

A STUDY OF THE PHYSIOLOGICAL EFFECT OF CONNECTIVE TISSUE COMPONENTS CONTAINED IN MEAT RAW MATERIALS ON HUMAN DIGESTION

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ABSTRACT

Radiological trials involving humans have revealed that an increase in the connective tissue ratio in meat products, as well as wheat bran dietary fibers added to the latter change the motor-evacuatory function of the gastrointestinal tract. Both substances alter the nature of stomach emptying, and provoke the same effect on the peristalsis of the duodenum and the small intestine.

Thus, in relation to the physiological effect on the motor-evacuatory function of the gastrointestinal tract connective tissue components display a marked similarity with dietary fibers. Yet, there are insignificant quantitative fluctuations between control indices.

INTRODUCTION

At present, a new trend in studying the influence of meat on man's nutrition is the research into detecting synchronization of the physiological effect of animal and vegetable dietary fibers (DF) on digestion. This interest was stimulated by the assumption (Sinclair, 1979; Trowell, 1979) that connective tissue components can provoke a positive effect on digestion. The assumption was substantiated by observations over the Esquimaux who eat no or very little vege-

table food but do not suffer from DF-deficit-related diseases. At the same time, they eat plenty of meat which contains connective tissue components, viz., collagen and glycosaminoglycans (mucopolysaccharides). This fact borne in mind, it was assumed that the latter are similar to dietary fibers as far as their physiological effect on the gastrointestinal tract is concerned. Canine experiments have confirmed a certain similarity between DF and connective tissue components (Rogov et al., 1988). Yet, no such observations have been carried out in humans. The goal of the present effort was to study the motor-evacuatory function of the human gastrointestinal tract following the consumption of meat products containing an elevated content of connective tissues and dietary fibers.

MATERIALS AND METHODS

The trials involved five males aged 22-38 with no pathological changes in the digestive system. Three types of boiled sausage were cooked. The first type contained pure beef; the second contained 4% of finely ground and thermally treated tendons, and the third contained 4% of DF preparations obtained by fermenting wheat bran with the size of particles less than 250  $\mu\text{m}$ . The sausages were reduced to a homogeneous paste. Each product (100 g) was labeled using  $^{113}\text{In}$ . For diagnostic purposes use was made of a "Dyna" scintillation gamma-chamber (USA) connected to a "RDR" 11/34 computer (USA).

All the volunteers received intravenous injections of  $^{111}\text{MBK}$  of  $^{99}\text{Te}$  on an empty stomach. Thirty minutes after a contrast image of the liver and the gallbladder had appeared on the monitor the volunteers ate 100 g of the product under study.

As the food passed, contrast images of the stomach, the duodenum and the small intestine were seen.

The period and nature of food evacuation, as well as the rate of stomach emptying were also followed up by the computer. The information was obtained as photos of the curves reflecting the discovered regularities. In 10 days trials were repeated with another type of sausage.

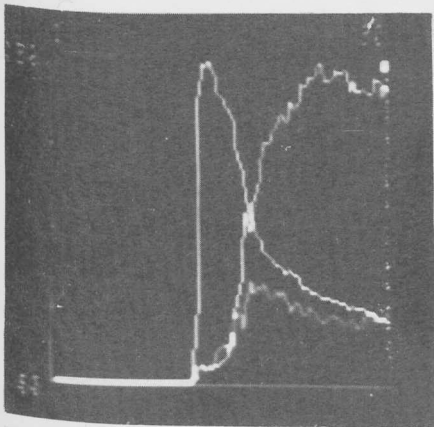
#### RESULTS AND DISCUSSION

Due to the individual specifics of each volunteer the results obtained differed in absolute parameters. Yet, in all of them the parameters of the motor-evacuatory function tended to change in the case of foodstuffs containing connective tissue components or dietary fibers. Figure 1 shows the most typical graphic presentation of the results obtained in one volunteer. Table 1 lists the corresponding quantitative values of the determined parameters.

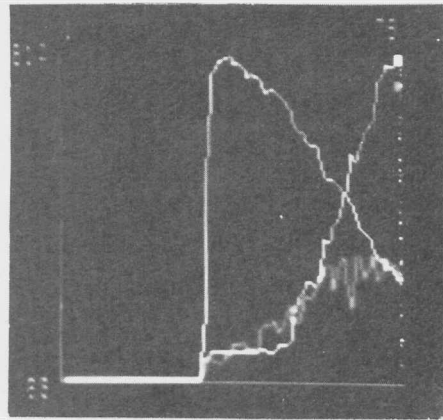
Analysis of the data shows that as the connective tissue ratio in meat products is elevated, or when wheat bran dietary fibers are added to the latter, the motor-evacuatory function of the gastrointestinal tract changes. The curves presented in Fig. 1 are graphic proof of this. Once the control product is consumed the food is evacuated from the stomach at two stages, the rates being 2.52 % min and 0.8 % min (with an average of 1.64% min). In the case of either experimental sample the nature of the curves gets changed to display one-stage emptying. The food is evacuated from the stomach more evenly and at the same rate over the whole period of emptying. As compared to control, both experimental

samples slow down the rate of food evacuation from the stomach and prolong the balanced volume of food in the stomach. The samples also prolong the period of food transport along the duodenum. The sinusoidal nature of the corresponding curves in Fig. 1 testifies to hyperperistalsis of the duodenum following the eating of either experimental sample. It should be noted that quantitative changes in the control indices are less pronounced in the case of tendons. This is likely to be due to the different physico-chemical properties of the substances.

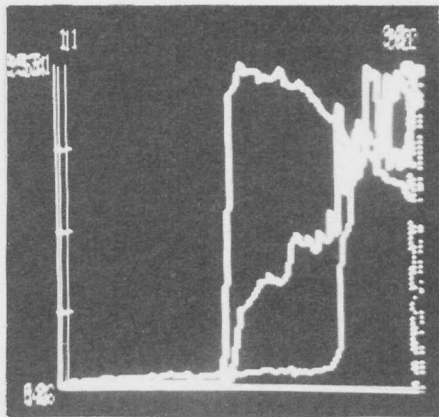
Thus, the trials performed have vividly demonstrated a certain similarity in the physiological effect of connective tissue components of meat raw materials and dietary fibers on the motor-evacuatory functions of the human gastrointestinal tract. The results obtained support the appropriate hypotheses. The conclusions favouring similarity between DF and connective tissues are in good agreement with the results obtained in animal experiments (Rogov et al., 1988). In canine experiments use was made of other foodstuffs. Which is why different regularities in the effect on the motor-evacuatory functions have been obtained. Yet, the unidirectional nature of these changes is doubtless. Further studies are needed to determine physiologically preferable levels of these substances in meat products.



beef muscle (control)

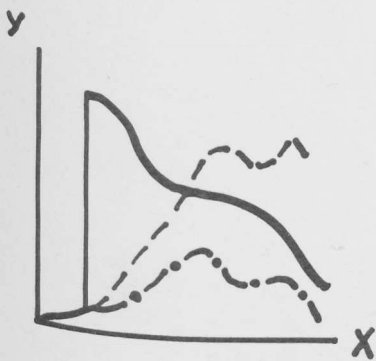


control + 4% of ground and thermally treated tendon



control + 4% of wheat bran dietary fibers

DESIGNATIONS:



X - period from the beginning of the experiment, min;

Y - volume of food in:

— the stomach

-•- the duodenum

--- the small intestine

Figure 1. Effect of connective tissue components and wheat bran dietary fibers on the motor-evacuatory function of the human gastrointestinal tract.

TABLE 1

Nos	Parameters of the motor- evacuatory function	Control	Meat product	
			Control + tendons	Control + DF
1.	Number of stomach emptyings significantly differing in the evacuation rate	2	1	1
2.	The rate of food evacuation from the stomach, % min	1.64	1.57	0.85
3.	Period in which stomach em- ptying dominates over food accession, min	6	8	19
4.	Period of food transport a- long the duodenum, min	10-11	17-18	23-24

## REFERENCES

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