EATING PATTERNS AND OBESITY*

BY ALBERT J. STUNKARD, M.D.

Introduction

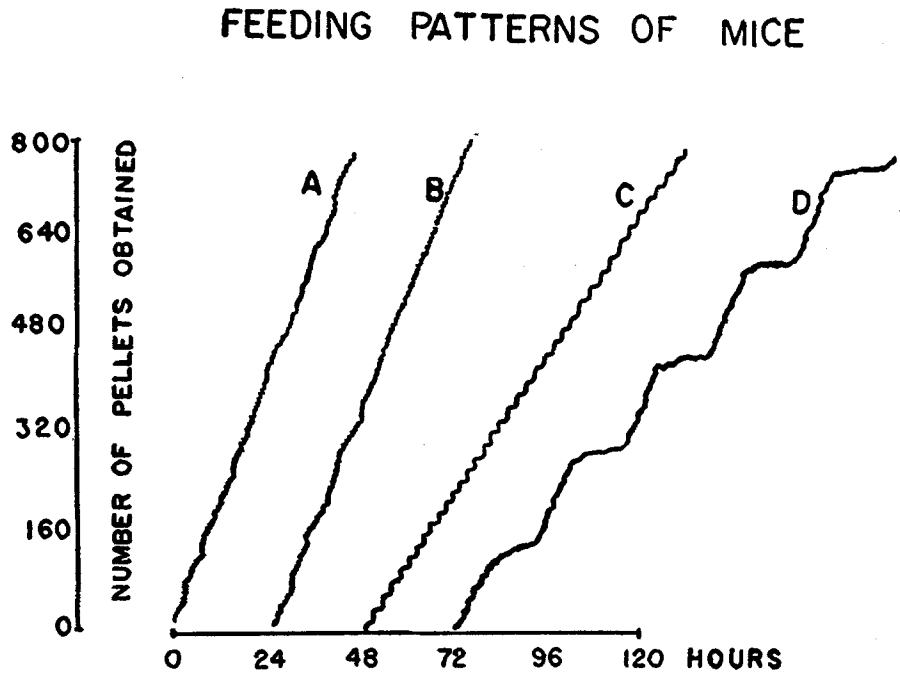
The eating patterns of obese persons have long attracted attention and their potential significance in the pathogenesis of obesity has been recognized. They have not, however, to the writer's knowledge, been subjected to systematic study. The present report makes such an attempt. It briefly reviews investigation which has revealed that different kinds of obesity in the mouse are characterized by distinctive types of feeding patterns. This is followed by a consideration of the variables relevant to analysis of eating behavior in man. These variables are then utilized to delineate three deviant eating patterns which have been observed in obese human subjects. These patterns are illustrated by short case reports, and their significance for an understanding of obesity is discussed.

Feeding Patterns of Obese Mice

A major advance in the understanding of problems of energy balance has been the discovery of methods for the production of obesity in laboratory animals. Within the last 15 years, three distinct techniques have been developed for this purpose: (1) the destruction of the ventromedial nuclei of the hypothalamus by the use of stereotaxic apparatus, (2) the administration of massive doses of gold thioglucose, and (3) the breeding of an obese-hyperglycemic strain of mice.[1] The types of obesity produced by these methods have been intensively studied, and a technique that has been as useful as any in characterizing the various types is analysis of behavior. This is most clearly demonstrated by the use of the Skinner box.[2] Animals confined in this apparatus obtain their food by pressing a bar which causes tiny pellets of food to be introduced into the cage. By registering each press of the bar on a continuous tracing, a graphic record of the frequency of feeding responses is obtained. Use of the Skinner box has demonstrated striking differences between the feeding patterns of non-obese and obese mice, and even between the feeding patterns of mice afflicted

*From the Departments of Psychiatry and Medicine, University of Pennsylvania, Philadelphia 4, Pa. This work was supported in part by the Research and Development Division, Office of the Surgeon General, Department of the Army, under Contract No. DA-49-007-MD-925.

with different forms of obesity.[3] The figure, adapted from Anliker and Mayer, summarizes the results of this study, which delineated three different feeding patterns. Inspection of the curves provides graphic illustration of their characteristics.



The figure is after Anliker and Mayer (Ref. 3). On the ordinate, is recorded the number of pellets of food obtained by the mice in units of time which are designated along the abscissa. Pattern A is that of a hypothalamic-obese mouse, Pattern B that of a gold-thioglucose obese mouse, Pattern C that of an obese-hyperglycemic mouse, and Pattern D that of a normal mouse.

In the first place, the slope of patterns A and B is distinctly steeper than that of patterns C and D. This reflects the fact that the food intake of both the hypothalamic-obese and the gold-thioglucose-obese mice is significantly greater than that of either the hereditary obese-hyperglycemic mouse or the normal mouse. Indeed, it will be noted that the slope of Pattern C is only slightly steeper than that of Pattern D. This characteristic illustrates the finding that the positive energy balance of the hereditary obese-hyperglycemic mouse is largely due to a decrease in energy expenditure, and its food intake is only slightly greater than that of the normal mouse.

A second characteristic of the curves is the absence of diurnal rhythms in the eating patterns of all the obese mice. The 24-hour cycle which is so prominent in the D pattern of the normal mouse is replaced in patterns A and B by the straight line, which indicates an almost constant rate of eating. The significance of the curious coarse grain of Pattern C has yet to be determined.

A third characteristic of the curves indicates that the study of feeding behavior may have predictive as well as descriptive value. At the time that this study was performed, the mechanism of gold thioglucose obesity was still unknown. However, the similarity of patterns A and B, which is indicative of similar feeding behavior of gold-thioglucose and hypothalamic obese mice, suggested that these two forms of obesity were closely related. A short time ago, this hypothesis was validated when it was shown that gold thioglucose produced chemical destruction of the same hypothalamic centers which were mechanically damaged in the hypothalamic-obese mouse.[4]

Eating Patterns of Obese Persons

General Considerations

The eating patterns of obese human subjects can hardly be described with a precision comparable to that which was possible in the case of the obese mice. This is particularly true of such formal characteristics of the patterns as the frequency and amplitude of the eating responses. Nevertheless, the student of human obesity has access to information about feeding behavior which is not available to the animal experimentalist, information which may be of value in understanding the far more variable course of obesity in man. Foremost among these sources of information are the obese person's reports of his experience. These reports have identified three variables which have proved useful in the definition of eating patterns in man. The first of these variables is the presence (or absence) of expressions of self-condemnation in association with a deviant eating pattern. The second variable is the degree of personal meaning or symbolic representation, which may be attached to the eating pattern. Finally, the subject's reports permit an assessment of the degree of stress to which he is being subjected at the time of his unusual eating behavior. It seems likely that these three variables do not exhaust the possibilities of

defining useful parameters for the characterization of eating patterns.

Use of the criteria which have been described has permitted the identification of three distinct patterns of overeating which are summarized in the accompanying table. Such patterns occur much more frequently in persons who are, or have been, obese. They may, however, occur in no more than a minority of obese persons, and even these may eat only a small part of their food in this manner. But when a pattern does enter into the eating behavior of an obese person, it does so with some consistency and may well make a significant contribution to the production and maintenance

Eating Patterns of Obese Human Subjects*

	Periodicity	Brain Damage	Relation to Stress	Apparent Personal Meaning	Associated Self-Condemnation
Night Eating	x	0	x	0	0
Binge Eating	0	0	x	x	x
Eating without satiation ..	0	probably	0	0	0

*A representation in tabular form of the characteristics of the three eating patterns which are described more fully in the text.

of his obesity. Brief descriptions of the three patterns follow, together with short illustrative case reports.

Pattern 1

The first pattern, which has been called the "night-eating syndrome," is characterized by morning anorexia, evening hyperphagia, and insomnia.[5] It occurs during periods of life stress and is often alleviated with reduction in the stress. Investigation has thus far failed to establish any consistent personal meaning of either the morning anorexia or the evening hyperphagia, in the sense that they constitute a symbolic representation or resolution of a conflict. Furthermore, persons manifesting this syndrome generally express little self-condemnation that is related to their overeating.

Case 1

H. G. is a 47-year-old woman who has been observed for five years, during which her weight has fluctuated wildly, from a low of 250 pounds

to an incredible 400, at which time she was unable to care for herself in any way, and, indeed, could hardly move. The onset of her obesity occurred at the age of 30, during a period of great stress following the death of her mother. At that time and, predictably, during periods of life stress thereafter, her food intake followed a night-eating pattern, always associated with considerable gain in weight. She would awake in the morning with no feeling of hunger and no desire to eat. Even when food was urged upon her, and even during periods when she was gaining 10 pounds a month, she would refuse to eat in the morning. She rarely ate before noon, and her food intake even at lunch and during the afternoon was very limited.

She usually began to feel a desire for food in the early evening, and would eat a large supper. Only temporarily sated, she soon returned to the kitchen and consumed larger and larger amounts of food at progressively shorter intervals. During these hours, she was assailed by loneliness and anxiety. To lessen her distress, she kept someone with her as much as possible, and, when she was alone, opened the door and windows, left all the lights burning, and played the radio loudly.

She rarely fell asleep before midnight, and usually awoke within an hour, anxious and hungry. Then she would eat a pint of ice cream and drink a bottle of soda pop. Temporarily satisfied, she would fall asleep for another hour before the cycle was repeated. Often she awoke three or four times a night to eat in such a manner.

The patient was observed several times at night during periods when she was manifesting the night-eating syndrome, and she appeared to be in the throes of an agitated depression. She would pace for hours, tearful and overwrought, intermittently trying to distract herself by reading and knitting, and eating anything she could procure by fair means or foul. In distinction to the diurnal rhythm of the depressive pattern, the storm would have passed by morning and the patient would have resumed the semblance of a jolly fat woman, a role she essayed in her more fortunate moments.

In further contrast—both to the depressive reaction and to the eating pattern which will be described next, there was a notable absence of any overt expression of self-condemnation. This particular woman had, in fact, developed to a very considerable degree the art of transferring blame to the environment, and although she was never frankly paranoid, she was able to keep her associates in a worried defensive posture most of the time.

Pattern 2

Some obese persons who have more than passing acquaintance with the phenomenon have aptly named the second eating pattern the "eating binge." As suggested by this title, such eating often

has an orgiastic quality, and enormous amounts of food may be consumed in relatively short periods. As is the case with the night-eating pattern, binge-eating, too, appears to occur during periods of life stress. In this latter pattern, however, dissociative processes seem to play a more important role. As a result, the relation of the eating binge to a specific precipitating event is likely to be both clearer to an observer and more obscure to the subject than is the case with the night-eating syndrome. Indeed, eating binges frequently seem to have highly personalized, if unconscious, symbolic meanings, and, again in contrast to the night-eating syndrome, they are regularly followed by severe discomfort and expressions of self-condemnation. As might be expected, binge-eating occurs with no particular periodicity.

Case 2

A. A. is a 30-year-old insurance salesman who frequently eats and drinks to excess. Since he periodically goes on brief but rigid diets, he has never become massively obese, but he has remained somewhat overweight most of the time. Every now and then, he overeats in a peculiar and most characteristic manner.

A. A.'s eating binges occur most commonly following some difficulty with his wife which might reasonably be expected to anger him. Instead, he is somehow able to convince himself of her unusual good sense, and go blithely about his business. Then, suddenly, out of the blue, he finds himself doing things which he considers utterly reprehensible. For instance, he might be walking down the street one day and then suddenly find himself in a grocery store, having bought an enormous quantity of food, all without any clear idea of how he had gotten there. At such times, he has a terrifying, uncanny feeling, but once having started on an eating binge, he is powerless to desist. As he explains it, "I don't know what happens. All of my good intentions just seem to fade away, they just don't seem to mean anything any more. I just say 'What the hell!' and start eating. And what I do then is an absolute sin."

After consuming all his grocery purchases in the shortest possible time, he sets out on a furtive round of the local restaurants, staying only a short time in each and eating only a small amount, constantly in dread of discovery. He is not at all sure what "sin" he feels he is committing; he knows only that it is not a pleasurable one. "I don't enjoy it at all. It just happens. It's like part of me blacks out, just isn't there any more. And when that happens there's nothing there except the food and me—all alone."

Following these binges, A. A. experiences awesome distress, and expresses the most bitter self-condemnation, always focused upon his eating, and rarely related to the interpersonal concerns which seem so clearly to precipitate the episodes. At such times he usually embarks upon a reducing regimen of a stringent, impractical character, and usually of very short duration.

The amount of food which A. A. consumes during a major binge may be of the order of 20,000 calories a day, since he has often gained as much as six pounds during one 24-hour period. Although such binges occur rather infrequently, lesser bouts of overeating, which follow the same pattern, seem to play a significant role in his continuing obesity.

Pattern 3

The writer has recently studied an obese man who manifests an eating pattern which might be called "eating-without-satiation." The most striking characteristic of this pattern is that the subject experiences difficulty in stopping eating once he has started, without, however, having shown any prior increase, either in the intensity of feelings of hunger or in the desire to eat. There appears to be no relation of this type of eating to periods of stress, and it manifests no periodicity, occurring in a random manner throughout the day. As in the night-eating syndrome, and in contrast to binge-eating, no apparent personal meaning can be ascribed to this pattern of food intake, and it is associated with no expressions of self-condemnation.

Case 3

Z. W. is a 20-year-old unemployed man who has suffered from massive obesity for the past eight years. His early growth and development had been normal, and he had always been in good health until the age of 12. At that time he suffered a very severe attack of encephalitis which culminated in three days of coma, after evidence of brain involvement. Z. W. recovered from this illness with no manifestations of brain damage that could be detected by either electro-encephalographic or neurological examination. However, psychological testing revealed moderately severe organic brain impairment.

When Z. W. returned home from the hospital his family noticed an unusual eating pattern which has continued to the present time. Whenever permitted free access to food, Z. W. will eat, and he will rarely stop eating as long as any food is available. This occurs from the time he awakes in the morning until he goes to bed at night. There is no evidence of any increased drive to eat; indeed he will not make any particular exer-

tion to obtain food. Furthermore, he is capable of restraining himself, at least over short periods, if he feels that the reasons for so doing are sufficiently compelling. For example, during a program of experimental studies which claimed his interest, he was quite willing to forego any food intake until after noon.

His eating is not associated with any evidence of guilt, and even when he discusses the obvious ill effects of his obesity, he expresses none of the self-condemnation so common among the binge eaters. Except for the inability to control his overeating, Z. W. appears to be relatively well-adjusted to a most difficult life situation. For example, during the first eight weeks after discharge from the hospital following his encephalitis, when food was freely available, Z. W. gained weight at a rate of 10 pounds a week. Although attempts were made then and many times thereafter to control his food intake, he reached a weight of 450 pounds by the time of the hospital admission during which he was studied.

Incidence of Patterns

The major sources of information about the incidence of these eating patterns is the relatively small number of obese persons treated by the author in the six years preceding this writing. Most of them had been referred to a special study clinic as a result of the severity of their obesity, or of difficulty in its management. The selection is therefore a biased one, and permits only cautious interpretation.

The first 25 obese persons treated in the special study clinic revealed an incidence of 64 per cent showing the night-eating syndrome, and the incidence in the next 15 patients was 66 per cent. In a questionnaire study carried out on 100 consecutive, and thus relatively unselected, obese persons in the nutrition clinic of the same hospital, the incidence of the night-eating syndrome was only 12 per cent. It is not clear whether this discrepancy results from different selection of subjects, different methods of collecting information, or both. It is worthy of note that the night-eating syndrome was not reported by any of a group of 38 control subjects with no history of weight disorder.

Since binge-eating has only recently been delineated as a distinct clinical entity, it is difficult to estimate its incidence. However, it is such a dramatic form of behavior that it seems unlikely that it would escape detection during even brief psychotherapy. It is, therefore, worthy of note that there is record of binge-eating in only three of 40 obese persons in the special study clinic.

Two non-obese persons, in whom there is a history of binge-eating, have been observed. Both of these were women, both schizophrenic, and both had been mildly obese at the time of their eating binges. When they were studied, however, both were underweight, and one was suffering from anorexia nervosa. This finding raises the question of whether the small percentage of obese persons who eventually develop anorexia nervosa may perhaps be confined to those who manifest the binge-eating pattern.

The pattern of eating-without-satiation was not present in any of the 40 obese persons treated in the special study clinic. However, it had been observed previously in a schizophrenic man following frontal lobotomy, during a period when he was rapidly gaining weight. Furthermore it was reported to be relatively common in a group of persons with extensive brain damage who were also obese.[6] These observations suggest that the pattern of eating-without-satiation may result from damage to the central nervous system. The site of such damage is still not clear.

Comment

One of the most fruitful developments in our understanding of obesity has been the introduction of the psychosomatic point of view.[7] Study of the lives as well as the metabolism of obese persons has yielded a vast amount of new information and has made it apparent that there are recurring themes in their lives. This finding has led to attempts to formulate a theory of obesity which ascribes primary etiological importance to psychological factors. The significant psychological factor has variously been considered to be: (1) a basic personality structure, (2) an increase in the intensity of certain drives, and (3) a basic psychodynamic conflict.

Despite the rather general acceptance of such hypotheses, none has been validated. Indeed, it has not even been possible to define psychological characteristics of obese persons which will consistently distinguish them from non-obese persons. In view of the apparent usefulness of the psychosomatic approach, it seems worth inquiring into the reasons for the failure.

A problem in much investigation of the stress disorders has been the need to explain too much too soon, and to generalize too broadly from valid but limited findings. Such issues may lie at the root of the failure of the psychogenetic hypotheses in obesity. For, in the ambition to explain all instances of obesity, it

has frequently been assumed, albeit implicitly, that obesity is a single disease with a single etiology. In the sense that the production of obesity requires at least a temporary disorder in the regulation of energy balance, obese persons do have something in common. But any physiological regulation is apt to require a complex piece of apparatus, and one as precise and vital as that controlling energy balance must contain a good many parts which could go awry. There seems to be no reason to assign all the possible disorders of all the possible parts to a single etiological agent. Indeed, the animal experiments described earlier provide excellent grounds for rejecting such a unitary hypothesis, even when dealing with obesity in animals. Such considerations must apply even more strongly in man, where the increased complexity of symbolic processes provides even greater possibilities for disorder.

Such considerations have persuaded investigators in several fields of research to consider obesity to be a symptom of multiple etiology. This viewpoint would appear particularly useful in psychiatric research. For if one did not feel obliged to find common features in every case of obesity, but could restrict one's efforts to members of subgroups of obese persons, it should increase the likelihood of discovering common and distinctive psychological features. Indeed, significant progress has already been made in this direction. By carefully delimiting the sample under study, Bruch, in her classic report on the family frame of obese children, was able to discover distinguishing psychological characteristics of an obese population.[8] Subsequent investigations, which have been similarly restricted to subgroups of obese persons, have met with similar success.[9-11]

These investigations have utilized such relatively nonspecific criteria as age, sex, and occupation in selecting their samples. However, if there are indeed different types of obesity, it would be preferable to select samples by criteria which might be more closely related to differences in etiology. Characteristic eating patterns may provide such criteria and may help to distinguish different types of obesity. For, as has been seen in the example of the obese mice, differences in etiology may be writ large in the behavior of the organism. An investigation of obese persons which seeks to find heretofore unrecognized differences as well as to con-

firm purported similarities may well be the next step in understanding obesity.

Summary

This report deals with certain theoretical and clinical aspects of the problem of overeating and obesity. It considers the advantages, especially in psychiatric research, if obesity were found to represent, not one disease, but the end stage of a variety of different conditions with differing etiologies. Experimentally-induced obesity in animals serves as a model of such a contingency since it can be produced by different methods, which result in different types of obesity. Some of the most striking differences have been found in the field of behavior, a recent study having demonstrated characteristic differences between the feeding patterns of obese and non-obese mice, and even between the feeding patterns of mice afflicted with different forms of obesity.

The eating behavior of obese human subjects is considered from this point of view, and three distinctive eating patterns are described. The first of these patterns is that of the night-eating syndrome, characterized by morning anorexia, evening hyperphagia, and insomnia. The second pattern is that of the eating binge, in which large amounts of food are consumed in an orgiastic manner at irregular intervals. The third pattern is that of eating-without-satiation which has been observed in persons suffering from damage to the central nervous system.

Hospital of the University of Pennsylvania
34th and Spruce Streets
Philadelphia 4, Pa.

REFERENCES

1. Mayer, J.: Genetic, traumatic and environmental factors in the etiology of obesity. Physiol. Rev., 33:472-508, 1953.
2. Heron, W. T., and Skinner, B. F.: An apparatus for the study of animal behavior. Psychol. Rec., 3:166-176, 1939.
3. Anliker, J., and Mayer, J.: An operant conditioning technique for studying feeding-fasting patterns in normal and obese mice. J. Appl. Physiol., 8:667-670, 1956.
4. Marshall, N. B.; Barnett, R. J., and Mayer, J.: Hypothalamic lesions in gold thioglucose injected mice. Proc. Soc. Exper. Biol. and Med., 90:240-244, 1955.
5. Stunkard, A. J.; Grace, W. J., and Wolff, H. G.: The night-eating syndrome. A pattern of food intake among certain obese patients. Am. J. Med., 19: 78-86, 1955.
6. Chapman, L.: Personal communication.

7. Bruch, H.: The Importance of Overweight. Norton. New York. 1957.
8. Bruch, H., and Touraine, G.: Obesity in childhood: 5. The family frame of obese children. Psychosom. Med., 2:141-206, 1940.
9. Dorris, R. J., and Stunkard, A. J.: Physical activity: performance and attitudes of a group of obese women. Am. J. Med. Sci., 233:622-628, 1957.
10. Feiner, A.: A study of certain aspects of the perception of parental figures and sexual identifications of an adolesecent female group. Doctoral dissertation, New York University. 1954.
11. Suczek, R. F.: The personality of obese women. Am. J. Clin. Nutr., 5:197-202, 1957.