



Panel Discussion

Appraisal of Food Intake

MARTHA TRULSON, M.D. (*Moderator*) AND SESSION SPEAKERS

DR. TRULSON (*Boston Mass.*): First, let us discuss sample sizes. Marina Flores made a survey (*Brit. J. Nutrition*) which involved forty families and the diet intakes of thirty-two children. In addition, the results of the examination of seventy-seven children clinically and biochemically complimented each other. In other words, dietetic surveys, clinical surveys and biochemical surveys indicate some interrelationships. We are trying to study a disease (coronary artery disease) in this country in which the incident rate is comparatively small and, therefore, the sample size must be large if any relationships are to be found. Dr. Morris, in his proposed study of English bank clerks, is planning to use between 10,000 and 15,000 men. Dr. Dawber, who is in the audience, is using a large sample. The technics have to differ because the sample size and literacy of the population will influence the survey technic employed.

In the family survey, which is necessary in the undeveloped technical areas for obtaining a base line on nutrition, the intake of the individual is masked. Also, in the dietary surveys carried out in individuals in the United States, calculations of the data on the amounts of nutrients will mask the food pattern and the eating habits of the individual. Two men may average 3,000 calories a day, and consume 4 per cent of their calories in alcohol, 40 per cent in fats and 12 per cent in proteins. One man (Mr. B) may be a respectable citizen who eats a good breakfast and good lunch and has one highball before dinner and a glass of milk before he goes to bed. The other (Mr. A) may grab a quick lunch, sometimes a big dinner and sometimes a small dinner. He has about six eggs a week, all on Saturday and Sunday. He does not drink a highball each night, but in-

stead drinks all his alcohol on Saturday night. Therefore, one is a constant sort of eater (Mr. B) and the other (Mr. A) a nibbler part of the time and a straight eater part of the time. If the diets are only reported in terms of nutrients, these differences are lost. All these factors may be important in the study of certain diseases.

DR. FREDRICK J. STARE (*Boston, Mass.*): I do not recall whether Dr. Cohn mentioned that there have been some suggestions in medical literature, although more often in so-called popular writings, pointing out that the food habits in those parts of the world where coronary arteriosclerosis and arteriosclerosis is high also fit in with the habits of meal planning.

Many years ago I began to write for popular magazines. In an article written for *McCall's* I said I had never seen a fat woman in Bali and that it was interesting to me that the Balinese seemed to be nibbling most of the day.

Dr. Cohn, were the cholesterol data you reported, except those from your colleague who decided to imitate the chicks, all obtained with chicks? As far as I know you have not carried out any of these studies in rats, which are harder to manipulate.

DR. CLARENCE COHN (*Chicago, Ill.*): You are correct in inferring that our studies on cholesterol metabolism have been confined to the chicken. However, Dr. Ruth Okey of California has trained rats to eat a cholesterol-containing diet in a limited time period. Under these conditions, she has observed an elevation in the serum cholesterol levels of female rats, but no change in the cholesterol concentrations of male animals. The cause for these differences are unknown.

I have presented the data from our somewhat limited studies in man. It should be noted, however, that Hashim has reported that

changing individuals from a hospital routine (three meals a day) to a formula regimen fed five or six times daily was accompanied by a decrease in serum lipid levels. This fall in lipids occurred regardless of the type of fat in the formula, although the amount of the decrease varied with the type of fat employed.

DR. STARE: We have a distinguished gastroenterologist with us, Dr. Seymour Gray. Dr. Gray, can you recall the days when you were working with sippy diets at Billings Hospital? Ulcer patients at that time were fed six to eight times a day and a good part of the diet in those days was cream. Can you recall any studies, either from a generation ago or more recent, which indicates that the cholesterol intake of ulcer patients is of the same magnitude as people eating three meals a day? Also, is it not true that ulcer patients who receive these frequent feedings are apt to lose weight?

DR. SEYMOUR GRAY (*Boston, Mass.*): Yes, the ulcer patient was frequently fed every two hours around the clock, which is true even today. It is believed that the incidence of coronary heart disease is greater in the ulcer patient in general. It is also thought that this may be due to the increased fat in the diet. Currently, many ulcer patients are given concentrated skimmed milk. I know of no evidence of weight loss in the ulcer patient fed the same number of calories in six meals instead of three.

DR. TRULSON: Is nibbling not a reversion to the eating habits of primitive peoples who obtained much of their food by foraging? I suppose that would be true of primitive people grabbing at food when they are hungry and as they find it. Dr. Cohn, what specifically constitutes a nibbler in man, the number of meals per day?

DR. COHN: I would like to answer this in two ways because the answers reach the very heart of the problem to which we are devoting our efforts. In the first place, a number of well meaning individuals have indicated to me that man is "normally" a meal eater and that it is against nature to try to make him eat more frequently. By contrast, we can only indicate that *in utero* man is fed from second to second, that after birth he is fed every few hours "on

demand" around the clock, and that because of social, economic and habitual pressures he becomes a meal eater; a meal eater in the sense that he eats one-tenth of his day's calories for breakfast, one-tenth for lunch and four-fifths for dinner. (Can one call this a normal intake of calories considering the portion of the day in which they are expended?) But to argue about man's eating habits avoids discussion of the essential problem, that is, does eating frequency play a role in the epidemiology (hence therapy) of metabolic diseases to which man is prone?

With this thought in mind, we are attempting to answer two questions: (1) Does man react to the frequency of food ingestion as do other animals? (2) Might the therapy (hence prevention) of some metabolic diseases be improved by increasing the periodicity of food intake? For this purpose, we are interchanging our observations in experimental animals and man. Although the data are as yet meager, it appears that enough are available to suggest that the answer to both questions is "yes." One of the studies we are planning is to determine how many meals makes man a nibbler.

DR. TRULSON: What interpretation do you attribute to differences between protein-bound iodine I^{131} uptakes which were all reasonably within the normal range?

DR. COHN: I will be the first to admit that the thyroidal I^{131} uptakes and protein-bound iodine were all in the normal range for man. However, every time we changed from one feeding regimen to another, these criteria of thyroid activity quantitatively changed in the direction that would be predictable from our observations in the rat. Thus, increased thyroidal I^{131} uptakes and protein-bound iodine were seen with increased periodicity of food intake while the converse characterized the fewer meals. All the changes which occurred were within the normal range but we were impressed with the consistency of the anticipated response.

Our 17-ketosteroid studies in man are not far enough along to yield meaningful results. Whether feeding frequency does influence adrenal cortical function remains to be determined. Actually we have only a few select



criteria which we can use to evaluate man's response to different feeding frequencies. We believe that the best and most meaningful ones will be evaluations of body fat and lean body mass in the same individuals when subjected to different periodicity of food intake. For this purpose we are attempting to evaluate total body potassium (as a measure of lean body mass) with the cooperation of Dr. Miller at Argonne Laboratories. It remains to be determined whether anticipated changes will be great enough to detect.

DR. TRULSON: Miss Stefanik, I notice you skirted salt intake in your approximation. Since people are interested in hypertension and thus interested in salt intake, what do you think about trying to ask questions which could be answered meaningfully on intake of salt?

MISS PATRICIA STEFANIK (*Boston, Mass.*): We had a little difficulty in trying to estimate salt intake, as does everyone. We did ask questions regarding habits of salting foods. (1) Do you use salt on foods at all? (2) Do you salt food before or after you taste it? The difference between the Italian and Irishman was that the Irish almost invariably said that they salted their food before they tasted it. I do not know whether this is an indication of Irish housewives' cooking or whether they use an extensive amount of salt.

DR. TRULSON: Miss Flores, there was suggestion in your talk that there is a wide variation in the day to day eating habits in Guatemala which would necessitate a seven-day survey. In the urban survey, when there is a small but regular cash income, is there more day to day stability in diets?

MISS MARINA FLORES (*Guatemala City, Guatemala*): I mentioned specifically that, despite the fact that the diets are monotonous, a wide variation in nutrients exists in these rural areas. The availability of food and money in small towns depends on many circumstances. For instance, one day the family might sell a chicken and, therefore, would have money to buy some beef, pork or milk. During the next week or two, however, it might not have the money with which to buy any food. In the urban areas, where the families are living on low but regular weekly salaries, the diets may

be more stable. On the other hand, since a greater diversity of items is available, there might be a wider variation in their intake.

DR. TRULSON: Dr. Cohn, what was the age of the juvenile diabetic subject studied and how long had he had his disease prior to the study period?

DR. COHN: He was about twenty-five years old and it was my impression that he had the disease for about five years.

If I can make several comments, I think they will answer a number of queries.

How do we go about dividing the diet to increase the periodicity of feeding? Simply by dividing every meal into two portions so that the individual has six feedings daily. An attempt is made to include protein in every feeding since it is our impression that the inability to handle too great a protein load at any one time accounts for a number of our findings. Any meal may be divided into two, three or four small meals and hence provide the six, nine or any number of feedings desired. Perhaps basic to this is forgetting the ingrained habit of three meals.

It should also be pointed out that the transfer of individuals from three to six or more meals a day has been accompanied by an unexpected phenomenon, psychological in nature. Being told to nibble, a number of our volunteer subjects lost their appetite whereas on their own, they often nibbled more frequently than we had asked them to. To us this represents the difference between orderly and disorderly eating.

DR. TRULSON: In Miss Flores' discussion of the Guatemalan dietary intake, did it correlate with the physical status of the children? Many surveys have been made on pregnant women and the effect of diet on the course of pregnancy and on the condition of the baby. Dr. Scrimshaw, has any work been carried out in Guatemala which supports or fails to support the conclusion that you can judge the condition of the baby by the diet of the mother? In England, Dr. Thompson has written that she cannot make these distinctions. This group has not been able to correlate the mother's diet with the physical status of the infant and yet Dr. Burke and her group say "yes." Dr.

Dickman's group in Chicago believed there was less abortion and the baby healthier if the mother was consuming a superior diet. Why are these results so contradictory? Is it due to sample selection or to dietary methodology or to workup of the material?

DR. SCRIMSHAW (*Cambridge, Mass.*): I am sorry to say the data are not yet available although Miss Flores and Dr. Cravioto have initiated a field study which should soon answer the question for a rural Guatemalan population.

MISS FLORES: We are very interested in making this type of study, but I strongly believe, as does Dr. Thomson in England, that it would require the use of the weighing method to ensure greater accuracy because the earlier results are quite confusing. We have just finished checking a study of pregnant and lactating women using the Dietary History Method. From the results, we are convinced that more precise methods must be used in order to arrive at more reliable conclusions.

DR. STARE: I want to ask Dr. Trulson a question more or less along this line. In this country the incidence of cardiovascular disease differs appreciably from one state to another. I believe the cardiovascular incidence varies by 100 per cent or more by states.

My question is whether or not anybody has attempted to show a correlation between the incidence of cardiovascular disease in primarily rural areas with urban areas? Whether there is a difference between Charleston and rural South Carolina? Whether it is low in those parts of Wisconsin from which we came and high in Milwaukee.

DR. TRULSON: There is a great variation from state to state, within urban areas and within nationality groups in urban areas. The over-all food studies that have been carried out by the U.S.D.A. indicate little variation in groups of food throughout these regional areas. Now this masks the individual, as we mention again. However, the variation in over-all food intake is evidently much less than in certain kinds of mortality rates.

The North Dakota study revealed differences in the occurrence rate of coronary arteriosclerosis among the farmers in rural areas and in the people in urban areas. I do not be-

lieve any differences in dietary intake were found to account for this. I think differences were noted in activity and in smoking. I do not know whether the farmer eats more frequently.

DR. DAWBER, has your group attempted any studies on eating habits?

DR. THOMAS R. DAWBER (*Framingham, Mass.*): We had considered that this might be an important factor and we have obtained some information on it. The difficulty encountered in carrying out epidemiologic studies in a city such as Framingham is the lack of variability within the population. I think we will find most of the people are following pretty much the same pattern. At least this has been our finding with everything except possibly total calories. The items are so correlated with total calories that this is about the only major factor we can look at.

DR. TRULSON: Dr. Cohn, have you considered that force feeding might involve the hypothalamus?

DR. COHN: We have actually made only one study that might possibly implicate the hypothalamus. When we found that the¹³¹ uptakes of the force-fed animals were only about 60 per cent of those of the animals eating *ad libitum*, we attempted to determine whether the pituitary or hypothalamus played a role in these findings. Accordingly, we measured the rate of regeneration of the thyroid in rats eating *ad libitum* and in those force-fed after hemithyroidectomy. We observed much better regeneration in the animals with free access to food and we attribute this finding to a decrease in the formation or release of pituitary thyroid stimulating hormone secondary to some unknown influence of feeding frequency on the pituitary or hypothalamus.

DR. STARE: I think the impression one can draw from Dr. Cohn's data and from data along similar lines in the literature is this; it is not just a free ticket to go ahead and nibble all one wants, but to take the normal caloric intake for a twenty-four hour period and divide it into frequent feedings. The point is that nibbling has been shown to cut down on total body weight in experimental animals, but the nibbling includes the same amount of food ordi-



narily eaten three times a day. Some years ago I tried to distinguish between "scientific nibbles" and "common nibbles." The scientific nibble is what you ordinarily would have eaten at lunch or dinner which you eat in the middle of the morning or afternoon or before you go to bed; the common nibble is the extra.

DR. TRULSON: I think we should return to diet methodology. The method to obtain diet information will depend upon whether a current or past intake is required. The past intake may reflect food patterns throughout a particular period, i.e., year or month. If past intake is required, a recall method must be used.

The basis for all dietary studies is a knowledge of the nutrient content of food. Food tables, their preparation and uses, will be discussed in detail later. It is sufficient to say that almost all field surveys and all surveys carried out by the recall method must rely upon the food table. Few survey teams can afford the luxury of chemical analysis during a field study.

In this country new foods are appearing almost daily. This makes the employment of the food table difficult. How can the nutritionist keep errors in calculation to a minimum? There must be a uniform method of recording. Keep the personnel who are preparing the tables for either desk or machine calculations to a minimum. The errors are not generally arithmetic, but appear as the result of interpretation and recording.

I should also mention the preference of some survey teams for weighing of food rather than measuring by some other means. In this country, some workers have found that when women weigh food they record a smaller intake than for those days when they are not weighing the diets. These workers believe that the effect is a change of food intake. In Guatemala someone other than the subject weighs the food, perhaps that makes for less change in food intake.

MISS FLORES: In agreement with your explanation, I think it is a good idea to use weighing of food in the United States as a means of reducing. In my country we try to disturb the living conditions of the family as little as possible, and believe that they do not change their

habits significantly. Probably your experience here is that women eat less when they weigh their food. I think that if you used shorter periods there would probably be less change in the diet and food intake. Since we do the weighing ourselves, we do not have this problem.

DR. TRULSON: Which brings me to the British study, which will be a "mail-order" study. A questionnaire will be mailed to the workers. These investigators are changing from a seven-day survey to a three-day survey of their particular group of bank clerks because there is apparently little variation in their daily intake. They will score the intakes and establish food patterns, as well as calculate nutrient intake. Miss Stefanik, have you thought of this?

MISS STEFANIK: To date we have no material on the quantitative side on this questionnaire because we were primarily interested in frequency of intake; we did ask some questions on the amount of milk and meat consumed and obtained research histories on these men. However, the short cut method to which Dr. Trulson referred has great possibilities since Morris' group is studying 10,000 men. Since they thought that they could not possibly measure the diets of all these men, they compromised by taking a sample of about a hundred men on whom a week-weighed diet was obtained to establish average serving portions; they used this information in estimating amounts from records which are to be sent through the mail. They will have the men record their intake for three consecutive days, count the frequencies of the foods on these menus, multiply by the average portion size which they have found to be characteristic of this group of bank clerks, and thus obtain a total food score.

High correlations were found for single food scores, for example, with milk the $r = 0.95$ between scores and weighed consumption. They hope to improve on correlations for combined fats.

Their method will not be applicable, perhaps, to other groups simply because this is a distinct population and this is characteristic of their eating habits and might not hold



true for other age groups and other countries.

DR. SCRIMSHAW: Is it possible today to obtain the dietary intake for a typical American family? In the underdeveloped areas, as Miss Flores has pointed out, study of the family often is the only sound approach. But is this possible with the way most people now live in the United States?

DR. TRULSON: It must be considered possible because the Department of Agriculture has surveyed thousands of families. I do not see how an urban family is going to account for all its food. The husband eats out at noon; the child has a school lunch; thus it is much more difficult to have a family type of survey going. Even the bank clerks in England, who

seem to have regular habits, eat 12 per cent of their meals away from home.

Now if we may summarize we find that methodology has to be adjusted to the type of survey involved. We can never find a method of measuring a person's eating which will show an exact intake for any long time, because people do not eat alike year after year. Main patterns of eating may be rather exact. We must use the food table intelligently and must realize its limitations and advantages. We must try to find new survey methods which will give us not only the nutrient content of food but also the usage of food, i.e., frequency of eating, amounts and way of preparing food, and time of eating.

