laboratory techniques. Seminal plasma was separated from semen, using centrifugation at 15,000 rpm for 30 min. Folic acid was determined by the method of Cooperman[4], and estimations of DNA were based on a modification of the diphenylamine reaction[5] and calculated per 10^6 sperms.

Prior to treatment, the mean value of folic acid in the blood was found to be 138.9 ± 11.5 IU/ml (mean + SE), similar to values reported in a healthy population[6-7], and the mean value in the seminal plasma was 44.5 ± 7.1 IU/ml. From this observation, it is evident that the basic levels of folic acid in seminal plasma (to the best of our knowledge, not previously estimated) are about 30% of the mean level in the blood. No correlation was found between the levels of folic acid either in the blood or seminal plasma and the sperm counts.

Following treatment with folic acid, the level in the blood increased about 5fold, whereas in the seminal plasma it increased, on average, only 3fold and additional treatment did not change these results. No significant changes in sperm count, percentage of motile cells and DNA content of spermatozoa were observed.

Since the number of sperms per ml semen and the degree of their motility are not affected by an increase of folic acid level, in both blood and seminal plasma, we think that oligospermia in man is not correlated with folic acid deficiency.

The elevation of folic acid in seminal plasma following treatment would suggest that either the seminiferous tubules are permeable to molecules of folic acid, or that the high dose which was administrated overcame the testis blood barrier.

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Motilities of isolated and aggregated mice; A difference in ultradian rhythmicity[1]

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Summary. Isolated mice display higher locomotor activity and greater sensitivity to d-amphetamine than aggregated mice. Ultradian motility rhythms can be shown to differ both quantitatively and qualitatively between isolated and aggregated mice.

Many differences in cerebral chemistry and morphology and in emotional reactivity characterize 'long-term' differentially-housed male mice[2-7]. 2 such differences are : a) higher locomotor activity of 'isolated' mice[5,6]; b) enhanced behavioral and toxicological effects of injected sympathomimetic amines (e.g. d-amphetamine) in 'isolated' mice[2-7]. It should be noted that the latter difference refers to the effect of these drugs on long-term differentially-housed mice. When mice are housed in colonies and then either grouped or isolated just after injection of sympathomimetic amines, these drugs produce quite opposite results; i.e., 'acutely-grouped' mice are more sensitive to the injected drugs than 'acutely-isolated' mice[8-12]. In the present study, the evolution and ultradian periodicity of the difference in motility were examined in control and d-amphetamine-treated long-term differentially-housed mice.

Materials and methods. Male, randomly-bred Swiss mice (15-20 g), weaned at about 20-22 days of age, were housed either singly (isolated) in opaque cages ($15 \times 20 \times 25$ cm) or in groups of 24 (aggregated) in wire-mesh cages ($15 \times 25 \times 45$ cm) for 16-47 days before experiments. All experiments were performed between September and November. Motilities of the mice were measured with 2 balanced electromagnetic platforms (Panlab). All animals were tested individually (1 mouse per recording cage) to avoid fighting among the isolated mice. Biological rhythm processors[13] were used to accumulate output pulses over 5-min intervals, and total counts were printed on a thermal paper (6-digit format), local time being internally generated. Animals were subjected to 12-h light-dark cycles, the dark phase being set at 19.00 h-07.00 h. Results are presented as cpm and as power spectra.

Animals were injected i.p. with either d-amphetamine-SO_4 (2 mg/kg; K&K Laboratories, Plainview, N.Y.), or with an equivalent volume of vehicle (0.9% NaCl), and then placed into recording cages 1 min after injection. Motor activity was recorded for either 90 min or 23 h after injections. Except for 90-min studies (figure 2, A), animals were injected and placed onto platforms at the same time of day. Animals had food and water ad libitum while in their home

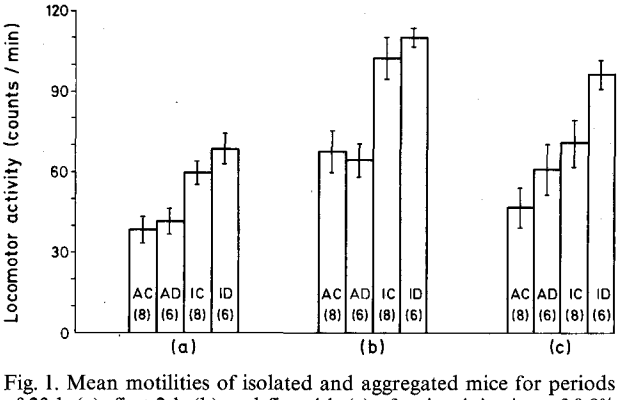

Fig. 1. Mean motilities of isolated and aggregated mice for periods of 23 h (a), first 2 h (b) and first 4 h (c) after i.p. injection of 0.9% NaCl or d-amphetamine-SO_4 (2 mg/kg). AC, aggregated control; AD, aggregated with drug; IC, isolated control; ID, isolated with drug. Vertical lines indicate SEM; numbers of animals in parentheses; all values for isolated mice are significantly greater than corresponding values for aggregated mice ($p < 0.02$; Wilcoxon's sum of rank test). The effect of d-amphetamine on isolated mice was significant only when measurements taken over the first 4-h period were combined (c); the drug produced no significant effect on the locomotor activity of aggregated mice. Animals were differentially housed for 25-47 days before testing, and were tested individually to avoid fighting activity among isolated mice.

cages, but were deprived of both during the 23 h of testing. Preliminary experiments indicated that food and water deprivation exerted no appreciable effect on locomotion over 23-h testing periods. Means, SD and SE of the signals were determined during selected recording periods using a PDP-12 computer, and significance was determined by Wilcoxon's sum of rank test. Synchronous averaging (by local time) and numerical filtering (high- and low-pass) were employed, and spectral estimations were made by an indirect method (i.e., via autocorrelation function)[13-15] with an error of the estimate < 15%.

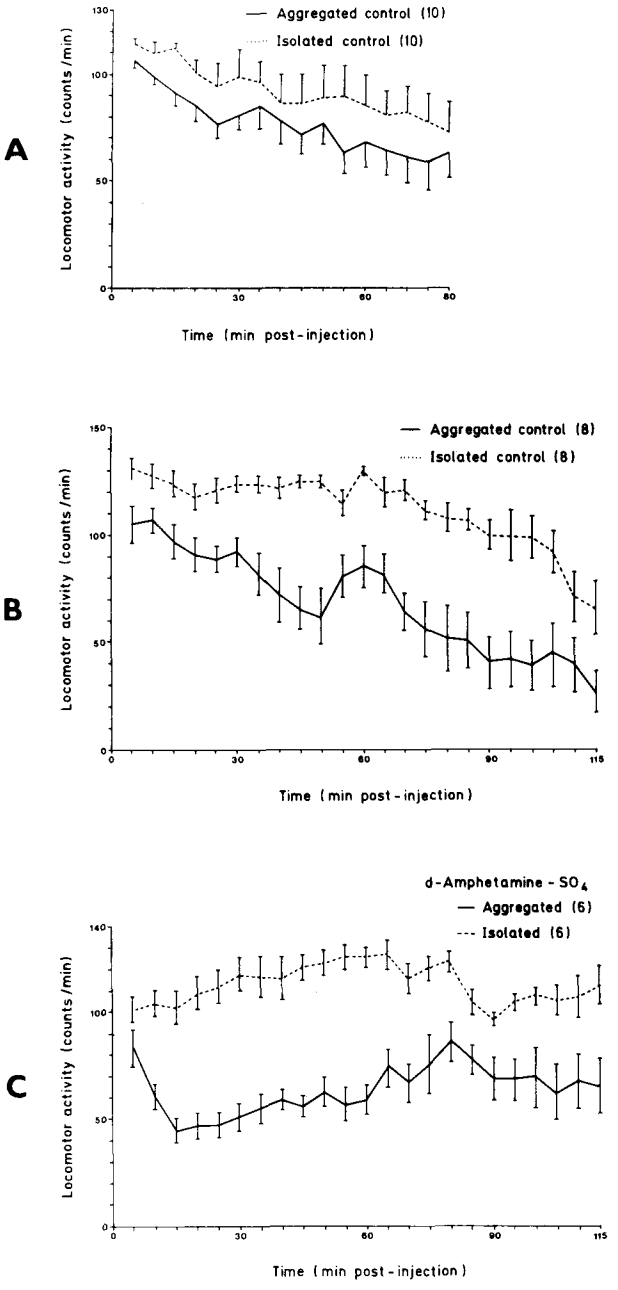

Fig. 2. Evolution of the difference in initial motility (exploratory activity) between isolated and aggregated mice and effects of d-amphetamine. *A* Differential housing for 16-20 days; *B* differential housing for 33-47 days; *C* differential housing for 25-32 days with injections of d-amphetamine-SO_4 (2 mg/kg). Vertical lines indicate SEM. All animals were tested individually to avoid fighting behavior among isolated mice.

Results and discussion. Figure 1 shows the motilities of the mice for periods of 2 h, 4 h and 23 h after injections. Regardless of the time period analyzed, isolated mice exhibited significantly higher motor activity than their aggregated counterparts (see also Lal et al.[6]). d-Amphetamine had no effect on motor activity of the aggregated mice, and enhanced this activity only slightly in isolated mice when results over the 4-h post-injection period were considered (figure 1, c). This difference was less pronounced, but generally in accord with those of previous workers who tested d-amphetamine action on long-term differentially-housed mice[2-7], and should be contrasted with results obtained with mice that were acutely grouped or isolated just after injection of the drug[9-12]. Comparison of data obtained after 16-20 days and 33-47 days of differential housing (figure 2, A and B), revealed that the difference in initial motor activity caused by differential housing was due to an increase in activity of the isolated mice, rather than to a decrease in that of the aggregated mice. Comparison of figure 2, B and C, revealed that though d-amphetamine exerted a negligible effect on motility over the first 115 min in isolated animals, it decreased motility during the first 45 min in aggregated animals. From 23-h motility recordings (figure 3), it became evident that d-amphetamine increased the duration of the initial peak of activity in both isolated and aggregated mice, thus causing a significant phase shift in both groups of animals. Also, motility over the initial 3 h post-injection, and the increase in motility stimulated by onset of the dark phase, were greater in isolated than in aggregated animals.

Power spectra of these data showed that the major periodicities of isolated vs aggregated controls were quantitatively different (figure 4). Power spectra of d-amphetamine-

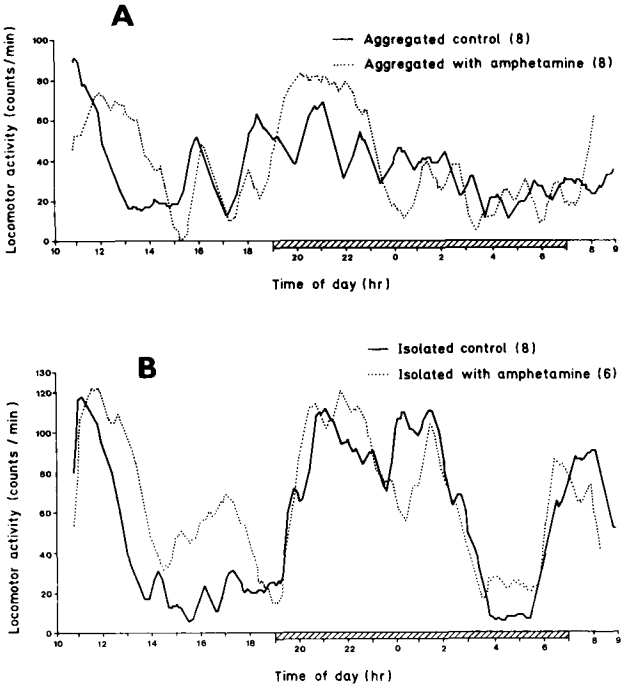

Fig. 3. Motilities of isolated and aggregated mice over 23-h periods following injections of 0.9% NaCl (control) or d-amphetamine-SO_4 (2 mg/kg). Note the significant phase shifts in activity caused by the drug ($p < 0.02$ for both isolated and aggregated mice during the interval of 90 min-4 h after injection), and the greater activity of the isolated mice. All animals were tested individually to avoid fighting behavior among isolated mice.

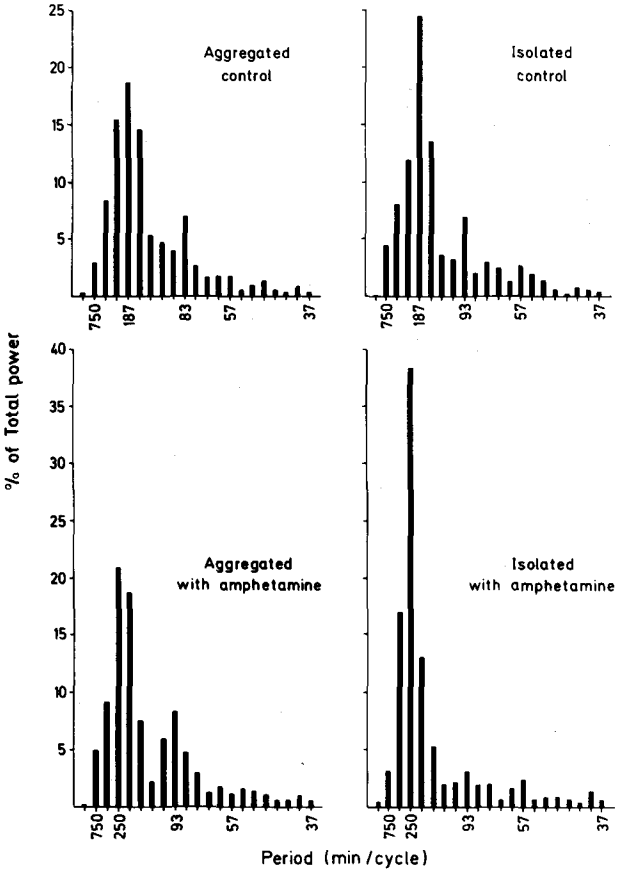

Fig. 4. Power spectra depicting predominant periods of ultradian oscillations in isolated and aggregated mice and the effects of injections of d-amphetamine-SO_4 (2 mg/kg). Power spectra were calculated via autocorrelation function with a data point-autocorrelation lag ratio of 6.7, which gave a quadratic error of the spectral estimate of $< 15\%$. Sampled raw data (sampling interval = 5 min) during the 23-h experiments were linked to improve resolution, and a temporal hamming window with 8% pedestal was applied to the autocorrelation function to avoid side lobe leakage. Low pass filtering was also used to remove low components (3 db, cut-off period 300 min). The period of each bar can be calculated by dividing 750 min by the order of the bar (1st bar has order zero, and is the dc component). Spectral power is represented as percentage of total power. Note that the major periodicity (187 min) has greater power in isolated mice. d-Amphetamine injections produced qualitative and quantitative changes in these ultradian rhythms (6–8 mice in all cases).

injected mice revealed both quantitative and qualitative differences (figure 4). For aggregated mice, the main power peak was shifted from 187 min to 250 min and increased by about 20% and the peak at 83 min was shifted to 93 min after drug treatment. For isolated mice, the main peak was also shifted from 187 min to 250 min and its power was increased by about 60%, and the peak at 93 min was reduced to about half its power by the drug.

These results corroborated earlier findings obtained with long-term differentially-housed mice; i.e., isolated mice displayed higher locomotor activity than aggregated mice and d-amphetamine exerted a greater effect on isolated mice[2–7]. The effects of d-amphetamine of prolonging the duration of the initial peak of motor activity, of producing a phase shift in motor activity, and of affecting the power spectra of motor activity, indicated that cerebral mechanisms regulating this activity are subject to modification by exogenous stimuli.

1 This study was supported in part by Centro 'Ramón y Cajal' and Fundación Juan March. Present address of F.V.D. is Centre de Neurochimie, 11 rue Humann, F-67085 Strasbourg Cédex (France).
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Transplantation of brain tissue in the brain of adult rats[1]

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Summary. Brain tissues obtained from rat embryos were transplanted in the forebrain and/or cerebellum of the adult rats. The transplants survived, grew and achieved normal cellular and cytoarchitectural differentiation. They had become anatomically integrated with the host brain. The animals did not show any obviously detectable abnormal behavior or pathology of the brain. The transplants survived as long as the animals did suggesting that they had become a part and parcel of the host brain.

Transplantation of brain tissue in the central nervous system of mammals has been attempted by early investigators who employed spinal ganglia, primarily, or pieces of brain tissue as the transplants[2–7]. They were successful to the extent that the transplants did survive and grow, but eventually these transplants degenerated. During past few years it has been shown that mitotically active precursors of neurons from the cerebellum of neonatal animals and neural tissues obtained from rat embryos can be successfully transplanted in the brain of the neonatal hosts[8,9]. These