

Abstract and file card

*VI LSD No.66 (§102a)

M 500 properties; Siamese fighting fish

M 340 instincts

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Lycergic acid diethylamide (LSD 25): II. Psychobiological effects on the Siamese fighting fish.

Science 120, 990(1954).

PROBLEM: The vegetative, motor and behavioural responses of the Siamese fighting fish (*Betta splendens*) to LSD.

METHOD - DOSAGE: Groups of 4 fish exposed to 100 ml. of concs. of 1 μ g/ml, 5 μ g/ml, 25 μ g/ml and 50 μ g/ml LSD for $\frac{1}{4}$ -6 hours and then transferred to spring water. Effects noted 6 hours after removal from the drug. Studies also made with untreated controls.

RESULTS: Quantitative differences were noted between the responses of adult and juvenile fish. The juveniles were far more sensitive.

The characteristic responses to LSD were: 1) Backward movements, 2) Head up, body usually suspended vertically, 3) "Cartesian diver" effect, 4) "Barrel-roll" effect, 5) "Trance-like" effect, 6) Slow and deliberate movements, 7) "kinking" of body, 8) Lateral postural display and 9) Pigmentation effects.

Recovery reaction: The fish slowly returned to normal from the stupor-like state induced by LSD. Complete recovery within 1 day (low dosage) or 1 week (high dosage). In many cases LSD altered the social behaviour. (This will be reported elsewhere.)

The fish could be roused from stupor by an attacking male and might even counter-attack. After a brief battle there was an immediate relapse into stupor.

Betta has essentially normal activity in spring water containing as much as 25% urine for at least 44 hours. It may thus be possible to detect LSD and other ergot drugs in urine and other body fluids.

Not a single fish was lost owing to the effects of LSD, regardless of the dosage used - even after the injection of 50 μ g into the caudal musculature.

COMMENT: The effects of LSD on aquarium fish were first investigated in our laboratories in 1952 (CERLETTI: unpublished findings), and were found to be practically identical with those reported in the present paper. However, the effect on motor functions is not specific to LSD. The effect of LSD on melanophores in the fish is of greater value as it enables a differentiation to be made between LSD-like substances. Methods are now available (serotonin antagonism of LSD) to demonstrate the presence of LSD in concentrations one thousand times as small as those possible using fish. The distribution of LSD in the organism has been studied by means of this method and the results will be published shortly (LSD exhibit, Federation Meeting,

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(LSD: II. Psychobiologische Wirkung auf siamesische Kampffische)

LSD-Konzentrationen von nur 1 γ /cc Quellwasser rufen bei siamesischen Kampffischen (*Betta splendens*) vegetativ-motorische Reaktionen und Veränderungen des Verhaltens hervor. Die Verf. glauben, dass derart LSD und möglicherweise auch andere Mutterkorn-derivate im Urin und anderen Körperflüssigkeiten nachgewiesen werden können. [Die Wirkung von LSD auf Aquariumsfische wurde erstmals in unseren Laboratorien im Jahre 1952 geprüft (CERLETTI: unveröffentlichte Ergebnisse); sie waren praktisch identisch mit den in dieser Arbeit publizierten. Allerdings ist die Wirkung auf die Motorik nicht spezifisch für LSD. Wichtiger ist die Beeinflussung der Melanophoren beim Fisch durch LSD, da diese gestattet, LSD-ähnliche Substanzen zu differenzieren. Heute stehen Methoden zu Verfügung, welche noch 1000fach kleinere Konzentrationen nachzuweisen gestatten, als es mit dem Test am Fisch möglich ist, nämlich mittels des Serotonin-Antagonismus des LSD. Mit dieser letzteren Methode wurde die Verteilung des LSD im Organismus studiert, und die Resultate gelangen demnächst zur Veröffentlichung (LSD exhibit, Federation Meeting, San Francisco, April 1955).]

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