Table 1. Excretion of urinary catecholamines (μg/24 hr).

Group	Cases (No.)	Samples (No.)	Mean ± standard error		
			Dopamine	Norepinephrine	Epinephrine
Normal	24	24	316 ± 14.6	42 ± 3.2	17 ± 1.1
Parkinsonism (all types)	16	16	241 ± 21.5*	40 ± 5.0	15 ± 0.4
Postencephalitic	6	6	177 ± 41.8*		
Idiopathic	8	8	297 ± 36.2		
Arteriosclerotic	2	2	212		
Striatal syndromes (all types)	16	32	377 ± 23.9*	36 ± 3.3	28 ± 3.7*
Wilson's disease	3	17	418 ± 24.8*		
Huntington's chorea	4	5	272 ± 45.8		
Dystonia	4	5	395 ± 45.8		
Sydenham's chorea	2	2	334		
Familial tremor	1	1	334		
Torticollis	1	1	328		
Choreoathetosis	1	1	308		

* Probability of difference from normal, $p < 0.01$.

various portions of the brain led Carlsson (*2*) to postulate a second role for the latter substance besides its established function as precursor of norepinephrine and epinephrine. This role has been related to the functioning of the extrapyramidal system (*3*). One of us (*4*) has reported the presence of a smooth muscle-stimulating substance, later identified as dopamine (*5*), in the urine of patients with diseases of the basal ganglia. The present report (*6*) concerns the differential urinary excretion of dopamine in Parkinsonian and some striatal syndromes.

Thirty-two patients and 24 normal control subjects (laboratory personnel) contributed 24-hour samples of urine for the determination of dopamine, norepinephrine, and epinephrine excretion. Epinephrine and norepinephrine were measured by the trihydroxyindole method (*7, 8*), and dopamine by a modification of the Carlsson-Waldeck procedure (*8*). Fluorescence measurements were carried out with the Aminco-Bowman spectrophotofluorometer.

Urines were collected for periods of 24 hours in bottles containing 10 ml of 18 percent hydrochloric acid as a preservative. All medication was withheld for 24 hours before the collection period and during it. A total of 72 urines were analyzed.

The 32 patients represented the following diagnoses: postencephalitic, idiopathic, and arteriosclerotic Parkinsonism, Wilson's disease, Huntington's and Sydenham's choreas, dystonia musculorum deformans, torticollis, familial tremor, and choreoathetosis. The division into "Parkinsonian" and "striatal" syndromes was based mainly upon the known pathology of the particular diseases concerned.

The summary of the data for the three catecholamines in Table 1 shows that the daily excretion of dopamine in the two main diagnostic divisions departs significantly from normal. The means, arranged according to rank, are Parkinsonism < normal < striatal syndromes, and the ratio of the means is 0.76:1.00:1.20. Because of the large variation encountered in these series of cases, it was of interest to determine the extent to which this over-all distinction, based upon the urinary output of dopamine, carries over to the diagnostic entities mentioned. For this purpose the data were subjected to the analysis of variance (*9*), and the residual error, after accounting for variance between specific diagnostic categories, was used to calculate the standard errors shown. Inspection of Table 1 reveals that in postencephalitic Parkinsonism the dopamine excretion is significantly lower than normal, and that in Wilson's disease this excretion is higher than normal. Some of the categories contained too few cases to permit statistical evaluation.

Epinephrine excretion was also significantly greater than normal in the striatal syndromes considered as a whole (Table 1), but the variability within the diagnostic categories was so great that further analysis of the data did not seem warranted. Norepinephrine excretion did not vary significantly between the major groups.

The physiological significance of these findings is difficult to assess because of lack of knowledge about the actual function of dopamine and its metabolites in the brain. However, the results support the hypothesis that dopamine plays a role in extrapyramidal motor function. The association of gross differences in the urinary output of dopamine with certain neurological diseases indicates the importance of further studies of the metabolism of this catecholamine in these disorders. Such investigations should include analysis of the catecholamine content of the brains of patients who have died with basal ganglia disease, for such information can help determine whether the concentration of cerebral dopamine itself undergoes major changes in these disorders (*10*).

Note added in proof: Ehringer and Hornykiewicz (*11*) have shown that the concentration of dopamine in the neostriatum is significantly reduced in cases of Parkinsonism. The norepinephrine level in the hypothalmus is also low.

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Possible Physical Effect of Solar Particles on Meteorological Parameters in Alaska

Abstract. Statistical significance was found in the reception of solar-particle invasions to sea-level pressure and upper-flow pattern changes at 500 mb in Alaska during a period of high solar activity. Recent IGY findings suggest that a physical relation exists between such solar particles and atmospheric changes.

For a sample of ten weather stations in Alaska and northwestern Canada, enclosed within an area between 60° and 70°N and 170° and 120°W, the sea-level pressure was tabulated for 16 days after a day (the key day) in which the earth's magnetic field was particularly disturbed. A key day is defined as a day in which the daily magnitude of the A_p index was 20 or more with a daily change of +10 or more from the previous day. The values of this index for the fall through winter of 1956–57 were taken from the *Journal of Geophysical Research* (*1*). For each of the ten sample stations the 24-hr pressure change was obtained

Table 1. Ridge frequencies at 500 mb for fall through winter of 1956–57.

Days after key days	170° to 150°W	140° to 120°W
1 and 2	14	25
3 and 4	14	21
5 and 6	19	22
7 and 8	8	37
9 and 10	7	28
11 and 12	6	20
13 and 14	9	26
15 and 16	11	21

with the pressure of the preceding day subtracted from the pressure of the following day. For each of the key days the mean 24-hr pressure change was individually calculated for each day of the 16-day period for the ten stations. A table was compiled showing the day-to-day pressure changes. A Student's *t* test was applied to the data, and significance was found at less than the 5 percent level in the mean 24-hr fall in sea-level pressure for the period from the 7th to the 8th day after key days.

A study was next made of the effect of particle invasions on the mean zonal and meridional flows in the Alaskan area at 500 mb for the same period of time. No statistical significance at less than 5 percent was found for any day after the key days in the day-to-day mean zonal flow changes. To determine the meridional flow between 60° and 70°N, a grid of points on the 500-mb chart was chosen for every 10° of longitude between 120° and 170°W along three parallels of 60°, 65°, and 70°N. The contour heights were tabulated to the nearest 50 ft. The absolute value of the meridional flow between each 10° longitude interval was calculated for the three latitude lines. The expression for the meridional flow was taken from Petterssen (*2*). A table was compiled showing the data for the day-to-day differences of the mean meridional flow after the key days. A Student's *t* test showed significance at less than the 5 percent level in the decreases in the mean meridional component for the 7th to 8th day period after key days.

A tabulation was made of the daily A_p changes, the mean 24-hr sea-level pressure changes, and the 24-hr changes of the mean meridional flow at 500 mb for the 7th to 8th day period after the daily A_p changes between 3 Sept. 1956 and 18 Mar. 1957. To obtain a degree of relation among the variables, the method of partial-correlation studies was used. A correlation coefficient of −0.021 was found between the mean 24-hr sea-level pressure changes and the 24-hr changes of the mean meridional flow at 500 mb. Both the correlation coefficients of −0.220 between the mean 24-hr pressure changes and the daily A_p changes, and −0.146 between the 24-hr changes of the meridional flow and the daily A_p changes, were found to be significant at less than 5 percent. Each test of significance involved 200 pairs of observations.

A frequency table for the presence of ridges at 500 mb was prepared as shown in Table 1. A ridge was defined to be positioned along the longitude having an average contour height higher than any longitude immediately preceding or following. Table 1 shows a tendency for maximum ridge occurrence for the 7th to 8th day period in the area east of Alaska between 140° and 120°W. An application of the Student's *t* test was used to determine any significance for ridge occurrence in the area for this time. The test involved the comparison of the means of two independent samples. The null hypothesis made was that the two samples came from the same population, and the observed difference of the means of the samples was tested for significance. As the area between 140° to 120°W contains a total of eight observations, then the level of significance corresponding to the *t* value of 4.29 was multiplied by eight. As this gives a level of significance less than 5 percent, then a significant tendency for maximum ridge frequency in the 7th to 8th day period after key days to the east of Alaska is found.

The above findings suggest that particle invasions from active regions on the sun physically affect the earth's atmosphere with its attendant sea-level effects. Recent findings (*3*) indicate that, whenever Sputnik III was north of 60°N geographic latitude in the auroral zone, a sharp increase in the measured intensity of x-ray radiation was observed. Presumably this is due to the effect of electrons impinging upon the upper atmosphere. Recent IGY satellite findings indicate that charges penetrating to low levels in the polar regions are associated with x-ray production. Such findings point out that large energy flux, such as that coming from solar flares, is sufficient to heat the upper atmosphere. The stratospheric warming over southeastern Europe in January 1958, a few days after a considerable increase in the drag of Sputnik II was observed, is attributed by Scherhag (*4*) to the influence of solar disturbances in the atmosphere. The solar storm of 12 November 1960 had been found to increase the air density of the upper atmosphere (*5*). Atmospheric heating by solar particles given off by this solar storm is thought to be responsible for the increase of drag on Echo I. It is suggested that the particle heating caused an expansion of the lower atmosphere with an increased air density at higher altitudes.

The heating effect should be present in the segment of the auroral zone in which the present study was made. The indicated statistical significance in ridge occurrences to the east of Alaska during high solar activity seems to bear out the effects of atmospheric heating by solar-particle invasions. The fact that the falls in sea-level pressure in Alaska accompany the ridge occurrence to the east of Alaska suggests that a physical relation does exist between solar-particle invasions and atmospheric changes.

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Substance in Peripheral Nerve Which Influences Oxygen Uptake

Abstract. Rat sciatic nerve contains a substance that diffuses into the surrounding medium and causes a fresh normal nerve to respire at an increased rate. Both the utilization of glucose and the increase in oxygen uptake with electrical stimulation of nerves in the presence or absence of glucose appear to be dependent on the presence of this substance.

The purpose of the experiments reported here was to elucidate some of the mechanisms concerned with the respiratory activity of isolated peripheral nerves, with and without electrical stimulation, in the presence and absence of added substrate.

Sciatic nerves, averaging 5 cm in length and 30 mg in weight, were obtained from adult Wistar rats weighing 225 ± 20 g. Respiration was measured at 37°C by the standard manometric procedure. Each nerve was placed in a Warburg flask containing 2 ml of a calcium-free, phosphate-buffered medium (initial *p*H 7.8 to 8.0) containing, in millimoles: NaCl, 122; KCl, 3; $MgSO_4$, 1.2; and phosphate buffer, 17.5. In some experiments glucose was added in 0.5 ml of additional medium to reach a final concentration of 0.01*M*. The vessels were gassed with pure oxygen. Respiratory activity was measured over 120 minutes.

Oxygen uptake was also measured in a medium in which a fresh nerve had been incubated previously. This incubation was at room temperature in 2.5 ml of the usual medium for times varying from 30 to 120 minutes. The nerve was removed and 2 ml of the