

THE REFRACTIVE INDEX OF HORSE-SERA.

By Dr. WALTER FREL.

Technique.—The refractometer of *Pulfrich* with heatable prisms was used, and this permitted accurate results being obtained. During the time of observation, the temperature was maintained within 1° of 37° C. All results in the following table were obtained by taking the average of five readings.

Whilst the rotation of the polarized light ray refers to substances with an asymmetric carbon-atom, the refractive index of a system is influenced by its different components, by both solvents and dissolved bodies. Refractometry is also an arbitrary method, resembling that used for the measurement of specific gravity. Variations of the refractive index of serum in various animals are slight, and also resemble those found in specific gravity. In the same way as other methods, the refractometer showed greater variations in sick than in healthy animals, and the average of all values obtained in the former is lower, a fact which may be explained by the disappearance of solids out of the serum.

The degree of rotation varies in direct proportion with the refractive index. Of thirty-one sera which had a rotative power on or above the average, the refraction of twenty-four, that is 77 per cent., was also above the normal average. Of twenty-six sera, of which the rotation was below the average, also 77 per cent. had a refraction which was less than the average.

INDEX OF REFRACTION, POLARIZATION, AND VISCOSITY
 COMPARED.

Date.	No. of Horse.	Condition of Subject.	Refraction at 37°.	Rotation at 37°.	Viscosity at 25°.
1909—July 7 ..	4656	Normal (opalizing)	1·35279	1·56	—
June 17 ..	4523	Horse-sickness	1·35111	—	—
July 15 ..	4432	"	1·35053	—	—
" 27 ..	4569	"	1·34963	3·78	—
" 15 ..	4683	N	1·34953	3·41	—
Aug. 10 ..	4494	H-S	1·34933	—	2·45
" 10 ..	4509	Hyperimmune	1·34915	—	2·42
June 9 ..	4514	H-S	1·34913	—	—
" 4 ..	4431	N	1·34908	—	—
" 28 ..	4682	N	1·34889	—	—
July 15 ..	4682	N	1·34868	4·00	—
June 9 ..	4594	N	1·34848	—	—
" 28 ..	4663	N	1·34834	—	—
July 7 ..	4553	H-S	1·34832	3·95	—
" 7 ..	4562	H-S	1·34823	4·08	—
" 7 ..	4663	N	1·34820	3·96	—
Aug. 4 ..	4707	Glanders	1·34820	3·87	—
June 9 ..	4482	H-S	1·34819	—	—
" 9 ..	4482	H-S	1·34809	—	—
" 4 ..	4511	H-S	1·34809	—	—
Aug. 4 ..	4710	N, Susp. glanders	1·34808	—	—
" 10 ..	4478	Hyperimmune	1·34808	—	1·98
July 15 ..	4684	N	1·34807	—	—
June 4 ..	4491	N	1·34798	—	—
Aug. 10 ..	4572	H-S	1·34796	—	2·00
Aug. 4 ..	4568	H-S	1·34794	3·66	2·14
July 27 ..	4695	N	1·34792	3·90	1·98
June 9 ..	4593	N	1·34791	—	—
Aug. 22 ..	4634	H-S	1·34791	3·64	2·09
July 15 ..	4356	H-S	1·34788	3·60	—
" 15 ..	4425	H-S	1·34787	3·84	—
1908—July 10 ..	3400	H-S passed	1·34784	—	2·06
1909—July 7 ..	4654	N	1·34779	—	—
Aug. 22 ..	4645	N	1·34771	3·90	2·06
" 10 ..	4517	Hyperimmune	1·34770	—	1·97
June 28 ..	4560	H-S	1·34768	3·84	—
" 7 ..	4486	H-S	1·34761	—	—
Aug. 22 ..	4659	H-S (opalizing)	1·34756	2·89	2·11
" 22 ..	4622	N (opalizing)	1·34746	3·70	1·94
July 7 ..	4579	H-S	1·34745	—	—
Aug. 4 ..	4579	H-S	1·34744	3·80	2·12
1908—July 13 ..	3701	H-S passed	1·34743	—	1·99
1909—July 7 ..	4655	N	1·34741	3·05	—
Aug. 4 ..	4060	Glanders	1·34735	3·59	1·91
June 4 ..	4521	N	1·34734	—	—
July 20 ..	4658	N	1·34733	3·66	—
June 9 ..	4486	H-S	1·34731	—	—
July 27 ..	4675	N	1·34724	3·80	—
" 27 ..	4574	H-S	1·34723	3·71	1·98
June 9 ..	4524	H-S	1·34723	—	—

Explanation of terms.

- N Normal.
 H-S Climax of horse-sickness—temperature—reaction.
 H-S end Second half of the horse-sickness—temperature—reaction.
 H-S passed The animal has just passed through horse-sickness: the temperature is normal again.

INDEX OF REFRACTION, POLARIZATION, AND VISCOSITY
 COMPARED—(continued).

Date.	No. of Horse.	Condition of Subject.	Refraction at 37°.	Rotation at 37°.	Viscosity at 25°.
1909—Aug. 4 ..	4565	H-S	1·34722	3·13	2·09
Aug. 22 ..	4599	N	1·34721	3·53	1·91
„ 22 ..	4658	H-S	1·34715	3·98	2·02
„ 10 ..	4572	H-S	1·34707	—	1·94
June 17 ..	4526	H-S	1·34704	—	—
„ 9 ..	4598	N	1·34702	—	—
„ 9 ..	4597	N	1·34700	—	—
„ 17 ..	4603	N	1·34695	—	—
Aug. 22 ..	4611	N	1·34693	3·26	1·89
1908—July 10 ..	3701	H-S passed	1·34689	—	1·85
1909—July 20 ..	4573	H-S	1·34688	—	—
„ 15 ..	4686	N	1·34684	3·48	—
June 28 ..	4583	H-S	1·34682	—	—
Aug. 4 ..	4567	H-S	1·34679	3·06	1·95
June 9 ..	4596	N	1·34677	—	—
„ 4 ..	4490	H-S	1·34675	—	—
„ 17 ..	4601	N	1·34671	—	—
„ 4 ..	4525	N	1·34666	—	—
July 27 ..	4634	N	1·34663	3·39	1·80
June 22 ..	4551	H-S	1·34662	—	—
July 27 ..	4693	N	1·34659	3·54	1·88
„ 27 ..	4673	N	1·34658	3·64	1·93
„ 20 ..	4660	N	1·34655	3·50	—
1908—July 8 ..	3340	H-S end	1·34653	—	—
1909—Aug. 4 ..	4606	N	1·34652	3·44	1·80
July 27 ..	4567	H-S (opalizing)	1·34648	2·94	1·86
1908—July 20 ..	4657	N	1·34643	3·41	—
„ 8 ..	3465	H-S passed	1·34642	—	—
1909—Aug. 10 ..	4606	N	1·34641	—	1·81
June 4 ..	4488	H-S	1·34640	—	—
July 20 ..	4647	N	1·34636	3·33	—
„ 7 ..	4667	N	1·34631	3·32	—
„ 20 ..	4651	N	1·34626	3·18	—
June 17 ..	4602	N	1·34623	—	—
Aug. 22 ..	4598	H-S	1·34621	3·57	1·90
July 7 ..	4567	H-S	1·34616	—	—
June 4 ..	4486	H-S	1·34615	—	—
„ 4 ..	4513	H-S	1·34614	—	—
„ 28 ..	4665	N	1·34604	3·20	—
„ 22 ..	4574	H-S	1·34599	—	—
July 15 ..	4685	N	1·34596	—	—
June 17 ..	4520	H-S	1·34595	—	—
„ 17 ..	4517	H-S	1·34587	3·11	—
July 20 ..	4438	H-S (opalizing)	1·34580	2·82	—
1908—July 8 ..	3634	H-S passed	1·34576	—	—
1909—July 7 ..	4576	H-S	1·34571	—	—
Aug. 22 ..	4629	N	1·34570	3·35	1·72
„ 4 ..	4603	N	1·34566	3·26	1·74

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INDEX OF REFRACTION, POLARIZATION, AND VISCOSITY
COMPARED—(continued).

Date.	Nc. of Horse.	Condition of Subject.	Refraction at 37°.	Rotation at 37°.	Viscosity at 25°.
1909—June 17 ..	3605	N	1.34558	—	—
" 9 ..	4518	H-S	1.34556	—	—
" 28 ..	4664	N	1.34555	3.13	—
" 28 ..	4582	H-S	1.34551	3.09	—
" 22 ..	4486	H-S	1.34551	—	—
1908—Sept. 1 ..	3682	N, average from six examinations	1.34549	—	1.69
1909—Aug. 4 ..	4609	N	1.34548	3.49	1.79
1908—July 10 ..	3707	H-S end	1.34529	—	1.79
1909—Aug. 11 ..	4604	N	1.34526	—	1.69
June 17 ..	3604	N	1.34516	—	—
Aug. 22 ..	4625	H-S	1.34503	2.89	1.79
" 10 ..	4603	N	1.34502	—	1.69
1908— " ..	3685	N, average from six examinations	1.34502	—	1.62
1909—Aug. 4 ..	4604	N	1.34500	2.96	1.70
June 22 ..	4575	H-S	1.34486	3.28	—
Aug. 4 ..	4613	N	1.34485	3.01	1.71
July 20 ..	4574	H-S	1.34482	3.20	—
1908—June 29 ..	3450	H-S passed	1.34481	—	1.96
July 13 ..	3668	H-S passed	1.34473	—	1.69
" 2 ..	3627	H-S passed	1.34473	—	—
" 2 ..	3475	H-S passed	1.34456	—	—
1909—June 4 ..	4487	H-S	1.34437	—	—
1908—July 2 ..	3457	H-S end	1.34423	—	—
June 29 ..	3338	H-S end	1.34419	—	1.70
1909—July 27 ..	4494	H-S	1.34409	—	1.63
1908—July 10 ..	3668	H-S end	1.34395	—	—
1909—July 20 ..	4569	H-S (opalizing)	1.34394	—	—
" 27 ..	4513	H-S	1.34382	2.75	1.62
1908—July 13 ..	3704	H-S end	1.34374	—	1.67
1909—Aug. 10 ..	4693	H-S (opalizing)	1.34374	—	1.66
June 28 ..	4546	H-S	1.34372	2.66	—
1908—July 14 ..	3706	H-S end	1.34372	—	1.68
" 10 ..	3705	H-S end	1.34366	—	1.63
" 10 ..	3702	H-S end	1.34358	—	1.58
" 10 ..	3667	H-S end	1.34324	—	—
" 13 ..	3663	H-S passed	1.34311	—	1.60
" 10 ..	3706	H-S end	1.34308	—	1.62
" 10 ..	3663	H-S end	1.34301	—	—
" 10 ..	3662	H-S	1.34264	—	—
1909—July 20 ..	4513	H-S	1.34258	2.49	—
1908—June 29 ..	3631	H-S end	1.34226	—	1.56
July 10 ..	3704	H-S end	1.34213	—	1.49

Explanation of terms.

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INDEX OF REFRACTION AND ITS VARIATIONS.

	Normal.	Horse-sickness.
Number of examinations	63	81
Number of animals	47	62
Average	1·34666	1·34602
Maximum	1·35279	1·35111
Minimum	1·34471	1·34213
Variation above average	0·455 %	0·378 %
Variation below average	0·145 %	0·289 %
Total variation	0·60 %	0·667 %
Variation above normal average	0·455 %	0·330 %
Variation below normal average	0·145 %	0·336 %
Number of values above average	44·5 %	53 %
Number of values below average	55·5 %	47 %
Number of values above normal average	44·5 %	42 %
Number of values below normal average	55·5 %	58 %