case (E) tended to wear off.‡ All patients were less broken in spirit and were more spontaneous in their interests and activity. It is particularly interesting to note that additional changes occurred in the organic cases which were not observed in those without demonstrable hormonal abnormalities. The symptoms listed as peculiar to the organic cases were alleviated. They exhibited more rational aggressiveness and less irrational irritability and sullen brooding. Nervousness and emotional instability were replaced by greater stability and control. Abnormal physical and mental fatiguability disappeared. Energy and stamina returned.

Before treatment, none of the cases had reacted appreciably to control injections. During subsequent control periods, the one psychogenic case who had changed his environment, remained normal; but the symptoms of the other cases returned in unabated form, save that now hope was manifested instead of despair.

9926 P

Red Cell Resistance to Lysins in Pernicious Anemia.

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Since there is evidence that there is an *in vivo* hemolytic process involved in pernicious anemia,[1] we have carried out measurements of the resistance, to saponin and other lysins, of red cells from cases of pernicious anemia in relapse and in remission.

The methods used were those described by Ponder.[2] Suspensions of red cells from normal oxalated blood and from the oxalated blood of cases of pernicious anemia are made by suspending the thrice-washed cells in sufficient 1% NaCl (or buffered Ringer at pH 7.0) to give 2.5(10^8) cells/cc. A series of dilutions of saponin, or of another lysin, is then prepared in 1% NaCl, and time-dilution curves

‡ It seems probable on theoretical grounds that there should be some psychic cases which, if their impotence (*i. e.*, adjustment to need for escape or revenge, etc.) could be destroyed, might go into some other, more severe form of neurosis.

1 Rhoads, C. P., *Cold Spring Harbor Symposia on Quantitative Biology*, 1937, **5**, 410.

2 Ponder, E., The Mammalian Red Cell and the Properties of Hemolytic Systems, *Protoplasma Monographien*, No. 5, 1934.

for complete hemolysis are plotted at 25°C up to times as long as 300 minutes, and in some cases 600 minutes. Under these circumstances, the resistance of the cells from the blood of cases of pernicious anemia, relative to the resistance of the normal cells, is simply and properly expressed by a constant R_∞, obtained by dividing the asymptotic concentration of lysin for the cell suspension whose resistance is sought, by the asymptotic concentration for the cell suspension from the normal control ($R_\infty = 1.0$). The resistance of suspensions of normal red cells varies remarkably little.[3]

In 6 cases of clinically ascertained pernicious anemia in relapse, we have found the red cell resistance to saponin to be greatly decreased, so that the time-dilution curve for the abnormal blood rises to an asymptote much higher than that for the normal blood. Frequently the 2 curves cross each other, as shown in Fig. 1, curves A and C, the times for complete lysis in high lysin concentrations being longer for the abnormal blood than for the normal, but the times in higher dilutions of lysin being very much shorter for the abnormal cells. The characteristic phenomenon, however, is the higher level of the asymptote to which the curve proceeds. To one unfamiliar with the analysis of time-dilution curves, the differences in the values of R_∞ for normal blood and for the blood from cases of pernicious anemia may not seem very impressive. As seen by the observer, however, since he is measuring the *time* required for complete lysis, the phenomenon is often very striking. Thus in a dilution of saponin of 1 in 50,000, the suspension of normal cells may hemolyse in 210 minutes while the suspension of cells from the pernicious anemia blood may hemolyse in 25 minutes; in a dilution of 1 in 100,000 the latter suspension may completely hemolyse in 5 hours, while the normal suspension may show scarcely any lysis.

In 10 clinically ascertained cases of pernicious anemia in remission, we have found the same phenomenon, although often considerably less marked (Fig. 1, curve B). Again the asymptotic concentration of lysin is less than it is for a suspension of normal red cells. It is a significant fact that the decreased resistance of the cells continues after the clinical symptoms have disappeared, and after the red cell count has risen to within normal limits. It should be pointed out that the decreased resistance can often be observed with certainty only as the asymptotes of the time-dilution curves are approached.

In 4 clinically ascertained cases of pernicious anemia in remission we were unable to detect any variation in resistance beyond the normal limits. In a few cases in which we have been able to follow the

[3] Ponder, E., *Biochem. J.*, 1926, **20**, 507.

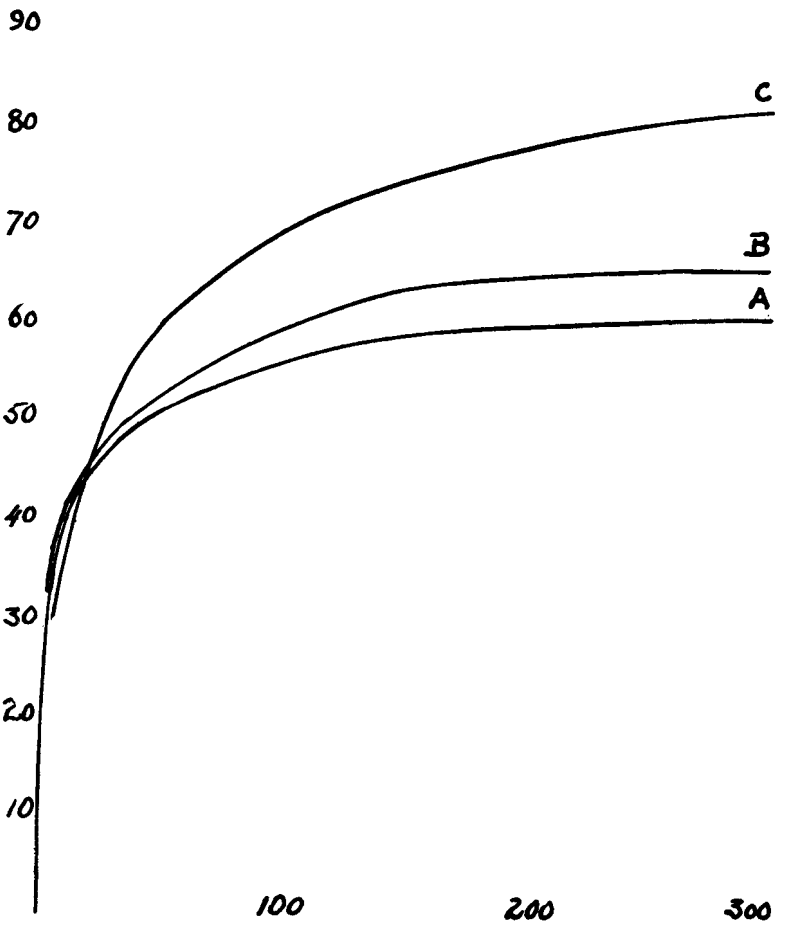

FIG. 1.

Ordinate, dilution of lysin $\times 10^{-3}$; abscissa, time in minutes. Curve A is a typical time-dilution curve for normal blood. Curves B and C obtained in typical cases of pernicious anemia in remission and relapse respectively.

TABLE I.

Clinical condition	Red cells per mm³	R_∞
Relapse	2,050,000	.61
"	2,160,000	.74
"	1,610,000	.62
"	1,880,000	.75
Remission	4,720,000	.84
"	4,710,000	.86
"	4,070,000	.66
"	4,720,000	.75
"	4,000,000	.97
"	3,380,000	1.00

resistance during treatment and clinical improvement, the asymptotic concentration for complete lysis unquestionably tends to fall towards the normal figure, but much more slowly than the clinical improvement takes place.

A number of typical results are shown in Table I.

These changes in resistance are observed not only with saponin (British Drug Houses), but when sodium taurocholate at pH 7.0 or sodium glycholate at pH 6.0 are used as lysins. The results clearly indicate that the red cells from the blood of cases of pernicious anemia are more vulnerable to the action of such lysins *in vitro* and probably *in vivo* also, and we are calling attention to them so that those who have access to clinical material may extend the observations.

9927 P

Cod Liver Oil Therapy in Experimental Tuberculosis.*

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Cod liver oil has been used from time immemorial by fisherfolk for the treatment of external wounds, and it has long been recommended for the treatment of tuberculosis. Löhr,[1] studying the wound healing properties of cod liver oil in various types of wounds, reported that this oil would aid in the healing of lupus. Our interest in the influence of cod liver oil on tuberculous lesions was especially aroused by the report of its successful use in the treatment of 3 cases of lupus by Banyai.[2]

Our purpose was (1) to confirm, if possible, the clinical observations on man by studying the effect of cod liver oil on tuberculous skin ulcers in guinea pigs, and if the results should prove favorable, (2) to isolate the chemical fraction in the oil responsible for the healing action, (3) to study its effect on other types of experimental tuberculosis, and (4) if these experiments should be satisfactory, then to determine the effect of the "pure substance" in human tuberculosis.

Tuberculous skin ulcers were produced by the intracutaneous in-

* This work was supported in part by a grant from the Wisconsin Alumni Research Foundation.

1 Löhr, Wm., *Wundheilung*, 1937.

2 Banyai, Andrew L., personal communication, 1935.