Table

Drogue		Psilocybine 2 mg/kg	5-HTP 60 mg/kg
Comportement viscéral	Electro-pneumogramme	↑	↑
	ECG	↓	↓
	Pression artérielle	↑	↑
Comportement somatique		↑	↓↑
EEG spontané	cerveau intact — néocortex	D	(D)D
	cerveau intact — paléocortex	S	S D
	cerveau isolé — néocortex	D	D
	cerveau isolé — paléocortex	(S)	D
Systèmes afférents spécifiques	Potentiel cortical somesthésique	↓	↓
Systèmes afférents non-spécifiques et Systèmes d'éveil	Stimulation sensorielle	↑	↓
	Système réticulaire mésencéphalique Stimulation 3/sec	○	↓
	Système réticulaire mésencéphalique Stimulation 150/sec	○	↓
	Hypothalamus postéro-latéral 150/sec	○	↓
Systèmes de détente	Thalamus median 3/sec	↓	↓
Antagonisme Système réticul.	1. Potentiel cortical réticulaire	○	○
Système thalamique méd.	2. Potentiel cortical recrutant	↓	↓
Paléocortex	Hippocampe 3/sec	↓	↓
Néocortex	Stimulation transcalleuse aire somesthésique	○	↓

↑ Activation ↓ Modération

D = Désynchronisation; S = Synchronisation;

○ = Aucun effet

les concordances suivantes: tachypnée et bradycardie, action mixte sur le comportement somatique, tranquillisante initialement et à faible dose, excitante par la suite et à forte dose. Par ailleurs, on observe les discordances suivantes: réactivité au bruit augmentée par la Psilocybine et diminuée par 5-HTP; réaction d'éveil à la stimulation réticulaire ou hypothalamique un peu augmentée ou inchangée après Psilocybine et diminuée par 5-HTP. L'action stimulante de la Psilocybine est imputable surtout à une dépression du système médiothalamique de détente, alors que ce système n'est que faiblement déprimé par 5-HTP. Enfin 5-HTP à forte dose excite le paléocortex hippocampique, cependant que la Psilocybine ne modifie pas son excitabilité, ou modère même la propagation de ses excitations dans le tronc cérébral et le cortex. De cette comparaison, il ressort un antagonisme central partiel entre la Psilocybine et 5-HTP, surtout pour ce qui concerne l'action sur le système réticulaire et le paléocortex hippocampique. Par ailleurs, l'action de la Psilocybine, malgré certains effets psychovégétatifs semblables[6], diffère de celle de LSD, qui active sélectivement le système réticulaire.

Nous remercions ici M. S. Graber pour sa collaboration technique, ainsi que les docteurs A. Cerletti et M. Taeschler (Sandoz AG.), qui ont mis la Psilocybine à notre disposition.

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Summary

Psilocybin, the by-product of which 'Psilocin' has been identified as 4-hydroxy-dimethyl-tryptamine (4-HTP) develops in the waking rabbit a marked activation of the somatic behaviour and of the electrical brain activity. This stimulating action is due to a depression of the mediothalamic recruiting and moderating system rather than to an activation of the reticular arousal system. The electrophysiological effects of 4-HTP are compared with those of 5-HTP.

[6] E. Rothlin, A. Cerletti, H. Konzett, W. R. Schalch et M. Taeschler, Exper. *12*, 154 (1956).

Induction of Multipolar Spindles by Single X-irradiated Sperm

Henshaw[1] studied in some detail the dose-dependent induction of multipolar spindles in sea urchin eggs inseminated with X-irradiated sperm. Since similar figures are known to arise in instances of polyspermy, he sectioned one hundred of these eggs and concluded on the basis of staining that only one sperm penetrated each egg.

In sea urchin eggs the time of loss of sensitivity to radiation-induced mitotic delay and the maximally delayed stage correspond approximately to the time of the splitting and migration of the centrioles when either X-rays[2] or UV.[3] are used. Hence, it is of some interest to confirm Henshaw's multipolar spindle results[1], especially if they indicate damage to the centriole.

Rather than repeating the original experiment a simple method was devised to provide a highly independent and statistically significant test of whether or not the X-ray-induced multipolar spindles arise from polyspermy. The method was to dilute the sperm until only a small fraction of the eggs were fertilized, wash away possible free sperm, and observe the division patterns.

Even assuming that there were no normal block to polyspermy the highest probability that any egg would be multiply fertilized would be the square of the probability of a single fertilization. The probability that some number N of eggs in a series each might be polyspermic would be the N^{th} power of the probability of a single multiple fertilization. Hence, the probability that all cases of multipolar

[1] P. S. Henshaw, Amer. J. Roentgenol. Radium Therapy *27*, 923 (1940).

[2] P. S. Henshaw, Amer. J. Roentgenol. Radium Therapy *27*, 917 (1940); *27*, 907 (1940).

[3] H. F. Blum and J. F. Price, J. gen. Physiol. *33*, 285 (1950). – R. C. Rustad, Ph. D. Dissertation, Univ. of Calif. (1958) and Manuscript in preparation.

Table

Three samples of eggs some of which have been fertilized with sperm irradiated with 90 kiloroentgens of X-rays

Unfertilized	1 Cell	2 Cell	3 or more Cells	$(F^2)^N$
978	15	0	7	
978	14	0	8	
982	12	0	6	
2938	41	0	21	$1{\cdot}7 \times 10^{-71}$

spindles arise from polyspermy may be defined as: $(F^2)^N$, where F is the fraction fertilized and N the number of eggs dividing directly into more than two cells.

«Dry» sperm from the sea urchins *Arbacia punctulata* and *Lytechinus variegatus* were irradiated with a Phillips X-ray machine at 250 K.E.V. and 15 milliamps using a 0·5 g/cm² aluminum filter. Dosages were measured with a Victoreen dosimeter. The doses regularly employed were approximately 30, 60, 90, and 120 kiloroentgens, although higher doses were used in one experiment. The sperm were stored until all irradiations were completed and then each sample was serially diluted in a series of dishes. Then a concentrated suspension of eggs was mixed into each dish. This procedure insured that none of the eggs would ever be exposed to an unusually high local concentration of sperm. After 20 min the eggs were washed several times to remove any free sperm.

Since the mitotic delay increases with increased X-ray dose it was possible to watch a number of fertilized eggs from each dose series divide by selecting suitable microscope fields in samples which were between 1 and 5% fertilized. Samples were taken from each experimental group and fixed in 3% formalin in sea water for later counting.

Many cells in samples which were only 1 to 5% fertilized were watched as they divided directly into three or four cells. The examination of samples with a higher percentage of fertilization and the later counting of fixed cells from the low fertilization percentage groups showed two dose-dependent effects. First, the percentage of multipolar cleavages increased with dose, and second, the number of cells formed by the first division increased with dose.

The critical nature of the polyspermy test is illustrated in the Table. These data represent three samples taken at the time of 30% division of a group of eggs which had been inseminated with sperm receiving 90 kiloroentgens of X-rays. According to the computations there is less than one chance in 10^{70} that these data could be the result of polyspermy. Other tabulated data and observations of uncounted samples indicate that this figure could be made arbitrarily small with continued counting and computation.

This simple experiment provides strong experimental evidence for the support of HENSHAW's[1] original conclusion: multipolar spindles are formed following X-irradiation of sperm and are not a polyspermy effect.

In attempting to develop a working hypothesis from these data it is of special interest to consider the tripolar mitotic figure and other forms of odd-integer numbers of asters, which multiply at a slower rate than in the control cells. These observations appear to define an asymmetrical damage to the centriole replication systems without, however, giving information as to whether this is a direct effect on some component of the astral figure or an indirect effect resulting from damage to some nuclear «trigger» for centriole replication. However, since LORCH[4] found that the asters can multiply at the usual rate following microsurgical removal of the nucleus, it is most reasonable to postulate that the induction of multipolar spindles is the result of direct X-ray damage of the centriole.

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Résumé

Une expérience simple de dilution établit que les clivages multipolaires des œufs de oursins résultent de l'insémination par des spermatozoïdes individuels qui ont été soumis aux rayons X.

Les données obtenues confirment l'hypothèse que le centriole est endommagé.

[4] I. J. LORCH, Quart. J. micr. Sci. *93*, 475 (1952).