

SOLUS SALMONELLA ELISA

Immunoassay-Based Test System for
the Detection of *Salmonella*
in Foods and Environmental Samples

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Certifying Body: AOAC





This method's performance was reviewed by AOAC Research Institute and was found to perform to the manufacturer's specifications.

This method has been evaluated in the AOAC® *Performance Tested Methods*SM Program for the detection of *Salmonella* spp. in raw chicken breast, raw salmon fillet, bagged romaine lettuce, shredded cheddar cheese, instant non-fat dry milk, shell eggs, raw beef trim (375g), stainless steel and polystyrene environmental surfaces. Solus *Salmonella* ELISA method has been compared to the USDA-FSIS MLG 4.08 and FDA/BAM Chapter 5 reference methods, as applicable to matrices.
(AOAC® *Performance Tested*SM License no. **051601**).

1. INTRODUCTION

Solus *Salmonella* ELISA provides a negative or a presumptive positive result from 2 enrichment steps within 36 to 44 hours, including the assay time. Some strains of *Salmonella enterica* subsp. *arizonae* are not detected by the Solus *Salmonella* ELISA method.

2. INTENDED USE

Solus *Salmonella* ELISA is for the detection of *Salmonella* spp. in selected foods and production environmental samples. The test method is easy to perform, however it requires laboratory facilities plus qualified and trained personnel. Basic training is recommended to first time users and is given by Solus Scientific Solutions Ltd.

Using the method includes compliance with Good Laboratory Practices (refer to EN ISO 7218).

3. REAGENTS PROVIDED

Most kit components are supplied stabilized and ready to use at working concentration with only the Washing Buffer concentrate requiring dilution. Each kit contains sufficient material for 1 (SAL-0096S) or 5 (SAL-0480S) x 93 determinations, plus controls. The kit expiry date is displayed on each product label.

Component	Appearance	Volume		Comments
		SAL-0096S	SAL-0480S	
Assay plate	96-well microplate with removable/breakable strip format	1	5	Wells coated with antibodies against <i>Salmonella</i> spp.
Negative control	Pale orange liquid. Green label.	3ml	10ml	Working concentration. Contains diluent with preservative.
Positive control	Black liquid. Red label.	3ml	10ml	Working concentration. Contains heat-killed <i>Salmonella</i> in diluent with preservative.
Conjugate	Colorless/very pale straw-colored liquid. Orange label.	11ml	60ml	Working concentration. Contains horseradish peroxidase antibody conjugate in diluent with preservative.
Substrate	Colorless/very pale blue liquid. Blue label.	11ml	60ml	Working concentration. Contains 3, 3', 5, 5'-Tetramethylbenzidine (TMB), hydrogen peroxide and stabilizers.
Stop solution	Colorless liquid. Yellow label.	11ml	60ml	Working concentration. Contains 0.2M sulfuric acid.
Washing buffer concentrate	Colorless/yellow/orange liquid. White label.	10ml x 6	60ml x 5	Concentrated. Dilute before use.

4. MATERIALS AND EQUIPMENT REQUIRED BUT NOT PROVIDED

Refrigerator at 2-8°C	Vortex mixer
Deionized or distilled (DI) water	Timer
Buffered Peptone Water (BPW)	Incubator at 37±1°C
Rappaport Vassiliadis Soya (RVS) broth or R10 modified RVS	Incubator at 41.5±1°C
Sponge samplers or swabs soaked in suitable neutralizing buffer (e.g. Lethen broth or HiCap buffer)	Tubes for sample boiling (e.g. 5ml polypropylene rimless tubes 12x75mm)
Measuring cylinders for various volumes (e.g. 250 ml, 1L)	Heating apparatus (e.g. heat block) capable of heating to 85-100°C
Sterile 10ml test tubes suitable for selective enrichment	Pipettes and tips (1ml; 0.1ml)
Homogenizer (or similar apparatus) and bags	Dynex DS2 or Microplate washer and microplate reader with 450nm filter
3ml transfer pipettes (sterile)	Autoclave for decontamination of samples

The following agar plates are recommended for confirmation of the positive ELISA screening results according to FDA regulated matrices, XLD (Xylose Lysine Deoxycholate agar), BS (Bismuth sulfite agar), HE (Hektoen agar), or according to USDA-FSIS regulated matrices, XLD, XLT4 (Xylose Lysine Tergitol 4 agar) or BGS (Brilliant Green Sulfa agar).

5. REAGENT PREPARATION

5.1 Wash Buffer:

Prepare the following in a clean vessel.

SAL-0096S	SAL-0480S
Add 10ml (1 bottle) of the washing buffer concentrate to 240ml DI water and swirl to mix.	Add 60ml (1 bottle) of the washing buffer concentrate to 1440ml DI water and swirl to mix.

5.2 Culture Broth (growth medium):

- Prepare Buffered Peptone Water (BPW) following manufacturer's instructions. Allow to cool to ambient temperature (18-25°C) before use in testing.
- Prepare Rappaport-Vassiliadis Soya broth (RVS) following manufacturer's instruction and dispense into sterile 10ml tubes. Allow to cool to ambient temperature (18-25°C) before use in testing.

Note: RVS preparation shall be done according to supplier's instructions in order to obtain the required selectivity. Any mis-preparation might end up in generating false positive results with Solus *Salmonella* ELISA.

6. SAMPLE PREPARATION AND ENRICHMENT- standard method

6.1 Pre-enrichment for food samples

- **25g sample** (raw chicken breast, raw salmon fillet, bagged romaine lettuce, shredded cheddar cheese, instant non-fat dry milk, shell eggs). Homogenize 25g of the sample to be tested, if necessary by homogenizer, in 225ml of BPW and incubate for 16-20 hours at 37±1°C.
- **375g sample** (raw beef trim). Homogenize 375g of the sample to be tested, if necessary by homogenizer, in 1.5L of BPW and incubate for 16-20 hours at 37±1°C.

6.2 Pre-enrichment for environmental surfaces

- Use sterile swabs or sponges, pre-moistened in neutralizing broth. Sample the environmental surface then enrich swab in 10ml, or sponge in 100ml, of BPW for 22-26 hours at 37±1°C.

6.3 Selective enrichment

- Transfer 0.1ml of the enriched sample into 10ml of RVS broth and incubate for 18-24 hours at 41.5°C±1°C.

Ensure that the bench processing time of samples is kept to a minimum and that transfer to 41.5°C incubator occurs as soon as possible. This is important to avoid extensive growth of competing organisms.



7. POST ENRICHMENT HEAT INACTIVATION

- 7.1. When the sample incubation period is completed, transfer 1-2ml aliquot (avoiding particulates) to a sample boiling tube (e.g. 5ml polypropylene tube).
- 7.2. Heat the aliquot to 85-100°C for 15-20 minutes in the tube. After heating, allow the sample to cool to ambient temperature (18-25°C). This may be accelerated by placing the tubes in cold tap water for ~5 minutes.

The non-heat-inactivated samples should be kept for verification until ELISA results are obtained. These samples should be kept at 41.5±1°C if the ELISA test is to be carried out within 2 hours. If this is not possible, keep the broths for up to 72 hours at 2-8°C prior to the ELISA test.

8. ELISA ASSAY PROCEDURE

- 8.1. Take test kit from storage at least one hour before use to allow the components to reach ambient temperature (18-25°C). Determine the number of wells required for the test. Take required number of strips from the pouch and fit them to the frame provided. Unused strips should be returned to the pouch and stored at 2-8°C.
- 8.2. Prepare Wash Buffer as detailed in section 5.1 for the kit size being used.
- 8.3. Leave the first well in the strip empty to serve as a 'blank' for measuring the absorbance of the substrate.
- 8.4. Pipette 0.1ml of Negative Control (Green label) into the second well.
- 8.5. Pipette 0.1ml of Positive Control (Red label) into the third well.
- 8.6. Pipette 0.1ml of each heat-inactivated sample separately into consecutive wells in the strip. If there are wells left over at the end of a test strip the Positive or Negative Controls may be repeated. †
- 8.7. Incubate the plate (containing the strips) at 37±1°C for 30-35 minutes.
- 8.8. After incubation, aspirate the contents of the wells, removing as much of the liquid as possible. Wash the wells 5 times with wash buffer ensuring complete filling and emptying of the wells through each wash cycle. The washing technique is critical to assay performance, hence it is recommended to use a microplate washer instrument.
- 8.9. Pipette 0.1ml of Conjugate (Orange label) into all wells except the 'blank'.
- 8.10. Incubate the plate at 37±1°C for 30-35 minutes.
- 8.11. Repeat the wash cycles as detailed in section 8.8
- 8.12. Pipette 0.1ml of Substrate (Blue label) into all wells, including the 'blank' well.
- 8.13. Incubate the plate at ambient temperature (18-25°C) for 30-35 minutes in the dark.
- 8.14. After incubation, stop the reaction by adding 0.1ml of Stop Solution (Yellow label) to all wells including the 'blank' well. The stop solution will cause any blue color in wells to change to yellow.
- 8.15. Read the optical densities of wells within 10 minutes in a plate reader using a 450nm filter. Before reading, inspect the wells for air bubbles and, if present, burst with a needle. The reader should be zeroed against the 'blank' well before the other wells are read. Do not use reference filter. The use of automatic ELISA equipment is preferred and should be set up and validated to this protocol.

† If using the Dynex instrumentation, care must be taken to avoid bubbles in the sample and reagent tubes, or films forming across the tube above the level of the liquid. It is essential to check that the system has successfully pipetted samples into the assay plate before proceeding.

9. INTERPRETATION OF RESULTS

Results are expressed as optical density (OD₄₅₀) measurements using a microplate reader.

Acceptance criteria:

Negative Control OD ₄₅₀	< 0.100
Positive Control OD ₄₅₀	> 0.500

The value of the blanking well (usually A1 when processing manually) should always be subtracted from all other results. Should the value of Negative or Positive controls not meet these criteria, the test is not considered valid and must be performed again.

Samples with OD₄₅₀ readings of < 0.200 are considered negative in which case the analysis is complete, the results may be reported and the corresponding non-heat-inactivated samples may be discarded following local regulations/guidelines.

Samples with OD₄₅₀ ≥ 0.200 are considered presumptive positive for *Salmonella*. Presumptive positive results must be verified using a recognized culture method.

10. CONFIRMATION OF POSITIVE RESULTS FROM SALMONELLA ELISA

- For USDA-FSIS regulated matrices (i.e. raw beef trim and raw chicken), streak non-heat-inactivated sample onto 2 agar plates (XLD, XLT4 or BGS) and incubate plates at 35°C±1°C for 24 hours. Pick up to 3 typical colonies from each plate and perform confirmation according to MLG 4.06. Typical colonies vary according to the agar plate: pink and opaque colonies with a smooth appearance and entire edge surrounded by a red color for BGSA; black colonies or red colonies with or without black centers for XLT4; pink colonies with or without black centers for XLD.
- For US FDA regulated matrices (raw salmon, lettuce, cheese, dry milk, shell eggs, stainless steel and polystyrene environmental surfaces), streak non-heat-inactivated sample onto 2 agar plates (XLD, BS or HE) and incubate plates at 35°C±1°C for 24 hours. Pick 2 or more typical or atypical colonies from each plate and streak to TSI and LIA. Incubate at 35±2°C for 22-26 hours and perform confirmation according to FDA BAM Chapter 5. Typical colonies vary according to the agar plate: brown, gray or black colonies which may contain a metallic sheen for BS; blue-green to blue colonies with or without black centers for HE.

11. KIT STORAGE AND EXPIRY

The kit and any unused kit components should be stored at 2-8°C. DO NOT FREEZE. The kit expiry date is displayed on the kit box plus all of the kit components within the box. Any unused diluted wash buffer can be stored for up to 10 days if kept at 2-8°C. Any unused microplate strips should be returned to the foil pouch with the desiccant sachet and the seal closed completely, then stored at 2-8°C.

12. SAFETY

While the procedures detailed are simple and easy to perform, they require laboratory facilities with qualified personnel trained for the handling of potentially pathogenic organisms. Training is recommended to first time users and is provided by Solus Scientific Solutions Ltd.



- The Stop Solution contains sulfuric acid which is corrosive. Wash immediately with large quantities of water if the solution comes into contact with skin or mucous membranes.

As a guide, the following precautions should be taken as a minimum:

- Protective clothing should be worn including lab coat, safety glasses, mask and gloves where appropriate.
- Do not pipette by mouth.
- Avoid contact with the skin.
- Do not eat, drink or apply cosmetics in the laboratory.
- Follow all applicable local, state/provincial, and/or national regulations on disposal of biological wastes.

13. PRECAUTIONS FOR OPTIMAL PERFORMANCE

- Reagents are provided at fixed working concentration. Optimum sensitivity and specificity will be reduced if reagents are modified or not stored under the recommended conditions.
- Do not mix different lots of reagents.
- Avoid microbial contamination of opened reagent bottles.
- Ensure that no cross contamination occurs between wells.
- It is essential for proper performance of the test that the enzyme-conjugated antibody is not allowed to contaminate other reagents and equipment.
- Ensure that kit components are not exposed to temperatures greater than 40°C.
- Solutions containing sodium azide should not be used for cleaning of equipment, especially washing devices (the peroxidase enzyme used in the kit is inactivated by sodium azide).
- Do not use for diagnostic purposes of medical specimens.

14. MSDS INFORMATION

Material safety data sheets (MSDS) are available for this test on request.

15. WARRANTY

Accurate results depend on the proper use of the kit by following the instructions for use carefully. If the kit fails to perform according to specification, please contact:

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Summary of changes

Change date	Issue Number	Change Summary
Jan2020	1	Rebranding and combining of Solus Salmonella ELISA – Insert 26 – Issue 3 – 11/18 (AOAC) and Solus Salmonella ELISA – Insert 27 – Issue 3 – 11/18 (AOAC) into a single document.

NOTE: Minor changes (e.g. formatting, grammar, correcting typographical errors) are not included in the summary of changes.

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