



Figure 3. Growth of *K. fragilis* in cottage cheese whey at 35°C after progressive transfers¹

¹*K. fragilis* plate counts on yeast-malt extract agar. Starter organisms recovered after 4-5 hours from each whey growth. Stored at 38°F for two weeks then used to inoculate the next batch of whey.

A New Custard for the Elderly

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Story in Brief

A new baked custard with fewer calories, higher protein, and a lower fat content was developed and tasted by a group of senior citizens. This custard was dried—when ready to serve, water was added and the custard was baked in the usual manner. The taste panel of senior citizens liked this dried custard just as well as the fresh product. They also preferred the custard which was approximately twice as sweet as normal, but preferred the normal texture as opposed to a thicker one which was more like a pudding.

Introduction

Because of decreasing birthrates and increasing life spans, the average age of the American population is continually shifting upwards. Thus, a larger and larger percentage of our population are being classed as elderly (over 55). A great deal has been written about the problems of the elderly. They often are malnourished, particularly in terms of protein, minerals, and certain vitamins.

While the research reported here deals with nutritional deficiencies of the elderly and the fabrication of foods for them, one must also be aware of the senior citizens' other problems since these limit their food sources. For example, many of them wear false teeth and thus they can't chew certain foods. Many of them are ill, and are on restricted diets. The literature concerning most of these problems has been reviewed (2). The purpose of this research was to develop new foods which the elderly could eat, but which were higher in proteins and some of the other nutrients normally lacking in their diet.

Experimental

As a first step, a group of senior citizens were located who were willing to give information about their food preferences. A survey of this group's eating habits was conducted and the results reported last year (2). The survey pointed out that one of the foods which senior citizens would prefer, was a baked custard similar to that of their youth. However, no such product was available on today's market. Accordingly, recipes were developed which had the appearance and taste of baked custards, but were higher in protein and other food nutrients than the puddings which are currently available (2).

Results

After preliminary work it was found that the main items affecting the food preference of the senior citizens, were the sweetness and texture of custards. Accordingly, a basic recipe was chosen (Table 1), then the sweetness increased by substituting fructose (from honey) for table sugar, increased thickness was obtained by adding gelatin. To assemble the custards, liquid ingredients were first heated to scalding (150°F), the solid ingredients were then mixed together and added to the liquid with stirring. Finally, the eggs were added and the entire custard then mixed into a homogeneous liquid, using a laboratory hand homogenizer or a Waring blender. Aliquots of each mix were then poured into 50 ml beakers, which were baked at 350°F (Figure 1).

Table 1. Composition of OSU custards.

	A (N-N)	B (H-N)	C (N-T)	D (H-T)
	Normal Sweetness Normal Texture	High Sweetness Normal Texture	Normal Sweetness Thick Texture	High Sweetness Thick Texture
Milk	43.0	43.0	43.0	43.0
Skim	24.4	24.4	24.4	24.4
Eggwhite	23.0	23.0	23.0	23.0
Sucrose	6.0	5.0	6.0	5.0
Fructose	0.0	4.0	0.0	4.0
Gelatin	0	0	0.6	0.6
Emulsifier ¹	0.01	0.01	0.01	0.01
Water	3.6	0.6	3.6	0.6

¹Tween 81, Atlas Chemical Co. Polyoxyethylene (5) sorbitan monostearate HLB 10.0.



Figure 1. Baking high protein custards at OSU for the taste panel of senior citizens.

At each tasting period the senior citizens on the taste panel received two plates, each containing two beakers of custard. From each plate the judges were asked to choose the custard they preferred. To complete a trial, six comparisons were necessary (AB, AC, AD, BC, BD, and CD—see Table 1). Thus, with each judge receiving only four samples at a time, three tasting sessions (or 12 comparisons) were necessary to complete the trial in duplicate. To neutralize any differences due to different days, each judge made each of 12 comparisons in a completely random order. In addition, samples were randomized as to their position on the plate (left or right). This randomization, together with the data analysis, was programmed on the computer with the SAS procedure (1). This program called upon a modified Chi-square procedure for data analysis.

Results

When the two variables, sweetness and texture, were compared, the senior citizens on this panel preferred the sweeter product. This custard was almost twice as sweet as that of a normal product. The senior citizens also preferred a normal texture similar to that they had known in their youth, i.e., one which "leaked" water after the first spoonful was taken. The thicker custard had a texture more like the puddings on today's market. When the variables were confounded (i.e., the preferred sweetness combined with the thicker custard) the judges were unable to make a distinct choice (Table 2). The 12 comparisons were repeated three times in duplicate. The first time the custards were made entirely with fresh ingredients, the second time milk powder was substituted for the fresh skim milk, and the third time dried egg whites were substituted for the fresh egg white. Unfortunately, some of these dry ingredients had an aftertaste due to their previous processing, which confused the judges.

Table 2. Preferences for baked custards by senior citizens.

Mix and Description			Mean ¹	Rank
(Mix)	(Sweetness)	(Thickness)		
A	normal	normal	1.52	2
B	high	normal	1.15 ²	1 (best)
C	normal	high	1.78 ³	4 (worst)
D	high	high	1.55	3

¹ Custards were scored by pairs as "1" for the best and "2" for the worst, thus the lower the mean, the better the custard. Means were computed over six possible comparisons: A vs B, A vs C, A vs D, B vs C, B vs D, and C vs D.

² Mix A (high sweetness and normal texture) was statistically different from the other three (probability = 0.001% with 108 degrees of freedom).

³ Mix C was statistically different from mixes A and D at the 0.025% level of probability with 84 degrees of freedom.

This made the data analysis of questionable value.

Therefore, a third trial was conducted, using a single custard (No. B), for which the taste panel had indicated a preference. A large batch of this custard mix was assembled, then divided into two parts. The first part was stored in the refrigerator until baked. The second part was freeze-dried, a procedure which removes moisture at subzero temperatures, and is used to dehydrate many foods today. The dried mix was then reconstituted with water to its original volume, and the two custards were baked in the usual manner. These two custards then were presented to the panel after the usual randomization and duplication. Statistical analysis of the results showed that the senior citizens could tell no difference between those custards made from the fresh or dry ingredients (Table 3).

Table 3. Taste panel preferences for custards made with fresh or dry ingredients.¹

Preferences		Chi Square	Significance
17	23	1.80	P>0.10

¹ Custard B: High sweetness, normal texture. One batch mixed then divided, the first (fresh) was stored for a week, then baked, while the second (dry) was freeze-dried, reconstituted, then baked.

References

1. Barr, J. B. and J. H. Goodnight. 1972. A user's guide to the statistical analysis system. Student Supply Stores, No. Car. State Univ., Raleigh 27607.
2. Mickle, J. B., Olive Pryor, and Wanda Smith. 1974. New Foods for the senior citizen. Okla. Ag. Expt. Sta. Rept. MP-92. p. 284.