonstrable by vital staining were all due to the presence of basic staining protoplasm of youthful character, and all different expressions of substantially the same substance.

KEY in 1921 found basophilic cells of frequent occurrence in the blood of the Mammalian Embryo, the frequency decreasing with the age of the embryo. BROOKFIELD (1928) confirmed the association of punctate basophilia with young cells in the human subject. Punctate basophilia is present classically where the bone marrow is excessively active: it never occurs/

occurs in aplastic anaemia, but chiefly in toxic anaemias where the products of red cell degeneration are retained within the body (PRICE JONES). GOODALL and GULLAND regard punctate basophilia as a degenerative phenomenon occurring in young cells.

The scope of the present research does not afford an intensive enquiry into the cause of punctate basophilia, but several points have emerged which lend support to the theory that punctate basophilia is associated with an active marrow, and that it is the young cells that are - at any rate chiefly - involved. A record was kept of the number of nucleated red cells observed and the proportion of these showing punctate basophilia. Altogether 789 nucleated red cells were seen and of these 32 showed stippling (4%), while only 0·9% of all erythrocytes showed punctation. The films of the 100 workmen examined contained nucleated red cells at one time or another.

Punctate basophil counts of the 100 workmen at routine monthly examination are summarised in Table I.

TABLE /

TABLE I.

PUNCTATE BASOPHILIA AMONG SHIPBREAKERS.

Thousands of Basophils per million Erythrocytes.

	-1	1-	2-	3-	4-	5-	6-	7-	8-	9-	-10	10-	20-	30-	40-	50-
May	4	9	8	12	5	10	9	7	2	2	68	18	2	2	0	0
June	1	6	5	11	11	10	8	5	8	3	68	14	5	0	1	0
July	1	1	4	12	16	15	9	5	10	2	75	16	3	3	1	1
Aug.	0	2	6	7	9	5	9	10	3	3	54	27	12	4	1	0
Sept.	1	7	11	11	9	9	13	9	4	3	77	15	5	1	0	1
Total	7	25	34	53	50	49	48	36	27	13	342	90	27	10	3	2

It will be seen that the counts most frequently met with fall between 3,000 and 7,000 per million. There are only 7 under 1,000, two of them falling below 500 per million while at the other end of the scale they range up to a maximum of 62,000 per million.

These figures are generally higher than those recorded for other industries. SCHMIDT of Leipzig examined the blood of lead workers and non lead workers. Of the latter 2% showed punctate basophilia, in no case exceeding 300 stippled cells per million. All lead workers showing symptoms exhibited punctate basophilia, and in 75% of cases stippled cells exceeded 300 per million. SCHMIDT was of opinion that the basophil count must reach 500 per million before it became of diagmostic significance. In his group of one hundred reputed cases of lead poisoning from the pottery district

RUSSELL/

RUSSELL found that 28 showed no punctate basophilia, 43 had counts under 1,000 per million while only two exceeded 10,000, one being 15,000 and the other 25,000 per million. He found that the more convincing clinical cases were these with heavy punctate basophilia.

Reviewing the position in 1925, AUB, FAIRHALL, MINOT and REZNIKOFF stated that their repeated daily examination of the blood during plumbism confirmed the observation of MEYER and SPERONI that the granulation varies markedly in amount from day to day. TELEKY regarded marked granulation as an index of rapid absorption of lead, but AUB and his co-workers observed marked stippling nine months after exposure had ceased and were not disposed to accept TELEKY's view. TELEKY and SCHOENFELD declare that stippling is more intense in early than in severe plumbism. OLIVER believes that some workers may exhibit a greater tendency to basophilia than others.

SELLERS expressed the view that blood tests were of most value in the prophylaxis of lead poisoning (rather than in diagnosis) and while unwilling to lay down an exact figure regarded 500 stippled cells per million as representing a danger signal between lead absorption and lead poisoning. In his group of ship-

breakers/

shipbreakers above referred to, 23% had more than 500 basophils per million. LANE considers small granule counts up to 3,000 of little or no significance in a lead worker: they merely indicate exposure to lead. He agrees with SELLERS on the value of average counts of groups of workers as indicating the degree of risk, and states that these averages are of more significance than individual counts, although the latter are useful in indicating new starters who are particularly susceptible to lead.

The following Table shows the exposure risks for the various months. These risks have been defined in the introductory pages:-

	A.	B.	C.
May	46	44	0
June	31	57	0
July	30	33	36
Aug.	22	34	42
Sept.	15	38	47

There has been a diminishing average risk throughout from May to September.

The figures in Table I demonstrate that, generally speaking, the height of the counts from month to month was remarkably constant despite the diminishing/

diminishing risk. In May for instance there were 76% falling under 10,000 per million, in June 77%, in July 76% and in September 78%. In August there was a notable fall to 55% though the risk then was less than in July, the more so since the August readings were taken within a few days of the workers' return after a holiday of at least ten days' duration.

The occurrence of the annual holiday in August provided material for an interesting comparison not only between the August punctate readings as a group with these for July and September but also for a study of the effect of the vacation with reference to groups of men exposed to the several risks. Among men employed on risk"A"the average punctation before the holiday was 5,000 per million as compared with 9,000 after returning to work. With risk "B" the figures were respectively 8,000 and 13,000 per million while with risk "C" the averages were 11,000 and 13,000, the increase being relatively greatest in the case of the most severe exposure. The readings for men in group "C" must be interpreted in view of the fact that practically all of these men had been engaged on heavier risks during May and June and had on their transfer to group "C" shown a great increase in punctation at the July examination, recording then an increase which doubtless to some extent anticipated the rise shown after the holiday by the heavier exposure groups.

The majority of the August examinations were carried out five days after the men had returned to work, but approximately 25% were made on the first morning after resumption and it was found that, notably in the case of the higher exposure groups, the increase in punctation was greater than than among the men who had been back at work for five days.

Cases 90 - 100 are of special interest in so far as they represent a series of workers who were observed at approximately weekly intervals during a period while they were engaged on a heavy "A" risk. This risk occupied approximately four weeks and its commencement was followed in some cases by a sharp rise in punctation, rapidly falling away and giving place to a trough of low punctation which continued during the heavy exposure, persisting with the appearance of symptoms of plumbism, to be followed on removal from intensive risk by a phase of higher punctation.

This increased wave of punctation following removal from a heavier exposure to a lesser has been frequently observed in the course of the investigation. Thus, among men who changed from an "A" risk to a "B" risk the average punctation rose from 5,000 per million before the change to 10,000 at the succeeding monthly examination: with a change from a "B" risk to a "C" risk the/

the average rise was from 6,000 to 12,000, and with a change from an "A" risk to a "C" risk from 5,000 to 12,000. It has to be borne in mind that these figures apply only to the monthly reading following the change and are not to be taken as inferring that over a long period punctation in the presence of a heavy risk is less than when the risk is smaller.

Table II shows the influence of duration of participation in the industry on the count of punctate basophilia:-

TABLE II

Duration of Exposure.	Punctate Basophils, thousands per million Erythrocytes.							
	-2·5	2·5-	5-	-10	10-	20-	30-	Total.
Under 3 mos.	5	9	12	26	3	2	0	31
3 mos. -	6	15	31	52	7	5	2	66
6 mos. -	7	18	31	56	19	6	1	81
9 mos. -	2	7	21	30	13	1	1	45
1 year -	16	30	41	87	18	4	2	111
5 years-	6	32	33	71	22	5	3	101
10 years -	5	9	8	22	7	4	5	38

There/

There is little difference between the height of the count reached in the several groups, though there is a tendency for workers in their first six months to have counts lower than these with longer exposures. Very high counts are obtained most frequently among workmen of longest standing, though even in the highest group 58% of the readings fall under 10,000 per million.

The presence of punctate basophilia may be noted in the blood of new starters in this industry very soon after commencement of work. Indeed, a count of 14,000 per million has been recorded on the second day of employment though this is exceptional. Counts in the region of 4,000 or 5,000 are, however, common within the first few days of starting work.

Table III sets out the incidence of symptoms among the men examined in relation to the height of punctate basophilia recorded at the examination at which the symptoms were noted:

TABLE/

TABLE III

Punctate Count.	Number Examined	Number Showing Symptoms				Blue Line.
		Headache	Consti-pation.	Abdominal Pain	Anorexia	
- 2,500	50	7	8	7	5	10
2,500 -	113	21	31	22	17	37
5,000 -	173	23	38	32	25	54
- 10,000	336	51	77	61	47	101
10,000 -	90	16	15	23	14	25
20,000 -	27	7	6	5	3	9
30,000 -	15	2	5	4	4	1

These results are summarised on a percentage basis in Table IV:-

TABLE IV

Punctate Count	Percentage showing				
	Headache	Consti-pation.	Abdominal Pain	Anorexia	Blue Line
- 10,000	15	23	18	14	36
10,000 -	18	17	26	16	28
20,000 -	21	26	21	17	24

The incidence of symptoms tends to be slightly higher with increased punctation, though this is neither constant nor striking in degree. The number of workers showing a blue

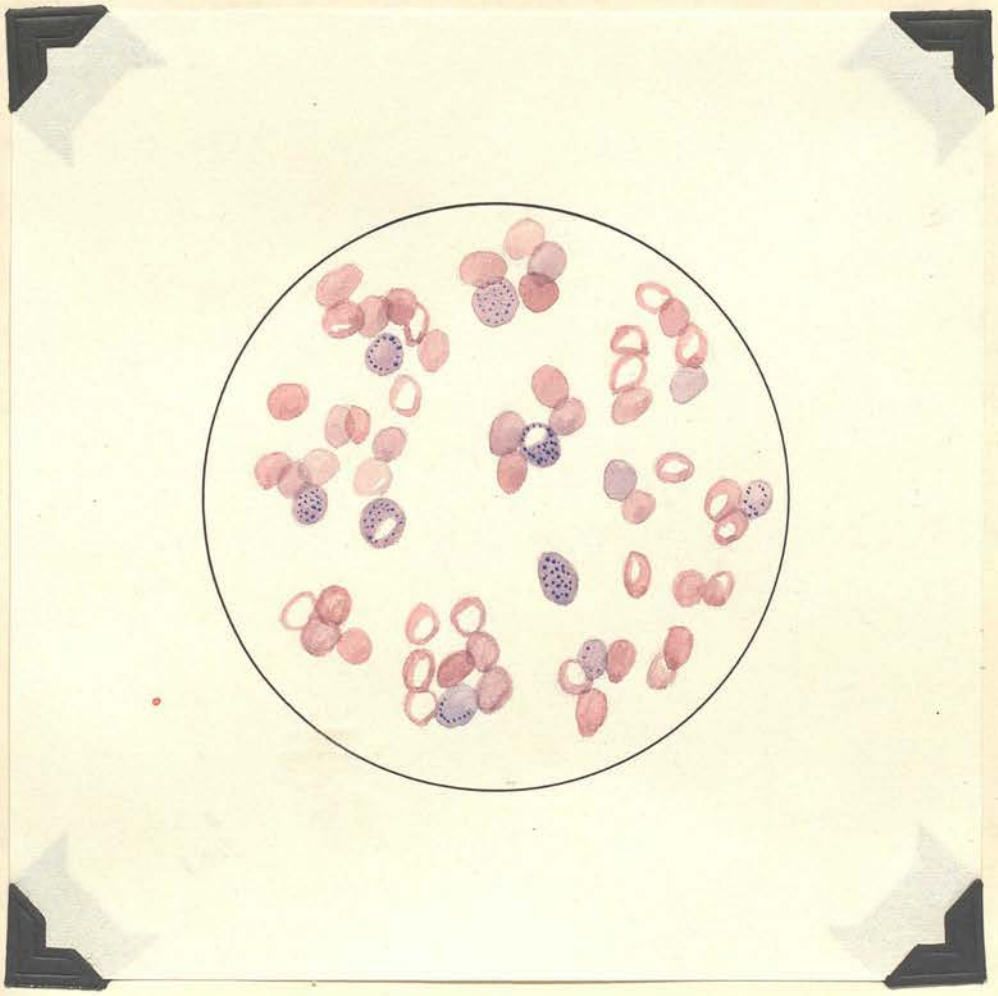
Burtonian/

Burtonian line on the gums bears no significant relation to the height of punctation.

Even in the absence of variation in the risk involved, and in the continued absence of symptoms the burner may show considerable variation in his punctate count from month to month.

Type of Punctation:

Punctate basophilia has been described in the case records as being fine or coarse, according to the size of the granules. The majority of the fine granules were just visible by the oil immersion lens and might easily be missed. Coarse granules were up to about 1 μ in diameter. There were many granules of intermediate size, and it was sometimes difficult to draw the dividing line between fine and coarse as regards an individual cell, but there was little difficulty in classifying the slide into the type which predominated - F, Fc, FC, Cf, C. Fine punctation is classically described as innumerable fine granules scattered uniformly throughout the cell. While this appearance was frequently met with, a smaller number of fine granules was more commonly seen, either situated eccentrically in a group or forming an incomplete chain round the periphery. Where the fine granules were few they/



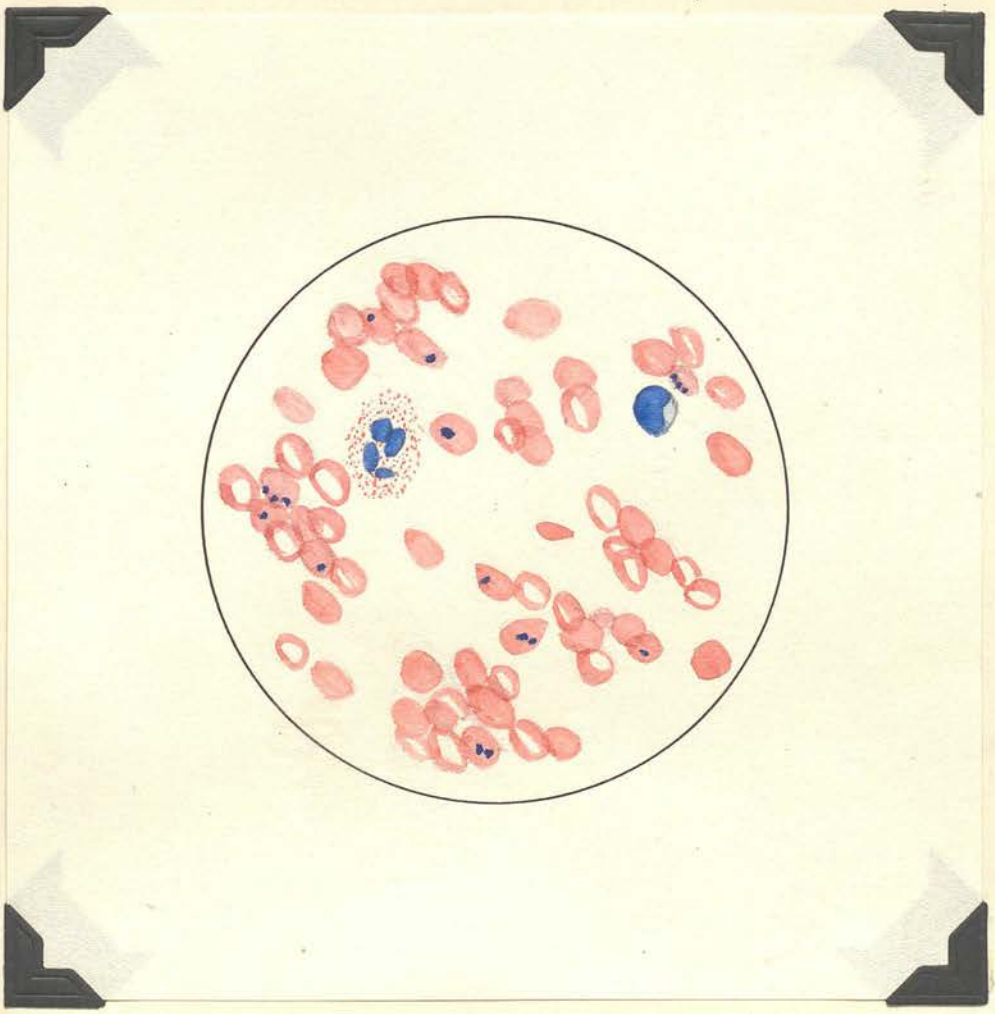
Typical Fine Punctation with Polychromasia.

they were almost always marginally placed, although a few fine granules scattered irregularly through the cell were also seen, but infrequently. Sometimes the granules appeared to be adherent to the exterior of a shrunken-looking cell. Cells containing many fine granules scattered throughout almost invariably were polychromasic, frequently highly so. Coarse punctation consisted of one to four larger granules situated anywhere in the cell, although they too had a slight preference for the marginal position. Coarse and fine punctation frequently occurred in the same slide, but never in the same cell. The granules in any given cell were always of uniform size.

Fine punctation was that most commonly seen. It was the predominating type present in 80% of the films, while in fully half of these it was present alone. Fine and coarse were present in approximately equal numbers in 15%, while in the remaining 5% coarse predominated, but its presence alone was of very infrequent occurrence.

Basophilic cells are seldom scattered uniformly throughout the field. They tend to be segregated in certain areas, leaving others almost clear, so that where the count was high a few fields might be seen where nearly every cell was punctate.

Table/



Typical Coarse Punctation.

Table V shows the distribution of the different types of punctation encountered in the examination of workers exposed to the several risks:

TABLE V.

Risk	Type of Punctation Present (%)				
	F.	Fc.	FC.	Cf.	C.
A.	33	41	20	5	1
B.	50	37	10	3	0
C.	41	39	17	3	0

The value of this Table is to some extent marred by the frequent changes of risk which the men have undergone, but it seems fairly obvious that, while there is rather more punctation of coarser type among men in group "A", no reliable inference as to risk can be drawn from the type of punctation present in the blood film.

Table VI deals with type of punctation in relation to duration of participation in the industry:-

TABLE VI.

Duration of Employment	Type of Punctation Present				
	F.	Fc.	FC.	Cf.	C.
Under 3 mos.	18	8	5	1	0
3 mos. -	29	24	9	2	0
6 mos. -	37	27	12	6	0
9 mos. -	14	24	6	1	0
1 year -	46	44	19	1	0
5 years-	46	39	13	5	0
10 years-	9	18	7	2	2

Punctation is finer among workmen of least exposure, though the differences between the groups are so small as to be of little practical importance. Very high punctate counts are usually predominantly fine in character, especially where the wave of punctation is of rapid development, as following a holiday or a change from a heavy exposure to one of less degree. On the other hand, cases where workers are heavily leaded and symptoms common (especially when associated with low punctation) tend to have the granules of coarser type.

POLYCHROMASIA.

Polychromasia/

POLYCHROMASIA.

Polychromasia is always present in the immature red cells of normal bone marrow and occasionally in the peripheral blood, where its presence becomes more prominent in all anaemic conditions associated with active red cell production. According to BROOKFIELD it is a constant accompaniment of punctate basophilia.

Fully two-thirds of the films examined have been described as showing polychromasia in greater or less degree. The remainder were not entirely devoid of polychromasic cells and in assessing polychromasia for record purposes the general appearance of the film has been the criterion mainly adopted. It might perhaps have been more strictly accurate to substitute "Polychromasia +, ++ and +++" for the "-, slight and +" which have been used. About 60% of all the slides examined were highly polychromasic.

Polychromasia increases with exposure until the burner has been employed at the work for about a year. Thereafter its incidence tends to diminish slightly, but among men of upwards of five years standing there is a return to the early high incidence of polychromasia.

The degree of polychromasia is intimately related to the height of punctation. Table VII demonstrates this relationship:-

TABLE VII.

Poly-chromasia	%age of films showing Punctate Basophils in thousands per million red cells.					
	-2·5	2·5-	5-	10-	20-	30-
+	5	19	43	21	8	4
Slight	9	37	26	23	3	2
-	30	34	24	10	2	0

The least polychromasic slides are those of lowest punctation.

In general, the type of punctate basophilia present bears no significant relationship to the degree of polychromasia, though it has frequently been observed during the research that the individual cells most closely peppered with fine punctation showed the highest degree of polychromasia.

RETICULOCYTES:

The study of the reticulated cells is recommended by KEY as a reliable indicator of the presence of young cells in the circulating blood.

Some/

Some authorities, notably MACCORD and his co-workers and JONES have advocated the use of the reticulocyte count as an index of lead absorption as a substitute for the usual count of punctate basophilia.

Until recently this method had the disadvantage mentioned earlier of requiring the use of a specially highly treated slide, not always readily available for field work. Vital staining methods have, however, been applied to films from a series of burners subject to a specially heavy lead risk, and it has been found that there is a close correlation between the number of reticulocytes and the height of the count of punctate basophilia -

	August			September	
	12th	17th	25th	5th	14th
Reticulocytes (%)	3·8	2·8	1·6	1·5	2·3
Punctate Basophils (per 1000 red cells)	12·4	8·5	3·8	4·2	8·6

These figures indicate the means of the readings on the dates in question. The films on 12th August were taken immediately after transfer to the intensive lead risk, work on which ceased on 6th September, i.e., the day after the fourth series of films. The reticulocyte curve showed a fall with the increase of risk and a rise on cessation of the very heavy lead exposure.

These findings are in accordance with those of BROOKFIELD who demonstrated in a series of cases being treated intravenously with lead that there was an intimate relationship between the reticulocyte, the stippled cells and the degree of polychromasia, and concluded that they were all different morphological expressions of the same substance.

NUCLEATED RED CELLS:

Fifty-six per cent of the films examined showed the presence of nucleated red cells, in the search for which roughly 80,000 red cells were examined in each film. Nucleated reds were found in at least one film from every case: 99% of them were of normoblastic type, the remainder of them being megaloblasts.

Table VIII shows the indidence of nucleated red cells in relation to the height of the punctate basophil count.

TABLE VIII.

Punctate Basophils per 1000000 red cells.	Nucleated Red Cells.			
	0	1-5	6-10	10 +
Under 2,500	30 (58%)	21	1	0
2,500 - 5,000	55 (47%)	60	2	0
Under 5,000	85 (50%)	81	3	0
5,000 - 10,000	67 (39%)	88	16	3
10,000 - 15,000	28 (44%)	31	4	1
15,000 - 20,000	13 (52%)	10	1	1
20,000 +	17 (41%)	24	1	0

Nucleated/

Nucleated red cells are seen most frequently in association with punctate counts in the region of from 5,000 to 10,000 per million. Counts between 10,000 and 20,000 are apt to show fewer nucleated cells, while in the group of very high counts (over 20,000) normoblasts are again more frequent. Punctate basophilia was found four times as frequently in nucleated red cells as in all erythrocytes, and nucleated cells were slightly more frequent among slides showing marked polychromasia.

The occurrence of nucleated red cells bears no relation to duration of employment in the industry: they have been found as early as two days after the commencement of employment. BLAIR BELL, WILLIAMS and CUNNINGHAM have repeatedly observed nucleated red cells on the fifth day following the intravenous injection of lead.

IRREGULARITY OF SIZE AND SHAPE OF RED CELLS:

Irregularity of size and shape of red cells was found in 15% of films examined. The irregularity generally affected size rather than shape, and cells of small size constituted the most common form of irregularity. Irregularity, when present, was nearly always associated with the presence of symptoms, or with a history of previous lead poisoning, or both: but/

but by no means all cases presenting symptoms or a history of previous lead poisoning showed irregularity in the film.

CHANGES IN WHITE BLOOD CELLS.

In striking contrast to the mass of literature on the subject of red cell changes in lead absorption is the almost complete absence of reference to the white blood cells. Such changes as have been noted in the literature have been either negative in character or so inconstant in occurrence as to be of little or no practical value. Several writers (e.g. MEYER) have pointed out that among workmen exposed to lead - as in the presence of many other toxic agents - there is apt to be a relative lymphocytosis. BIONDI regarded eosinophilia and mononucleosis as of only slight relative importance in relation to plumbism. BROOKFIELD noted a "tendency for the large mononuclears to show an increase from the normal 2% to about 5% of the total leucocyte count", and regarded this as being due to a stimulation of reticulo-endothelial system; but he concluded that otherwise the findings as regards the leucocytes were quite negative. BLAIR BELL, WILLIAMS and CUNNINGHAM found occasional evidence of relative lymphocytosis in patients treated by lead injections, and, fairly commonly, a slight increase/

increase in eosinophils, together with what they termed an increase of "streaky forms", but they summed the matter up by saying that "there is nothing specific or definite in regard to changes seen in white cells, as there is in the red cells".

NEUTROPHIL POLYMORPHS:

The distribution of the proportion of neutrophil polymorphs found at the routine monthly differential counts of white cells is shown in Table IX.

TABLE IX.

%age of Differential Count.	Cases	%age of Differential Count.	Cases	%age of Differential Count.	Cases
20/25	1	45/50	44	70/75	41
25/30	1	50/55	71	75/80	11
30/35	9	55/60	91	80/85	4
35/40	17	60/65	97		
40/45	25	65/70	63		

There is lacking from the literature a standard distribution curve for normal subjects with which to compare this range, and haematologists differ widely in their definition of normal limits. EHRLICH's figure of 70 to 72 as the normal neutrophil percentage is generally regarded/

regarded as too high. A mass of opinion (MEDLAR, STITT, OATWAY, and the recently published work of PRICE JONES) places the normal range at above 55 to 65 per cent, which is lower than GOODALL and GULLAND's 60% to 75% while still more recently FRIMODT-MÖLLER and BARTON give 45% to 55% as the normal range and quote VON BONSDORFF's figure of 46%. It is, therefore, difficult to draw any reliable conclusion from the polymorph distribution curve recorded in Table IX: probably it may be regarded as falling a little lower than normal, but, in any case it has not been found that the neight of the polymorph percentage has, per se, any great significance.

Arneth counts were made on films from a few representative types of cases at each of the routine monthly examinations, and the results are summarised in Table X.

TABLE/

TABLE X. Mean Arneth Counts of Workers showing varying degrees of exposure to lead.

Case No.	Duration of Employment at 1st examn.	Prev.hist. of lead poisoning.	Risk at consecutive Monthly Examination.	Mean Arneth Counts.					Condition during investigation.
				I	II	III	IV	V	
34	New starter	No	AABBB	2.2	25.3	51.5	18.2	2.8	No symptoms
35	New starter	No	AACCC	1.4	21.6	49.8	25.2	2.0	-do-
99	3 months	No	BBBBA	0.6	16.0	41.8	34.8	6.8	Symptoms
23	3 months	Yes	AACCB	0.8	13.6	45.0	32.2	8.4	-do-
64	4 months	No	BBAAC	1.4	17.6	43.4	33.2	4.4	No symptoms
11	8 months	No	BBCCC	1.6	22.8	46.2	25.4	3.8	-do-
10	8 months	Yes	BBCCB	0.6	13.8	45.6	31.6	9.2	Symptoms
53	9 months	yes	BAABB	0.2	14.2	41.2	38.2	6.2	-do-
18	2 years	No	BACCC	0.6	15.4	47.2	30.4	6.4	No symptoms
32	3½ years	No	ABAAB	0.6	9.8	37.8	40.4	11.4	-do-
79	7 years	yes	ABBBB	0.6	8.6	40.0	37.4	13.4	Symptoms
52	10 years	yes	AACCC	0.2	5.2	29.4	47.2	18.0	-do-

The most striking feature of these results is the general shift to the right which they display: this is specially marked among workers with long exposure to lead. The Arneth Count showed little variation from month to month especially among the workers of older standing and the shift to the right was noted at an early stage after the commencement of work in the industry as is evidenced by the following extract from the early record of Case No. 34, a new starter.

Month.	Risk.	Arneth Count				
		I	II	III	IV	V
May.	A.	5	32	52	9	2
June.	A.	2	27	46	23	2
July.	B.	2	21	44	29	4

EOSINOPHILS:

Table XI sets out the distribution of the proportion of eosinophils found at the routine monthly differential counts:-

TABLE XI.

%age of Differential Count.	Cases	%age of Differential Count.	Cases	%age of Differential Count.	Cases
0 -	165	3 -	31	6 -	7
1 -	158	4 -	8	7 -	2
2 -	94	5 -	8	8 -	1

These figures indicate that there is no high prevalence of eosinophilia among workers examined and a study of the individual case sheets shows that eosinophilia, when it does occur, is of no prognostic significance.

BASOPHILS:

The proportions of basophil leucocytes found on differential count are summarised in Table XII:

TABLE XII.

%age of Differential Count.	Cases	%age of Differential Count.	Cases.
0 -	420	2 -	2
1 -	51	3 -	1

These figures, like the eosinophil readings fall within normal limits and are of no special significance.

LYMPHOCYTES and MONOCYTES:

In the differential counts given in the case records lymphocytes are classified into large and small. Many cells of intermediate type were present, but lymphocytes were not described as large unless attaining to at least the size of a polymorph: frequently they were twice or thrice this size. The term "large lymphocyte"/

"large lymphocyte" has been used to cover a certain range of cell type the characteristic cell being typically lymphocytic, with a large deeply basophilic nucleus which often practically filled the cell. Other cells, again, had abundant clear protoplasm and strongly resembled hyaline cells. These had a soft oedematous appearance. They were frequently indented by red cells lying in apposition to them and often showed short pseudopodia. Generally the protoplasm was structureless but occasionally it contained azure granules. The nucleus might be centrally or eccentrically situated, and might be indented on one or both sides, sometimes with production of a butterfly-like appearance suggesting that the cell was in process of amitotic division. In a few cells the nucleus was of still more complex shape.

The nucleus was always deeply stained and often presented a reticulate structure: occasionally a nucleolus was seen. In a few films there were seen cells of loosely granular appearance without visible nucleus, and numbers of broken cells. Most of these were still recognisable but some were so degenerate as to beggar classification.

That the cells showing most increase were of lymphocytic origin was borne out by the presence of similar/

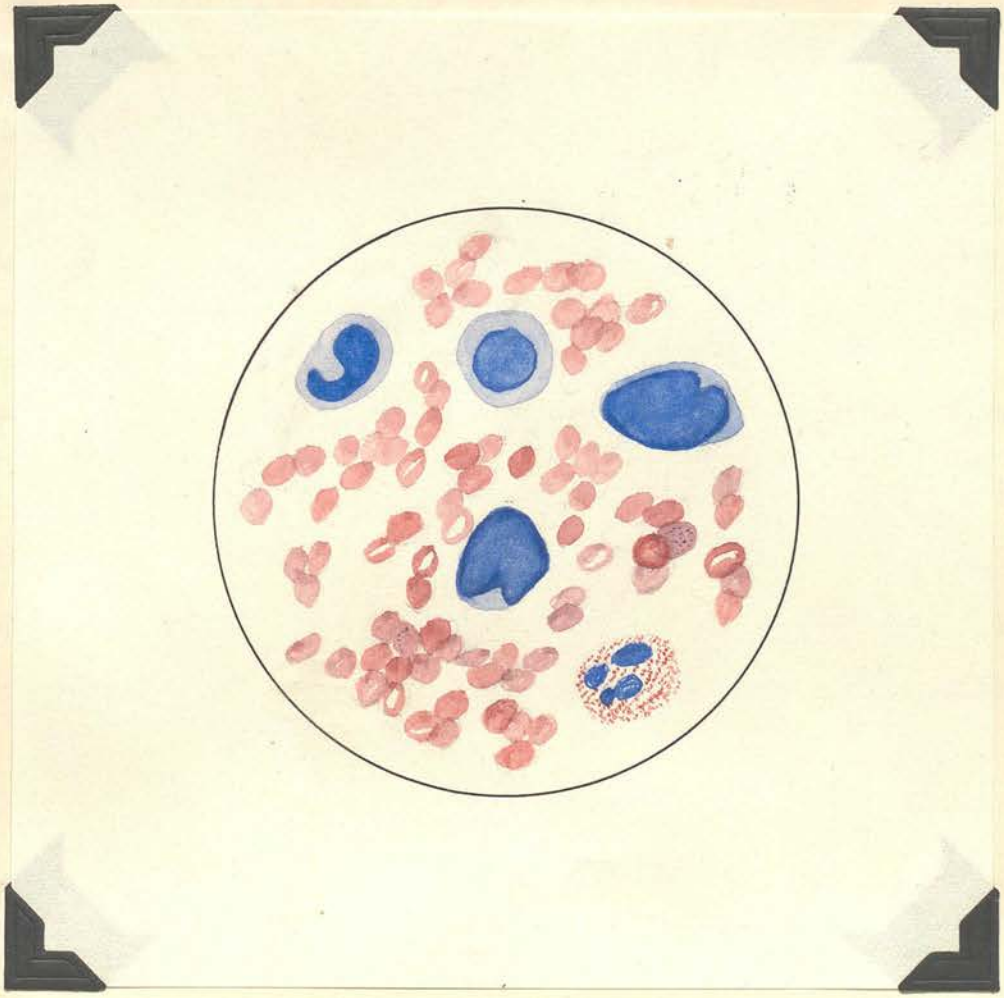
similar cells of all degrees of size from the normal small lymphocyte upwards. In a film from a worker of only three days' exposure, where a count of 24% small lymphocytes was recorded more than half of these were larger than usual and the protoplasm more abundant. In a film from the same worker after 11 days' exposure only about 8% of the 17·5% of small lymphocytes present could be described as of the usual size. By this time, too, enlargement of the lymphocytic nucleus had become a character of the film as distinct from a mere increase in amount of protoplasm, and in films from workers of longer standing typically small lymphocytes were seldom seen so long as the worker remained well.

As "Monocytes" have been classified in addition to cells of typical character, others of streaky appearance with complex nuclei somewhat resembling polymorphs but much larger in size and without definite granules. These are probably the same cells as were observed by MINOT to be increased in poisoning by tetrachlorethane. Monocytes were found to account for less than 5% of all white cells in 81·3% of films examined: 17·1% of films fall between 5% and 10% while the remaining 1·6% gave monocyte readings between 10% and 15%.

It is possible that in the case records the number of large lymphocytes has been slightly overstated and that of monocytes correspondingly understated, but it is felt that this is of little practical importance, since the purpose of the investigation is an endeavour to find a method suitable for application by the works doctor and precise differentiation between large lymphocytes and monocytes of the type described is admittedly a matter of great difficulty even for the expert haematologist. To overcome this difficulty it has been considered advisable, in discussing the practical application of the differential count, to slump together the two types of cell and the combined figure, under the name large mononuclear lymphoid cells, is made the basis for the discussion which follows.

Table XIII sets out the proportion of the large mononuclear lymphoid cells in the differential count at the routine monthly examinations.

TABLE/



Typical Large Mononuclear Lymphoid Cells.

TABLE XIII.

Month.	Large Mononuclear Lymphoid Cells. %age Differential Count.											
	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-
May.	5	10	16	22	19	12	4	2	0	0	0	0
June.	4	8	12	24	21	12	6	0	0	1	0	0
July.	1	7	14	18	18	23	13	3	1	1	0	0
Aug.	2	3	5	12	23	10	17	7	7	7	3	2
Sept.	0	1	8	5	17	20	18	16	4	7	1	2
	12	29	55	81	98	77	58	28	12	16	4	4

When this table is considered in conjunction with the falling risk from month to month it is apparent that there is an increase in these large cells corresponding fairly closely with the decline in risk.

TABLE XIV.

Relationship between Risk and Proportion of Large Mononuclear Lymphoid Cells at Routine Monthly Examinations.

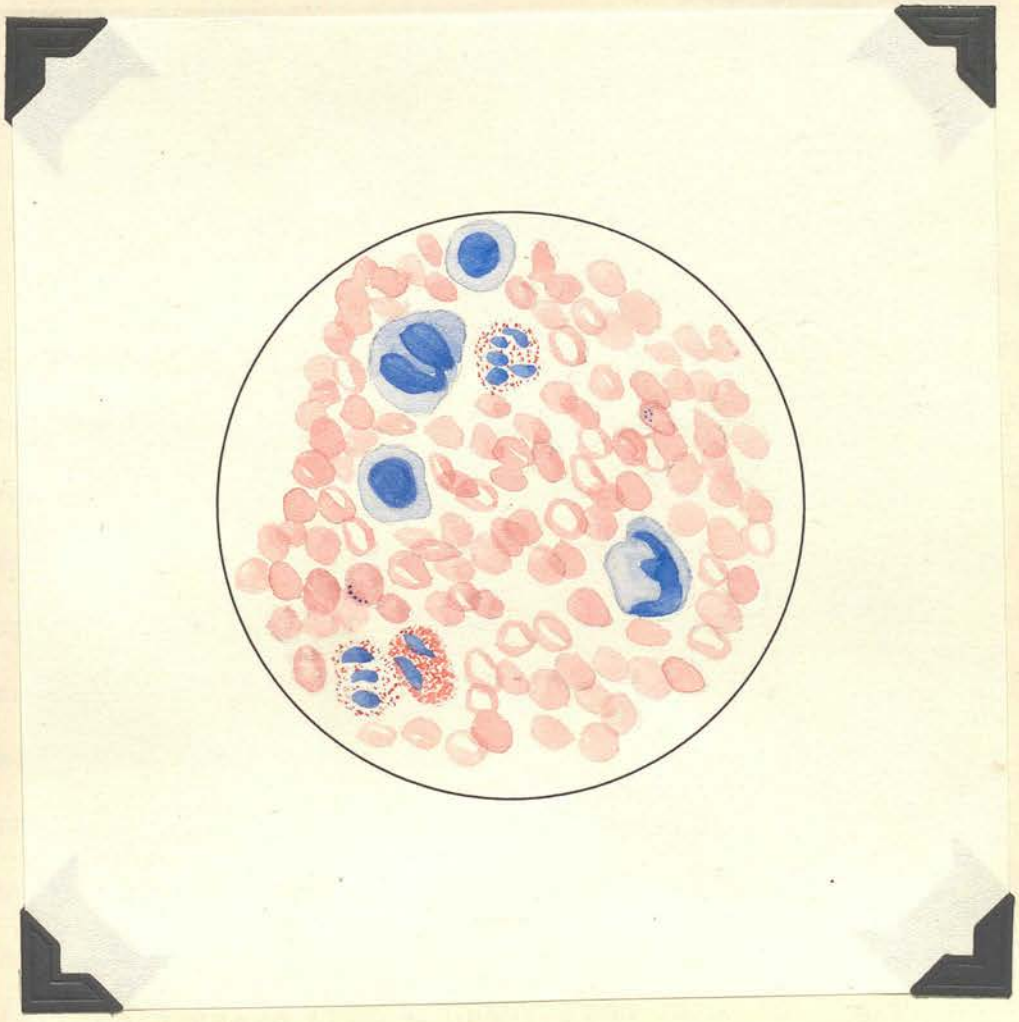
Month	Risk			%age of Large Mononuclear Lymphoid Cells.		
	A.	B.	C.	5-	25-	45-
May.	46	44	0	53	37	0
June.	31	57	0	48	39	1
July.	30	33	36	40	51	2
Aug.	22	34	42	22	57	19
Sept.	15	38	47	14	71	14

It is found that the height of the large cell figure is related to the incidence of symptoms; and this relationship is much closer than that prevailing in the case of punctate basophilia. Table XV shows the number of cases examined, grouped according to large cell count, with the number of workers in each group showing symptoms or the presence of a Burtonian blue line on the gums.

TABLE XV.

%age of Large Mononuclear Lymphoid Cells	Number Examined	Number with				
		Head-ache.	Consti-pation.	Abdominal Pain.	Anor-exia.	Blue Line.
5-	41	13	16	11	7	11
15-	136	30	34	38	29	45
25-	175	18	34	23	18	39
35-	86	14	16	9	10	24
45-	28	1	2	1	0	8
55-	8	1	1	0	1	3

The relationship is brought out more clearly in the sub-joined Table, where the number of groups has been reduced and the incidence of symptoms shown as a percentage of the workers in each group:-/



Typical Large Mononuclear Lymphoid Cells.

Large Mononuclear Lymphoid Cells	%age of workers with				
	Head-ache.	Consti-pation.	Abdominal Pain.	Anor-exia.	Blue Line.
5-	24	28	28	20	32
25-	12	19	12	11	24
45-	6	8	3	3	31

With the notable correlation in respect of symptoms there is an absence of any relationship between the large cell count and the presence of blue line on the gums.

The relative increase in the proportion of large cells begins to appear very soon after commencing work in the industry, and while the element of individual variation plays some part, the average reading generally shows the total of monocytes and large lymphocytes to be approximately equal to the small lymphocytes before the end of the first week, while by the end of the second week the large cells usually out-number the small in a ratio of fully 2 to 1. This ratio is subsequently maintained so long as the individual remains well: it is sometimes very much exceeded, notably where a reading follows passage from a heavy lead risk to one lighter. Many instances of this suggest themselves from a perusal of the case sheets, especially where the risk has changed from A to C, and again, in the readings taken during August, just after the annual holiday. This latter/

latter factor explains why the proportion of large cells appears to be even higher in August than in September though in the latter month fewer men were exposed to an "A" risk. The high upward swing of the large cell curve after such a diminution of risk generally follows closely upon the change of exposure which causes it, though in cases where the previous exposure to lead has been exceptionally severe and long-continued the sharp rise may be delayed for a few weeks. In the case of the post-holiday rise, return to a major risk was speedily followed by a drop in the proportion of large cells, though in the presence of a "C" risk the figure may remain high for some considerable time.

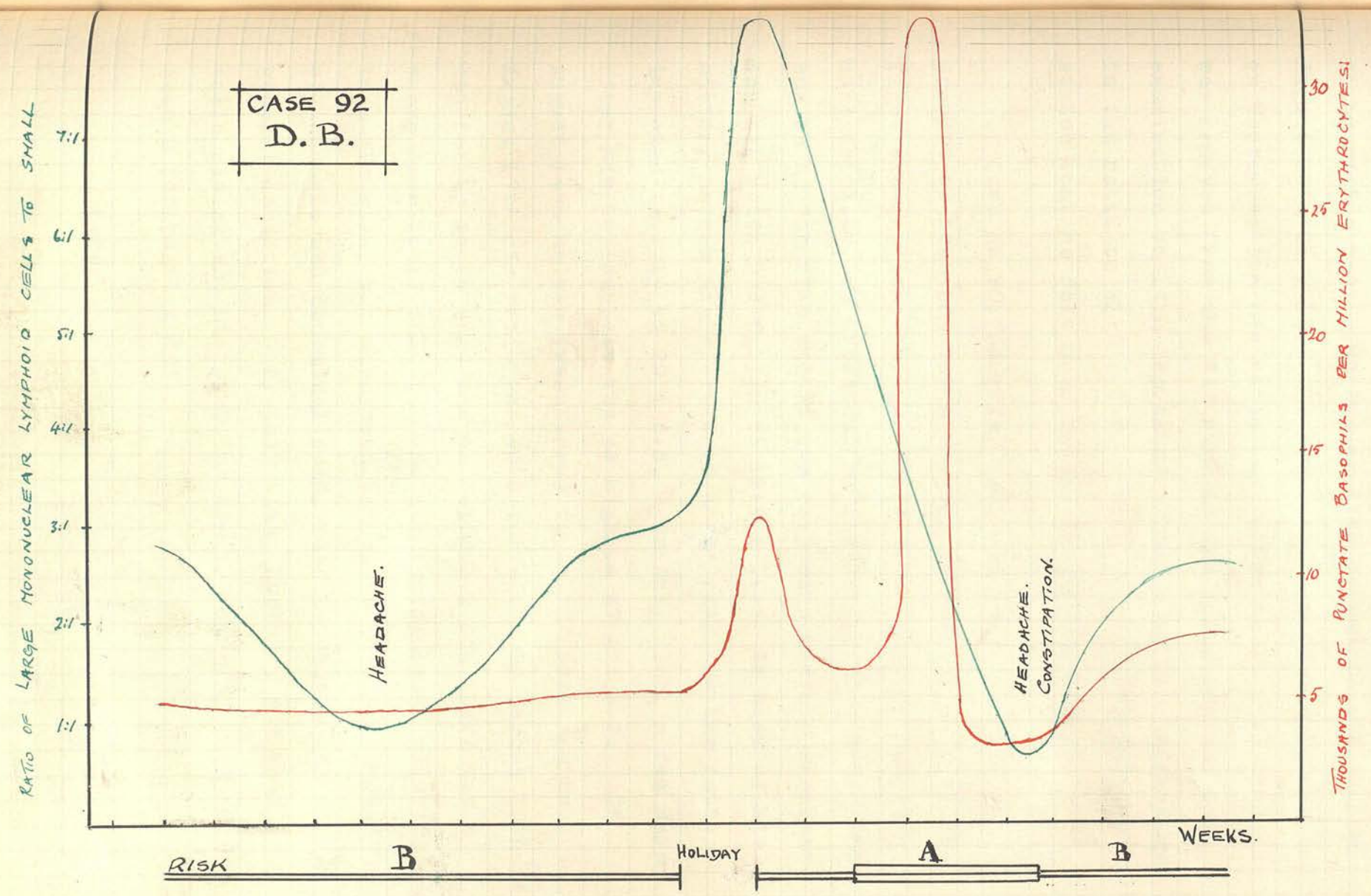
It has not been possible to ascertain how long the excess of large cells persists after cessation of exposure to lead: this probably depends on the extent to which the worker is "leaded." The proportion of large cells gradually falls away and after a month the small lymphocytes have been found to be as numerous as the large, even in the case of men who had been exposed to an "A" risk: with a "C" risk the fall may be more rapid.

Experience shows that for practical purposes the most useful guide to the workers' condition is the ratio/

ratio prevailing between the large mononuclear lymphoid cells and the small lymphocytes. A fall in this ratio while the man is at work is to be regarded as a grave warning of impending disaster and an indication for the immediate removal of the man from the risk.

Cases 90 to 100 are of special interest in the illustration of this point. These cases are drawn from a group of men who had been exposed to a very considerable risk before the commencement of this investigation: several of them had had previous attacks of lead poisoning. The group was further subjected to an intensive spell of "A" risk while under observation, and though some of the men bore the work well others showed the development of symptoms or of blood changes which gave evidence of impending trouble.

Such a case is No.92, Arnott, whose reading in May gave a ratio of large lymphocytes and monocytes to small lymphocytes of only 10·5 to 23·5 following a severe attack of lead poisoning a few weeks previously. He was then on a "B" risk, and by the following month the ratio had improved slightly to 12·5 to 19. In July the improvement was much more marked (30.5 to 8·5) and on July 31st, following his holiday, the ratio was 33 to 6·5. On August 11th he was transferred to an "A" risk and the following day his ratio was found to/


CASE 92
D. B.
RATIO OF LARGE MONONUCLEAR LYMPHOID CELLS TO SMALL
7:1
6:1
5:1
4:1
3:1
2:1
1:1
THOUSANDS OF PUNCTATE BASOPHILS PER MILLION ERYTHROCYTES.
30
25
20
15
10
5
HEADACHE.
HEADACHE.
CONSTIPATION.
WEEKS.
RISK
B
HOLIDAY
A
B

to be 33·5 : 5·5. On August 17th it was 28 : 4, and on August 25th 25 : 15. He remained free from symptoms, but on September 5th his ratio had fallen to 17 : 15·5. He was removed from the "A" risk on the following day and examination on 14th September showed a marked improvement in the ratio to 41·5 : 7·5. With this improvement he stated that he felt much better in general health.

Case No.90, Macklin, too, had been off work on account of lead poisoning shortly before the date of his first examination, though in his case recovery had been more complete, as evidenced by his ratio, 30 : 8·5. He was on an "A" risk and at the following monthly examination his ratio had fallen to 18·5 : 12. In view of his history he was transferred to a "B" risk and the ratio improved in July to 20 : 6·5. On July 31st, a few days after his holiday, it was as high as 47·5 : 6·5. On August 14th he was transferred to an "A" risk and on August 17th his ratio was 40.5 : 17·5. By August 25th it had fallen to 28 : 14 and on September 5th there was a sharp drop to 17 : 30·5. He was removed the following day to a "B" risk, but when seen on September 14th complained of headache and abdominal pain, with deterioration of his general condition. By this time, however, his ratio was again rising and his symptoms had disappeared when he was seen a fortnight later.

Case/

Case No. 91 had been engaged in the industry for four months when he was first examined, and had not suffered from lead poisoning. He had no symptoms, and his ratio was 32·5 : 11·5. He was on a "B" risk. In June he complained of headache and his ratio had fallen to 20 : 21. In July he was better though still continuing his "B" risk and his ratio had risen to 35·5 : 13·5. On July 31st, after his holiday, his ratio was 49 : 6, and on August 11th he was transferred to an "A" risk. The following day his ratio was 33·5 : 7, on August 17th it was 31 : 9. On August 25th it was rather lower at 19·5 : 8, and on September 5th he was found to be showing clinical deterioration. He complained of headache with constipation and his ratio had fallen to 10·5 : 16·5. The following day he was transferred to a "B" risk and on September 14th his symptoms had largely cleared up though he did not feel as well as he had done a month previously. His ratio was now 20·5 : 12 and on September 30th along with marked clinical improvement it had risen to 28 : 11.

When first seen case No. 98 had been employed as a burner for six months. He was on a "B" risk and gave no history of lead poisoning. He had no symptoms and his ratio was 28 : 7. In June he was off work on account of a foot injury, and when seen in July had a ratio/

ratio of 30 : 6. On July 31st he was free of symptoms and his ratio was 37 : 11·5. On August 11th he was transferred to an "A" risk, and the following day his ratio was found to be 26 : 7. On August 17th it was 32·5 : 5 and on August 25th 25 : 9. He was next examined on September 5th when he was still from symptoms but his ratio had fallen steeply to 15·5 : 28. He was transferred to a "B" risk the following day but three days later had to lie off work on account of headache and colic.

The case sheets afford numerous similar records amply establishing the value of the ratio in relation to clinical condition; it is now proposed to discuss briefly this and the other findings in relation to the prevention of plumbism among shipbreakers.

DISCUSSION.

Previous investigators have agreed that any help which examination of the blood can give in the control of lead poisoning is to be derived solely from the red cells. Changes in the white cells have been dismissed unanimously as trifling in amount, inconstant, unspecific and of no practical value. Regarding red cell changes there is no such unanimity. Almost all the authorities have looked to punctate basophilia as the source from which help was most likely to be derived, though a few have insisted on the importance of such factors as total red cells and haemoglobin estimations and irregularity in size or shape of the cells in the estimation of clinical condition.

The attitude to punctate basophilia has varied widely. Nearly all authorities are agreed that its presence in any considerable amount is to be regarded as suggestive of lead absorption though there is still dubiety about the height of punctate count which may be accepted among lead workers as without grave significance. LANE regards any figure under 3,000 punctate cells per million as being of little importance, though earlier observers considered

a/

a very much lower figure as the permissible limit. SELLARS and LANE are inclined to regard average height of punctation among large groups of workers as indicating the degree of lead risk to which they are exposed, and some physicians have advocated exclusion from industry of workers whose punctate basophil count reached high levels of varying degree, even in the absence of clinical symptoms. Recent work has rather tended to throw doubts on the acceptance of these views. GEHRMAN, discussing the prevention of lead poisoning in industry in 1933 advocates, inter alia, careful and frequent medical examination, each examination consisting of search for subjective and objective signs of lead absorption, including complete blood examination, with a careful search for stippled cells. He considers the presence of punctate basophilia to indicate lead absorption, but thinks that the height of the punctate count is in no way indicative of the degree of absorption. JONES (R) has recently (1933) pointed out that severe cases of plumbism of long duration with marked secondary anaemia may show very few basophilic cells till they are taken away from their exposure and effectual treatment results in a start being made towards recovery, and that/

that in fact the percentage of reticulocytes may be below normal while the illness is most severe (as may also be observed in cases of pernicious anaemia). BÖTTRICH in 1932 made the same statement regarding punctate basophilia in cases of plumbism of long standing, and DAVIDSON, investigating outbreaks of lead poisoning from the consumption of contaminated water, was unable to show any close parallelism between the incidence of punctate basophilia and the degree of contamination of the water, or the amount of lead excreted in the urine.

In considering the results of the present investigation it has to be borne in mind that the lead risk of the shipbreaker is much more acute than that generally met with in industry. It may be that the problem studied here is radically different from that in other fields, such as the pottery or electric accumulator industries and it may be that measures of medical control applicable to these industries are inapplicable to shipbreaking, and vice versa. Here, for instance, it has been found that every film examined showed the presence of punctate basophilia, and if this has no quantitative significance obviously any examination for/

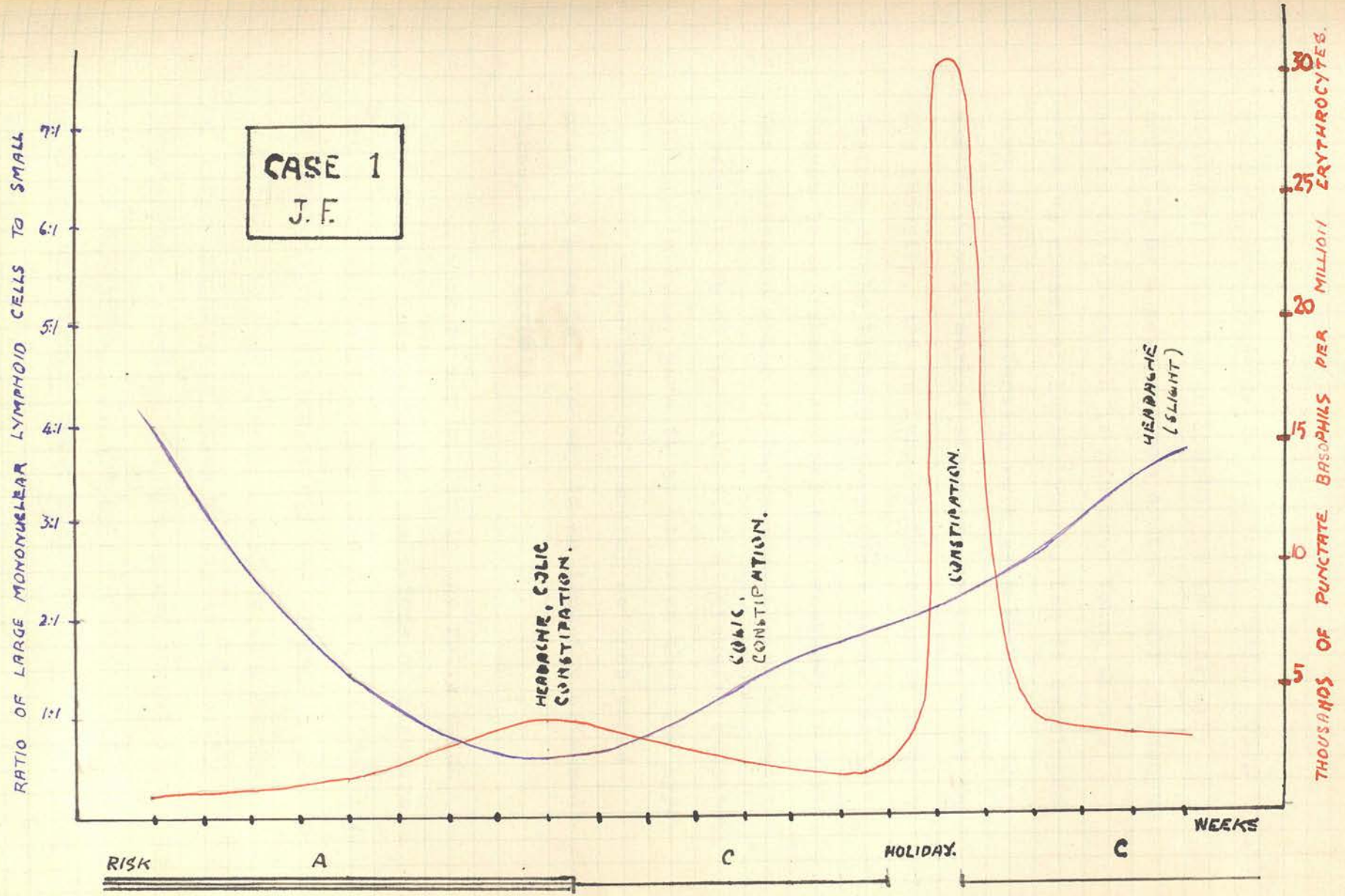
for punctation is of little or no value in the industry. It has now been found that in shipbreaking the height of the punctate count is not necessarily related to the development of clinical symptoms of plumbism. It is not uncommon to find a fall in punctation along with the development of clinical symptoms, while recovery from an attack of lead poisoning is frequently associated with a high wave of punctation. Nor does punctation increase with an increase in risk, for many instances have been noticed of a great increase in punctation following a holiday or transfer from a heavy risk to a lighter. At the same time, there has been observed in some cases a more transitory rise in punctation for the few days immediately following transfer from a lesser risk to a greater this being followed by a sharp fall in the continued/presence of the heavy risk. In this connection it is of interest to recall the words of RUSSELL in 1915: "I have often looked, but without success, for a case to illustrate/the theory that the marrow reacts actively to small doses of lead and throws out punctate red blood cells, but if the dose is increased above a certain quantity it becomes paralysed and the basophil cells disappear from circulation. This is known to happen in chronic experimental lead poisoning, as was shown by NAEGELI and/

and LUTOSLAWSKI, and with other poisons SCHMIDT got similar results".

It has been pointed out that the type of punctation present offers little assistance, while polychromasia and reticulocyte counts have been found to correspond fairly closely with the counts of punctate basophilia. Nucleated red cells have been seen in association with widely varying clinical conditions, while irregularity of size and shape has been noted particularly following a breakdown in health. It appears to be a late manifestation, possibly of some value in assessing compensation claims but little or no help from the viewpoint of prevention, with which this investigation is primarily concerned.

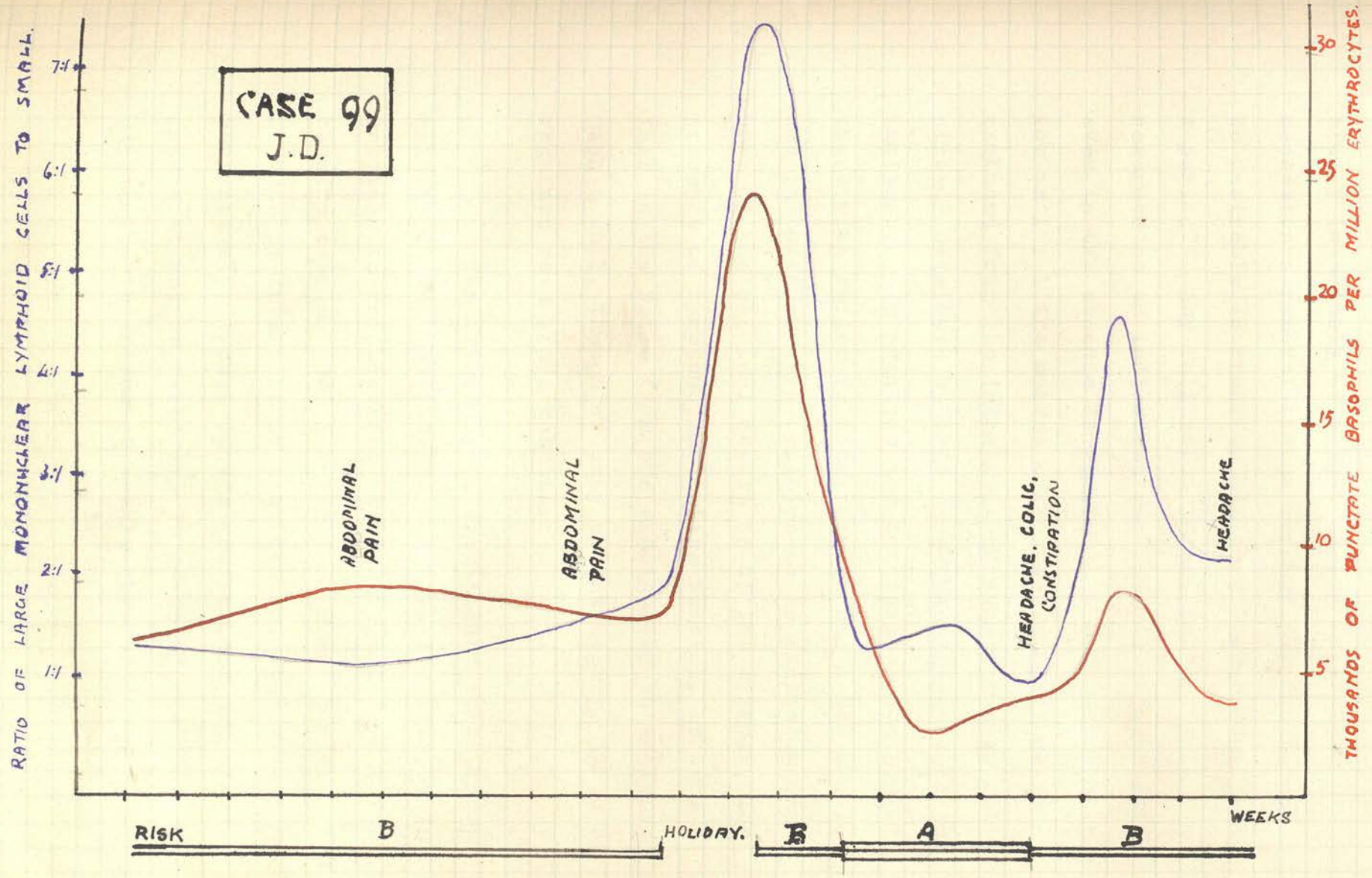
In considering the white blood cells, a study of the granulocytes has been found to yield little of practical importance. There is no significant eosinophilia and the shift to the right which has been observed in the Arneth Counts occurs early and in workers still comparatively well, though it attains its most striking degree among heavily-leaded burners of long standing.

Much more help has been derived from a


CASE 1
J. F.
RATIO OF LARGE MONONUCLEAR LYMPHOID CELLS TO SMALL
7:1
6:1
5:1
4:1
3:1
2:1
1:1
THOUSANDS OF PUNCTATE BASOPHILS PER MILLION ERYTHROCYTES.
30
25
20
15
10
5
HEADACHE, COLIC CONSTIPATION.
COLIC, CONSTIPATION.
CONSTIPATION.
HEADACHE (SLIGHT)
WEEKS
RISK
A
C
HOLIDAY.
C

study of the lymphocytic picture. PRICE JONES (1933) states that the large lymphocyte is generally accepted as a younger form of the small lymphocyte, and in this research it has been found that a relative excess of large lymphocytes is developed very soon after starting work as a burner. This excess is well marked after two or three weeks in the industry, and so long as it continues to be a feature of the blood picture there seems little reason to apprehend any serious breakdown in health. The increased ratio of large lymphocytes to small appears to be of the nature of a defensive reaction. BIONDI, in 1922, gave it as his view that the hypothesis of a mechanism of humoral defence would probably have to give way to an immunity obtained through histogenesis.

Workers may differ in the ratio which they display under similar conditions of exposure, and it is difficult to lay down a hard and fast line of demarcation between safety and danger. It has been found in this research that so long as the ratio of large lymphocytes (plus monocytes) to small lymphocytes exceeds 2 : 1 the worker is not likely to develop symptoms. In the rare instances where symptoms are present under such conditions they are almost/


CASE 99
J.D.
RATIO OF LARGE MONONUCLEAR LYMPHOID CELLS TO SMALL.
7:1
6:1
5:1
4:1
3:1
2:1
1:1
THOUSANDS OF PUNCTATE BASOPHILS PER MILLION ERYTHROCYTES.
30
25
20
15
10
5
ABDOMINAL PAIN
ABDOMINAL PAIN
HEADACHE, COLIC, CONSTIPATION
HEADACHE
WEEKS
RISK
B
HOLIDAY.
B
A
B

almost invariably of slight degree and seldom necessitate removal of the workman, though it may be desirable to transfer him to a lesser risk for a period. Any fall below this level is to be regarded as an indication for intensive supervision even in the absence of symptoms. With a ratio as low as 1 : 1 the worker ought certainly to be excluded from the industry: if symptoms have not already developed by that time their appearance is imminent. In practice the difficult cases are these with ratios falling between 2 : 1 and 1 : 1, and in these cases a decision as to exclusion may turn on the clinical condition of the workman, the presence of symptoms indicating removal, or on a fall in the ratio from one examination to another. Such a fall, though of only slight degree, is to be regarded as a grave warning.

The frequency of examination will depend chiefly on the severity of the risk involved. In relation to shipbreaking, it is suggested that the routine examinations for risks A, B and C might well be made at intervals of one, two and four weeks respectively, though in the case of the two minor groups it may be necessary in cases of special difficulty to introduce weekly observations.

A/

A study of the ratio may be of service in indicating when a convalescent workman is fit to return to work, often a thorny problem. Such a man should not be allowed to resume till his symptoms have gone and his ratio has risen to at least 2 : 1.

Routine blood examinations cannot replace careful clinical supervision, but they can provide the physician with an instrument capable of anticipating clinical collapse. The determination of the ratio between large lymphocytes and small, now advanced as a preventive measure, does not imply any complicated technique. There can be no doubt that its general application would go far towards a reduction of the risk of lead poisoning which is at present so serious in the shipbreaking industry.

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