Ind. J. Physiol. Pharmac., Volume 33, Number 4, 1989

SHORT COMMUNICATION

INGESTIVE BEHAVIOUR OF STARVED RATS AFTER SINGLE INTRAPERITONEAL INJECTION OF FRESH PLASMA FROM WELL-FED RATS

SHASHIKALA D. SAHAKARI, MARJORIE E. ABRAHAM*, FRIDA MONTEIRO, MANJULA R. VARDE AND JOLLY F. MASCARENHAS

Department of Physiology, Goa Medical College, P. O. Santa Cruz, Bambolim, Goa - 403 005

(Received on April 30, 1989)

Abstract : Ingestive behaviour of control and experimental rats following 96 hours of starvation was studied. The control animals were injected normal saline intraperitoneally (I. P.) whereas the experimental animals were injected I. P. with fresh plasma obtained from well fed rats. Having been presented with food 15 minutes after the injections, the food intake (Gms±SEM) of control animals for the first five hours after injection was 6.00±0.44, whereas, the intake in experimental animals for the same period was 0.55±0.05. The food intake was significantly suppressed for the next three days, attaining the normal values by the 4th day.

Since all the rats were starved prior to injection, all of them increased in weight during the four days of study, but the increase seen in the experimental group was much subdued. Therefore the plasma factor, suppresses not only the food intake but also the gain in body weight.

Key words : ingestive behaviour starved rats I. P. fresh plasma well-fed rats

INTRODUCTION

A new endogenous anorexogenic agent was extracted from the plasma of humans and a wide variety of other animal species including rats (1–4). This substance was named satietin by Knoll in 1979 (1). Infusion of human satietin in rats decreased their food intake but, also produced taste aversion (5, 6). This taste aversion and malaise may have been due to a foreign molecule cross-species allergic reaction. For any substance to be considered a physiological suppressor of food intake, it must be demonstrated that the compound is not reducing the animal's food ingestion by making it ill or experiencing malaise. Human satietin may have attenuated the rat's food consumption, atleast in part, because it produced illness or malaise in the animals Therefore Bellinger and Mendel, in late 1987, did demonstrate that rat satietin infused ICV into rats suppressed the animals' food consumption without producing taste aversion (7).

Thus purified satietin was shown to inhibit ingestion when given centrally. We wanted to elicit

*Corresponding Author

if fresh plasma given I. P. can also produce the same results acting peripherally. Therefore we studied the ingestive behaviour of starved rats after a single I. P. injection of fresh plasma from well-fed rats.

METHOD

Male rats grown in our laboratory were used for the experiment. Thirty animals were given Hind Lever pellets and tap water *ad lib* for one week. Care was taken to see that plenty of food and water was remaining in the cage the next morning. After one week these well-fed animals were decapitated around 9.30 a.m. and the collected blood was centrifuged at 4°C in a refrigerated centrifuge.

Forty other animals were starved for ninety-six hours. Only water was provided during that period. These fasted rats were divided into 2 groups. Three ml of the fresh plasma from well-fed rats was injected intraperitoneally (I.P.) into twenty of the fasted rats. The other twenty were injected I.P. an equal quantity of normal saline to serve as controls. Fifteen minutes after injection, the animals, both experimental and control were provided measured quantities of food and water in their individual cages. Food intake for the first five hours and 24 hours after injection was measured to the nearest 0.1 gm. The food intake and body weights were measured every 24 hours for the next three days.

Data obtained was analysed using students 't' test and P value determined. P value of less than 0.05 was considered significant.

RESULTS AND DISCUSSION

The mean food intake (Gms±SEM) of all the 40 animals prior to 96 hour fast was 16.55±0.31. Single I.P. injection of fresh plasma from well-fed rats produced a significant suppression of food intake for the first 3 days after injection. The experimental rats showed a marked decrease in food intake measured for the first five hours after injection (Table I).

TABLE I : Mean food intake in gms±SEM.

	0 day	*First 5 hrs*	*Days*			
			1	*2*	*3*	*4*
Control (n=20)	16.55±0.31	6.00±0.44	12. 6±0.51	14.05±0.91	15. 3±0.63	17.0±0.94
Exptal.		0.55±0.05	7.15±0.71	10. 6±0.61	13.15±0.66	16.2±0.79
P Value		<0.001	<0.001	<0.01	<0.05	

Mean food intake of all 400 rats prior to fasting is shown on zero day.

The normal levels (prior to fasting) of food intake were reached by the fourth day which correlate very well with the work of Bellinger and Mendel (6). Therefore satietin should be the agent responsible for the suppression of food intake seen in our rats since, after a 96 hour fast, the other anorexogenic agents cease to be effective in decreasing the food intake (1–4).

The mean body weight of all the 40 rats prior to injection was 141.11 Gms±4.71. The control rats which received saline injections showed a normal growth pattern. The experimental rats, which received fresh plasma from well-fed animals, showed a much subdued increase in their body weights during the four days of study despite a near normal eonsumption of food (Table II). Bellinger demonstrated a long lasting decrease in body weight inspite of the recovered food intake (6). The difference in body weight is due to the difference in procedure. He injected satietin into rats, which were well-fed, while we injected the rats after they were fasted for 96 hours. Normal rats subjected to food deprivation can maintain growth and minimize weight loss by increasing the efficiency of utilization of whatever food was taken during the 24 hour period (8, 9). Thus the rats in our study showed an increase in body weight which was much less than what was seen in the control group due to the effect of satietin for effect, of satietin on body weight is independent of its effect on food intake (6). This indicates that the plasma substrate can not only suppress food intake but also show attenuation of increases in body weight.

In conclusion, our study shows that fresh plasma from a well-fed rat suppresses independantly the food intake and body weight gain when injected into 96 hour-fasted animals. This effec is probably due to the endogenous anorexogenic agent, satietin, because when rats are fasted for 96 hours, the other anorexogenic agents present in the plasma are found to be ineffective in reducing food intake.

ACKNOWLEDGEMENTS

The authors wish to thank Mrs. Olive Skaria for preparation of the manuscript.

TABLE II : Mean body weight in gms±SEM.

	Days				
	0	*1*	*2*	*3*	*4*
Control (n=20)	141.11±4.71	159.07±7.8	167.64±7.63	172.57±7.52	178.92±3.71
Exptal. (n=20)		146.95±6.71	154.35±6.51	154.10±6.53	161.65±4.82

Mean body weight of all 40 rats just prior to I. P. injections is shown on zero day.

REFERENCES

1. Knoll J. Satietin : A highly potent anorexogenic substance in Human serum. *Physiol Behav* 1979; 23 : 497.
2. Knoll J. Anorectic agents and satietin an endogenous inhibitor of food intake. In : Yoshida H, Hagihara Y, Edashi S, eds. Advances in Pharmacology and Therapeutics. II Vol. 1, CNS Pharmacology, Neuropeptides, New York : Pergamon Press, 1982; 147.
3. Knoll J. Satietin : Endogenous regulation of food intake, In : Costa E, Trabucchi M, Eds. Regulatory Peptides : From molecular biology to function, New York : Raven Press 1982; 501.
4. Knoll J. Satietin : a 50,000 dalton glycoprotein in human serum with potent, long lasting and selective anorectic activity. *J Neural Transm* 1984; 59 : 163.
5. Bellinger LL, Mendel VE. The effect of intracerebroventricularly infused satietin on conditioned taste aversion and feeding in rats fasted different lengths, *Pharmacol Biochem Behav* 1985; 23 : 559.
6. Bellinger LL, Mandel VE. The effect of continuous intracerebroventricular infusion of satietin on ingestion, activity and body weights of rats. *Physiol Behav* 1987; 41 : 505.
7. Bellinger LL, Mandel VE. Intracerebroventricular infusions of rat satietin into rats does not produce conditioned taste aversion. *Physiol Behav* 1987; 41 : 511.
8. Hill JO, Fried SK DiGirolamo M. Effects of fasting and restricted refeeding on utilization of ingested energy in rats. *Am J Physiol* 1984; 247 : R318-R327.
9. Boyle PC, Storlien LH, Harper AE, Keesey R. Oxygen consumption and locomotor activity during restricted feeding and realimentation. *Am J Physiol* 1981; 241 : R392-R397.