

posures presumably increase resistance to radiation. It may be that the non-specific resistance to stress as defined by Selye(12) is increased. Perhaps specific resistance to the products of cellular destruction is increased comparable to the increased resistance of rabbits to bacterial toxins produced by previous x-irradiation as described by Bisgard(13). The results reported here for total body x-irradiation are similar to those reported by Raper(9) for total body surface Beta radia-

tion of mice.

Summary and Conclusion. 1. It has been demonstrated with a fair degree of certainty ($0.05 > P_{diff} > 0.02$) that three weekly exposures of 144 r followed by a 30 day rest period increases the resistance of mice to a subsequent lethal dose of x-radiation.

2. It is concluded that no adequate explanation for this phenomenon of increased tolerance to x-ray radiation is available at the present time.

13. Bisgard, J. P., Hunt, H. B., and Dickinson, R. H., *Radiology*, 1944, v43, 330.

Received December 19, 1949. P.S.E.B.M., 1950, v73.

Phytotoxic Properties of Spinal Fluids from Paresis, Tabes and Neuro-Syphilis. (17620)

DAVID I. MACHT.

From the Laboratories of the Sinai Hospital, Baltimore, Md.

The author has been studying the pharmacological properties of bloods from various psychoses for many years(1,2). The findings established clearly that sera from patients with organic and functional psychoses when tested by the author's standardized phytopharmacological methods, exhibited marked toxic effects on the root-growth of *Lupinus albus* seedlings grown in plant physiological solutions. The sera from purely psychoneurotic patients were not phytotoxic. More recently, the writer has begun a phytopharmacological examination of normal and pathological spinal fluids by exactly the same methods as those employed for examination of blood sera. In the present paper are reported the findings with the spinal fluids from a series of cases with general paresis and a series of non-psychotic patients suffering from Tabes Dorsalis and other cases of neuro-syphilis.

The methods employed have been described(3,4,5). The effect of spinal fluids

dissolved in Shive's plant physiological solution(6), was studied quantitatively on the root-growth of *Lupinus albus* seedlings for 24 hours under standardized ecological conditions. By the index of growth is meant the ratio of the root-growth in a solution of the unknown drug to the growth of control seedlings in normal physiological solutions.

$$\text{Index of growth} = \frac{X}{N} \times 100$$

It was found that 1% solutions of normal spinal fluids exert practically no phytotoxic effect on the root-growth. A 2% solution of spinal fluid gives an average index of growth of 92%, the readings ranging from 80% to 100%. Table I shows the results obtained with a series of 16 cases of paresis, 10 cases of tabes and 14 cases of other neuro-syphilitic patients. It will be seen that all of the paretic spinal fluids yielded readings far be-

1. Macht, D. I., and Macht, M. B., *J. Lab. and Clin. Med.*, 1941, v26, 597.

2. Macht, D. I., *Southern Med. J.*, in press.

3. Macht, D. I., and Livingston, M., *J. Gen. Physiol.*, 1922, v4, 573.

4. Pels, I. R., and Macht, D. I., *Arch. Dermat. and Syph.*, 1931, v23, 601.

5. Macht, D. I., and Grumbein, M. L., *Arch. Internat. de pharmacodyn et de therap.*, 1938, v60, 95.

6. Shive, J. W., *Physiol. Researches*, 1915, v1, 327.

TABLE I.
200 Normal Human Spinal Fluids 2% in Shive's Sol. Give Average Phytotoxic Index of 92%.

Patient with general paresis	Index of growth %	Patient with tabes dorsalis	Index of growth %	Patient	Disease	Index of growth %
J.L.	55	S.1.	84	S.7	Neurosyphilis unclassified	78
A.W.	56	S.5	100	S.4	" asymptomatic	74
M.J.	62	S.12	82	S.7	" "	93
L.C.	45	S.15	99	S.16	" "	98
A.B.	56	S.36	99	S.10	" "	70
B.C.	62	S.37	80	S.34	" "	92
H.R.	65	S.61	88	S.13	" "	80
B.H.	44	S.62	87	S.14	Meningovascular syphilis	99
C.K.	60	B.C.	95	S.33	" "	81
J.S.	62	C.H.	96	S.35	" "	84
E.C.	69			S.38	" "	82
J.M.	60			S.8	Neurosyphilis with optic atrophy	86
H.C.	57			S.9	E.R.B. spastic paraplegia	85
L.B.	68			S.43	Syphilitic muscular atrophy	81
G.C.	64					
M.D.	48					
Avg index of growth in 2% sol.		58.5%	91%			84.5%

low those given by normal spinal fluids, the average phytotoxic index being 58.5%. In fact the spinal fluids were relatively more toxic than the blood sera of the same patients. On the other hand, the 10 specimens of spinal fluids from locomotor ataxia, gave an average reading of 91%, practically normal. The series of other neuro-syphilitic cases also gave quite high readings, the average being 84.5%.

All of the above cases were, of course, of syphilitic origin and gave positive Wassermann tests. Fortunately, however, the author has already pointed out elsewhere that syphilitic blood sera when tested on *normal* seedlings, produce no toxic inhibition and usually give even slightly higher indices of growth(7). The phytotoxic properties of paretic spinal

fluid therefore must be ascribed to biochemical changes inherent in the psychosis. This difference between paresis and other neuro-syphilitic patients may be of interest from the standpoint of localizing the seat of the psychotic affection.

Summary. 1. A phytopharmacological examination of spinal fluids from a series of paresis cases yielded marked phytotoxic results. 2. Spinal fluids from a series of patients with *Tabes dorsalis* gave the same readings as those of normal spinal fluid. 3. Other cases of neuro-syphilis also yielded almost normal indices of growth. 4. The above phytotoxic properties of paretic spinal fluids cannot be ascribed to syphilis because syphilitic blood sera and spinal fluids, alone, from non-psychotic patients are not phytotoxic.

7. Macht, D. I., and Gardner, R. E., *Proc. Nat. Acad. Sci.*, 1936, v22, 384.