Achievement of Market-Friendly Initiatives and Results Program (AMIR 2.0 Program)

Funded by U.S. Agency for International Development

Analytical Instrument Installation and Training
Aqaba Food Testing Laboratory
Ministry of Health, Jordan

Final Report

Deliverable for PSPI Component, Workplan Activity No. 531.6
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This report was prepared by George Miller, in collaboration with Chemonics International Inc., prime contractor to the U.S. Agency for International Development for the AMIR Program in Jordan.

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EXECUTIVE SUMMARY

Upgrading of the technical competence in the MOH Aqaba Food Laboratory will bring the laboratory facility up to international standards. The operation of newly installed instruments will give the laboratory analytical methodologies that will ensure the quality and safety of foods imported into the new Aqaba Special Economic Zone (ASEZ).

Previous assessments and consultation of this laboratory noted analytical work lacked the assurance of high quality. An Analytical Quality Assurance (AQA) Program was established. Modern analytical laboratory instrumentation has been delivered. Installation and training on the new instrumentation has been completed.

Training of the analytical staff followed the installation of the equipment. This opens the way for a new way for a new analytical assessment of foods in Jordan.

INTRODUCTION AND BACKGROUND

The AMIR Program in Jordan is a USAID-funded activity and as a part of its overall program, it is committed to assisting Jordan in establishing a risk-based system of import food control. Such a system ensures food safety as well as providing, Jordan with better access to world markets. Most of that access is through the Port of Aqaba on the Red Sea. Aqaba is Jordan's only seaport and about 80% of all Jordan food imports enter Jordan by ship at that point. The remaining food imports arrive in Jordan via land through customs ports on its borders with neighboring countries.

As of February 2001, the Aqaba Special Economic Zone (ASEZ) was established and includes the Port of Aqaba and 375 km^2 of the surrounding area. The ASEZ Authority is the governing body for the Zone and is responsible, among other things, for ensuring the quality and safety of foods imported into the Zone. The Food Testing Laboratory of the Ministry of Health in Aqaba provides the analytical service for samples of foods offered for import at the Port.

The AMIR Program arranged for an earlier assessment review of the Aqaba Food Testing Laboratory. That review recommended certain analytical instruments and equipment be purchased to upgrade the Aqaba laboratory. This was completed. A recommended analytical quality assurance program was established for the food-testing laboratory.

The Aqaba food laboratory AQA Program has been initiated and is in place. Implementation of Chapter 7, Analytical Methods lacks the validation of methods as per defined in "performance testing". The laboratory needs to selective its validate its analytical potential. To do so requires adding new methodology to the laboratory profile.

The consultant met with the Aqaba Food Testing Laboratory and identified methodology to be included in the AQA Program. Immediate startup of these new method capabilities will upgrade food import coverage.

The remaining report discusses needed instrumental equipment, training needs, new methodologies and specific support material needs.

RECEIPT OF ANALYTICAL INSTRUMENTS AND EQUIPMENT, AQABA, JORDAN

The consultant has witnessed the successful operation of the analytical instruments purchased by USAID under the AMIR Project at the Ministry of Health Food Testing Laboratory in Aqaba, Jordan.

Minor adjustments were made in items that demonstrated inoperative functions. A reverse osmosis distillation unit was in need of higher water inlet pressure to function. A fan blade was balanced in a laminar flow hood.

All parts lacking in the initial installation of the HPLC and GC units were successfully installed. All data-reporting units were operational.

Training sessions were conducted by the instrument vendors and the laboratory analytical staff was guided through instrument operations.

Letters of transfer of equipment/items from Chemonics International USAID – AMIR Program have been successfully completed with the Jordan Ministry of Health.

RECOMMENDATIONS AND CONCLUSIONS

For the purpose of implementation of AQA Program and to assure operational growth and success, the Consultant has identified various food analytical methods to upgrade the laboratory. These methods all utilize the new instrumental techniques now added to the laboratories profile. These new methodologies are listed in Annex 3, Suggested Methodology.

To enhance a rapid validation of these methods, a list of supplies, consumables, and accessory equipment, has been proposed and listed in Annex 4 New Methodology Support Materials. It is **recommended** that these items be purchase to support this program goal.

It is **recommended** that immediate validation be done on all methods to be included in the AQA Analytical Methodology Chapter 7.

It is **recommended** that analytical time be allotted to food samples matching the recommended new chemical/instrumental methodologies.

It is further **recommended** that the Import Inspection Group be periodically advised of the Laboratories new validated analytical potentials.

It is **recommended** that analytical recoveries be initiated with each new chemical analysis. Validation of the laboratory and the method, with meaningful recovery data, will increase the value of all sample results. This is a standard international practice.

It is **recommended** that adding an inlet pressure pump to provide line pressure for operation further enhance the reverse osmosis distillation unit. It is also **recommended** that an ultra violet irradiation unit and an ion exchange unit be added to the outlet flow after the storage tank. This treated water will then meet all the new stringent analytical criteria.

The Consultant evaluated the professional depth of the Laboratory staff and **recommends** addition of a professional of a higher of specialization in analytical chemical analysis. New upgraded instrumentation and methodology will need analytical and problem solving skills.

It is **recommended** that further training be received in analytical chemistry techniques and chemical methodology problem solving. Analytical staff members must be exposed to the experiences of other analytical chemists. Cross training with other laboratory sites are **recommended** and might included:

1. Royal Scientific Society, Amman, Jordan
2. National Research Center, Baga and Amman, Jordan
3. Medical Inspection Laboratory, Amman, Jordan
4. University of Jordan Consultation Center, Amman, Jordan
5. Varian Corporation, or other instrumental firms, Regional Courses

It is **recommended** that effort be made to obtain quality reference standards. The new instruments and their analytical potential come with a new level of detection that shows new levels of chemical contamination and impurities.

It is **recommended** that the laminar filter areas be given better closure for their area to protect their operation. It is also **recommended** that all clean room operational instructions be clarified, listed and communicated to all staff.

A review was made of the laboratory's chemicals, glassware and supporting equipment. A list of needed components to support methods listed in Annex 3, Suggested Methodology, was compiled. From this list, items not provided in normal MOH purchasing support were placed on a support list, Annex 4. These items will accelerate inclusion of newly gained analytical skills. With the purchase the AQA Chapter 7, Analytical Methods, will quickly include many new import assessment tools. Again the Consultant **recommends** immediate purchase of these items to guarantee an increase analytical potential. The Food Laboratory has developed there own list of other items that they will immediately order through MOH purchasing channels.

ANNEX 1: List of Persons Met

Ministry of Health (MOH)

Dr. Dahmen Al Abadi, Director Ministry of Health, Aqaba, Jordan
Eng. Mahmood Mustafa, Head, Food Testing Laboratory, Aqaba, Jordan
Eng. Mai Adnan, Quality Coordinator, Food Testing Laboratory. Aqaba, Jordan

Aqaba Special Economic Zone Authority

Dr. Mazen M. Haobasha, Director of Environment Planning Port Operations
Eng. Rima H. Zu'mot, Division Head, Food Control

Private Sector

Eng. Maher Alawi, Service Mgr. Arab Medical & Service Alliance, Amman, Jordan
Dr. Mousa Howari, General Manager, Spectrum Scientific, Amman, Jordan
Eng. Bassem Yassin, Varian Field Engineer, Spectrum Scientific, Amman, Jordan

ANNEX 2: Laboratory Participants in Instrumental Training By Private Sectors

Ali Tawaha	Analyst
Ashraf Dradka	Analyst
Majed Terad	Analyst
Amjad Himour	Analyst
Mai Adran	Quality Assurance Coordinator
Mahmoud Mustafa	Head of Laboratory

ANNEX 3: Suggested Methodology

1. Separation and Detection of Synthetic Food Colors by Ion-Pair HPLC

   APB Laboratories, Ottawa, Canada, Section 11A

   Instrument – HPLC

   Detection: Visible, variable wavelengths

2. Liquid Chromatographic Determination Aflatoxin in Foods

   A.O.A.C. Official Methods of Analysis, (1995), 16th Edition,
   Chapter 49, 2.17, 49, 2.03, 49, 2.0l, 49, 2.10 C
   Modified GCAP Method Files, 16 May 1999

   Instrument – HPLC

   Detection: Visible, 365nm wavelength

3. Determination of Aflatoxin in Cornmeal

   Supelco HPLC Technology Method

   Instrument – HPLC

   Detection: Visible, 365nm wavelength

4. Determination of Pautulin in Apple Juice

   Perkin Elmer Chromatigraphic Application
   JOAC, 57, 1111-13
   Supelco HPLC Technology Method

   Instrument – HPLC

   Detection: Flourescence, 365nm excitation, 440nm emission

5. Determination of Aflatoxin in Dairy Products (M_1 & M_2)

   Supelco HPLC Technology Method
   AOAC, 49, 3.06

   Instrument – HPLC

   Detection: Fluorescence, 365nm excitation, 440nm emission

Annex 3 Suggested Methodology Continued

6. Determination of Phenolic Antioxidants in Oils and Fatty Foods

   Perkin Elmer Liquid Chromatographic Applications
   AOAC 47 Pg 2, 47 2.02

   Instrument – HPLC

   Detection: Ultra Violet, 280nm wavelength

7. Determination of Non-Nutritive Sweetener in Beverage Products

   Analysis of Soft Drink Applications-
   Perkin Elmer Liquid Chromatography Application

   Instrument – HPLC

   Detection: Ultra Violet, 254nm wavelength

ANNEX 4: New Methodology Support Materials

CHEMICALS AND GLASSWARE

B.H.A.	BDH	27513	250 gm
Prophyl Gallate	Fluka	48710	100 gm
T.B.H.G.	Fluka	19986	100 gm
Silica Gel 60, 70-230 mesh ASTM	Merck		500 gm
Glass Wool	BDH	330564S	500 gm
Filter Paper, 24 cm Diameter	Watman #1		2 box/100
Dichloro Methane, HPLC Grade	Lab Scan	P55082	1 case of 6, 2.5 liters
Tetra Hydrofurane	Sigma	34929	~100 gm
Caffeine	Aldrich	C8960	~100 gm
Vanillin	Aldrich	V2375	~50 gm
Aspartame	Sigma	47135	500 gm
Sodium Benzoate	Fluka	71300	500 gm
Sorbic Acid K^+ salt	Fluka	85522	500 gm
Hexane Sulfonic Acid, Na^+ Salt for HPLC	BDH	1527922	25 gm
Tetra-n-butylammonium hydroxide	BDH	135061K	5 gm
Syringe – 10ul, Hamilton 701 N Point Style 2	Varian	HM80300	
Hamilton Guide with Chaney Adapter	Varian	14806	2@
Chloroform, HPLC Grade	Lab Scan	C2507	2.5 liters 6@
Isopropanol, HPLC Grade	Lab Scan		2.5 liters 6@
Water,	LabScan		2.5 liters 6@
Chromo-Column Teflon Plug With Porous Plate			
1. 11 mm x 300 mm	Kontes	420542-0213	6@
2. 22 mm x 400 mm	Kontes	420540-0234	6@
3. 19 mm x 400 mm 250 ml Reservoir	Kontes	420290-0000	6@
Test Tube, Graduate			
1. 15 ml	Kimble	45153	case of 12
2. 5 ml	Kontes	898250-005	6@
Pipette Volumetric			
1. 5.0 ml	Kimble		12@
2. 40 ml	Kimble		6 @

NEW METHODOLOGY SUPPORT MATERIALS, Continued

EQUIPMENT

1. Glass Reservoir for Branson Reverse Osmosis Still

2. Tabletop Steam Bath, 300 x 40 ml.

3. Automatic Transfer Pipette – Adjustable
   10 ul – 100 ul
   100 ul – 1000 ul

4. Ultrasonic Bath Heated – 1.9 liter
   Bronson Model 1510 E-MT

5. Sep-Pak Cartridge LC-CN
   "Supelclean"
   Supelco, 57013, 2 packages of 54 each

6. Sep-Pak c-18 Cartridge
   Supelco or Waters, 2 packages of 50 each

7. UV Irradiator for Outlet of Reverse Osmosis Still, 1 each

8. Ion-Exchange Column Kit for Reverse Osmosis Still Outlet, 1 each

9. Septum, Varian, Model 3800 GC, Capillary, 1 package of 50 each

10. Guard Column Cartridge Holder for HPLC, 2 each

11. C-18 HPLC Guard Column Cartridges, 3 packages of 3

12. C-8 HPLC Guard Column Cartridges, 3 packages of 3

13. Gas Cylinder (3) Wall Bracket Supelco Z23,691-8 2@ $62 @

14. Capillary Starter Kit - Supelco 2-3639 1 @ $123

15. Visiprep Solid Phase Extraction Vacuum Manifold Supelco 5-7030-U
    $500

16. SepPak Cartridge LC-8 - 3 ml. Sulpelco 5-051451 1 @ pkg 54 $83

17. SepPak Cariridge Silica Gel – 3 ml Supelco 5-05048 1 @ pkg 54 $68

*Note: Items listed may be further identified with equivalent items and priced by local Amman, Jordan scientific supply sources, such as: Arab Medical & Scientific Alliance, Spectrum Scientific.