# BACTERIOLOGICAL CONTROLS FOR PRODUCING HIGH-QUALITY BREADED SEAFOODS

By Travis D. Love*

This report outlines methods, materials, and the interpretation of results that would permit the average plant technologist to provide valuable data to management on inplant bacteriological controls for breaded seafood products. These data, when properly applied, will help produce a high-quality breaded seafood product with an extended shelf life.

The Pascagoula Technology Laboratory offers a free laboratory refresher course to train the fishery plant technologist. In general, 1 week is enough to acquaint the average graduate (college) technologist or bacteriologist with the special problems and methods for inplant bacteriological controls. Training in the interpretation of results is an important part of this course.

It is essential that plant managers who wish to set up an inplant bacteriological control program employ a technologist or bacteriologist with college training in bacteriology. High school graduates may be trained to make bacteriological plate counts and other determinations; however, their work should be closely supervised by a person trained in theory and in interpretation of results. It would be wasteful to pay an inadequately trained person to use expensive materials and equipment to produce data of questionable validity.

Bacteriological Methods

Officially published methods should always be closely followed to obtain valid results. The plant bacteriologist should have these manuals for day-to-day reference:

Standard Methods for the Examination of Water and Waste Water, APHA, 12th ed., 1965.

Recommended Methods for the Microbiological Examination of Foods, APHA, 1958.

A Manual of Microbiological Methods by the Society of American Bacteriologists, McGraw-Hill Book Co., 1957, New York, N.Y.

A Manual of Determinative Bacteriology, Bergey's, 7th ed., Williams and Wilkins, Baltimore, Md.

Microbiology of Foods, Tanner, Garrad Press, Champaign, Illinois.

Our Laboratory will provide technical advice at all stages of a plant's installation of a bacteriological controls program. Pascagoula bacteriologists have prepared three papers on inplant and laboratory studies on microbiological flora of breaded frozen seafood products: Carroll, Love, Ward, and Waters (1966); Reese, Carroll, Ward, and Garrett (1966, in press); and The Proceedings of the Fresh Iced Shrimp Symposium, April 1966. These papers are free to seafood-processing plants and may be obtained on application to the Laboratory. In addition to our personnel, supervisory personnel of the USDI Fishery Products Inspection Service are also trained to provide information on installing a bacteriological controls program.

Equipment and Materials

Minimum equipment for an inplant bacteriological control program can be obtained for \$1,600-\$2,000, exclusive of laboratory furniture. The following equipment is essential to the proper performance of the necessary counts and determinations:

Microscope, monocular, with oil immersion objectives and eye piece up to 950 diameters (Figure 1).

Incubator (Figure 2).

Large pressure cooker for 15 pounds steam (Micro-matic or Presto are suitable)1/ (Figure 3).

Waring blendor with 12 aluminum screw-cap, 1-quart jars. (Figure 4).

Harvard double-pan trip balance with gram weights.

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1/The use of brand names does not imply endorsement of a firm's products to the exclusion of other products of suitable quality.

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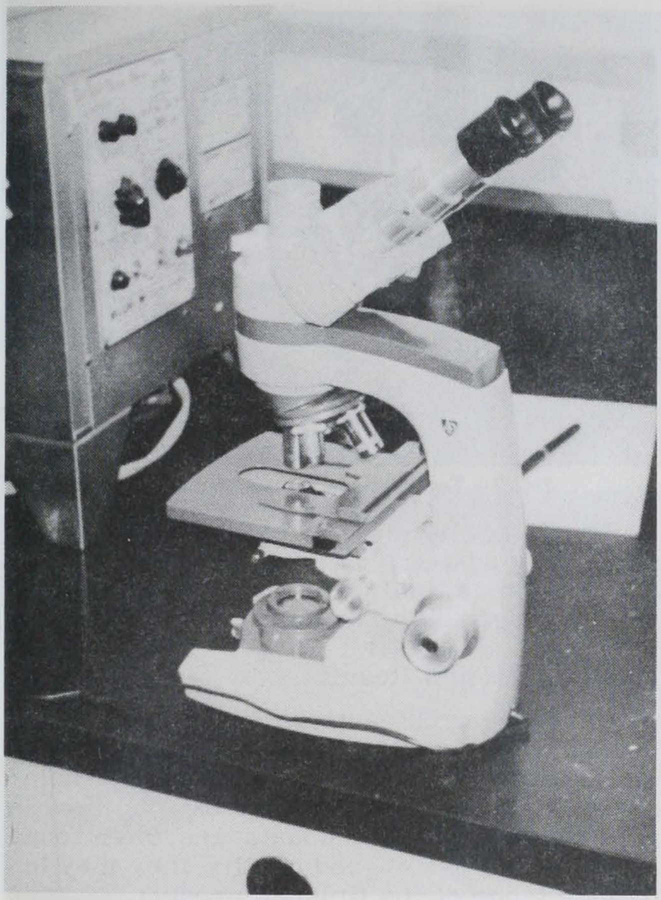

Fig. 1 - Microscope.

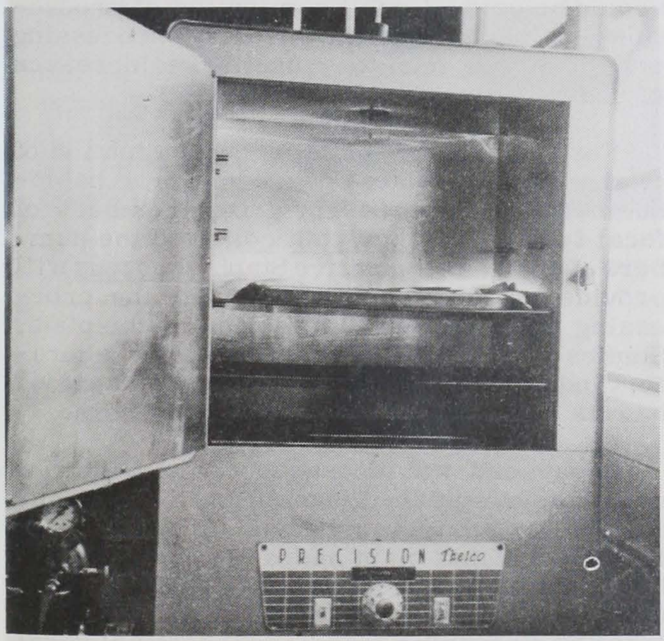


Fig. 2 - Incubator.

Fig. 3 - Pressure cooker.

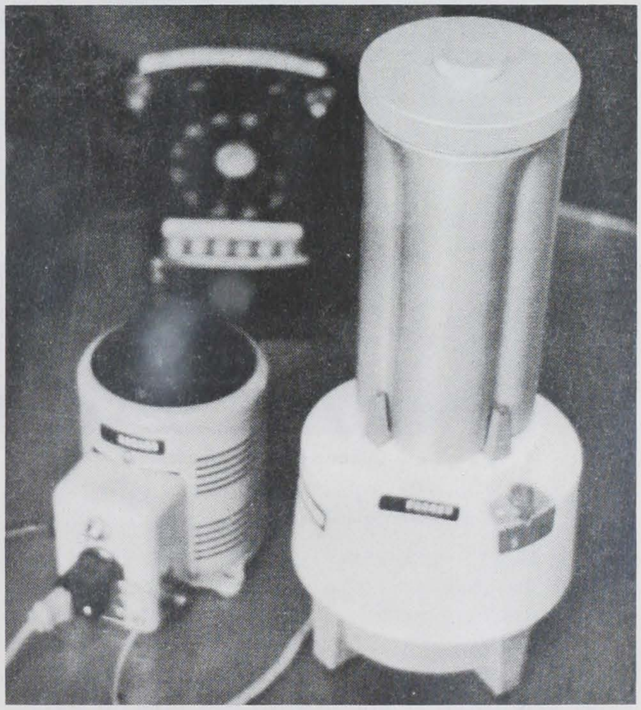

Fig. 4 - Waring blendor.

5 dozen assorted pyrex Erlenmeyer flasks.

100 pyrex dilution bottles, 100 ml.

Quebec colony counter (Figure 5).

Refrigerator, standard, household (Figure 6).

Quick freeze, small household type.

750 test tubes, 13 mm., pyrex, screwcap (Figure 7).

Assorted small items such as micro slides, inoculating loops, cotton, gauze, forceps, stains, counters, stop watch, etc.

Pipette, bacteriological, 100, graduated, 10 ml.

Petri dishes, disposable, plastic, 2 cases, 750 each.

Media, bacteriological 15 pounds assorted (Difco or BBL suitable).

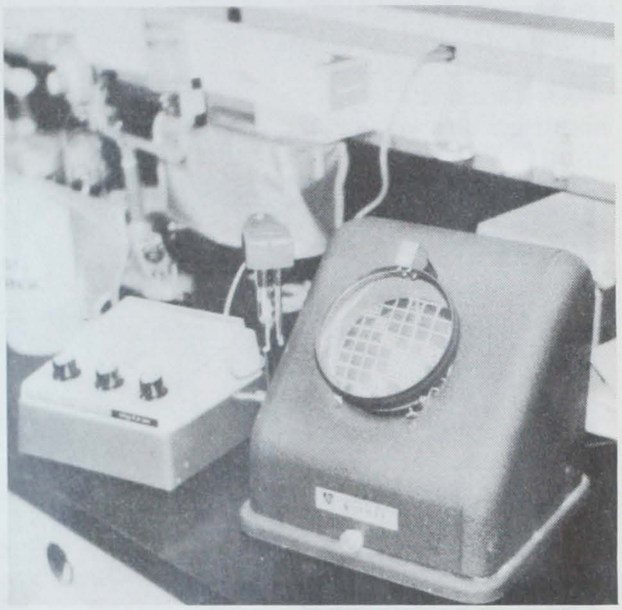

Fig. 5 - Quebec colony counter.

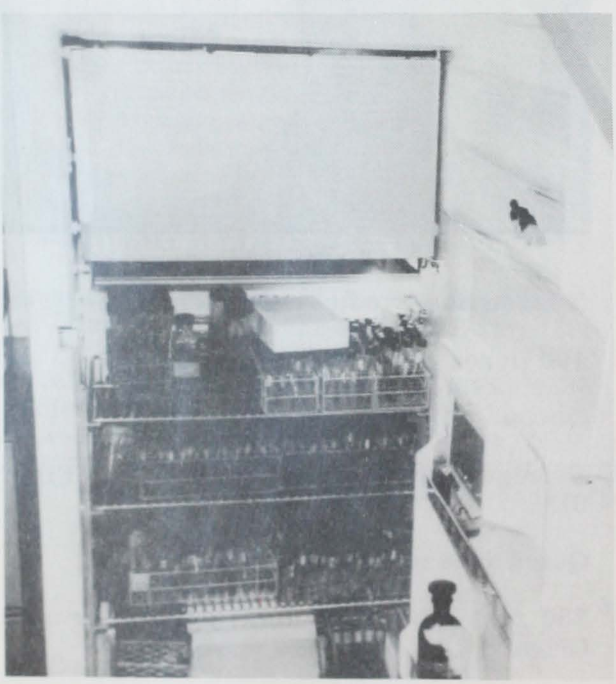

Fig. 6 - Refrigerator.

Fig. 7 - Test tubes and pipette cannisters.

The listed items can be purchased from warehouse stocks of any laboratory supply firm--such as, but not limited to, Curtin, Fischer, Sargent, or Thomas.

Interpretation of Results

One should be cautious in comparing and interpreting results of inplant studies. Bacteriological counts and most-probable-numbers may vary widely because of variations in raw materials. High counts are often found in raw materials of good quality; they may influence those of the finished product.

Increases in total plate counts and the number of bacteria of public health significance should be controlled. Examination of production-line samples will pinpoint processing practices that tend to cause large increases of undesirable microorganisms.

For the average plant, a determination of total aerobic plate counts, most-probable-numbers of the coliform group, numbers of fecal types of Escherichia coli, and the numbers of coagulase-positive Staphylococcus will provide sufficient data to evaluate the processing practices and sanitation of the plant. Studies at the Pascagoula Technology Laboratory indicate that each frozen breaded seafood has its own limited microbiological flora.

Because of the increased use of bacterial counts as an index of sanitation by State and Federal regulatory agencies, it is of prime importance that plant managers control, and have data on, the bacterial flora of their products. The State and Federal regulatory agencies are discussing mandatory bacteriological standards for all frozen foods. We may find, however, that blanket standards proposed for frozen raw foods are difficult to comply with in commercial practice. So plant managers and the Bureau of Commercial Fisheries ought to obtain data on production-line samples that will make possible the formulation of satisfactory standards for each product.

LITERATURE CITED

CARROLL, BOBBY J.; TRAVIS D. LOVE; BENJAMIN Q. WARD; and MELVIN E. WATERS.
1966. Microbial analyses of frozen raw breaded shrimp, Fish. Ind. Res., 3(3).

REESE, GLADYS B.; BOBBY J. CARROLL; BENJAMIN Q. WARD; and EPHRIAM S. GARRETT, III.
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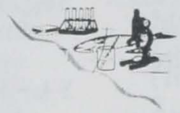

## CANNED SALMON PLENTIFUL AND NOURISHING

Salmon has helped nourish members of the human race since prehistoric times. Today, thanks to modern canning methods, salmon is widely known as a cosmopolitan food fish. Its delicious flavor, nutritional value, and the convenience of the easy-to-store, easy-to-use can are three good reasons for serving salmon frequently, says Harold E. Crowther, Acting Director of the Department of the Interior's BCF.

A heavy catch of salmon in 1966 will result in plentiful supplies of canned salmon during the coming Lenten season.

This recipe, developed by BCF's home economists, demonstrates a simple-to-prepare canned salmon entree.

For menu suggestions and some helpful hints in serving this tasty fish, write for the popular Bureau recipe booklet, "Take a Can of Salmon." This 17-page booklet, in color, is free from the Canned Salmon Institute, 618 Second Ave., Seattle, Wash. 98104.

### SALMON CHOWDER

- 1-pound can salmon
- 1 chicken bouillon cube
- 1 cup boiling water
- $\frac{3}{4}$ cup chopped onion
- $\frac{1}{2}$ cup chopped green pepper
- 1 clove garlic, finely chopped
- $\frac{1}{4}$ cup butter or other fat, melted
- $\frac{1}{3}$ cup salmon liquid
- 1-pound can tomatoes
- 1 can (8 ounces) whole-kernel corn
- 1 cup sliced okra (optional)
- $\frac{1}{2}$ teaspoon salt
- $\frac{1}{4}$ teaspoon thyme
- Dash pepper
- 1 whole bay leaf

Drain salmon, reserving liquid. Break salmon into large pieces. Dissolve bouillon cube in boiling water. Cook onion, green pepper, and garlic in butter until tender. Combine all ingredients and cook for 15 minutes or until vegetables are tender. Remove bay leaf. Serves 6.