Pesticide Residues in Food: Technologies for Detection

October 1988

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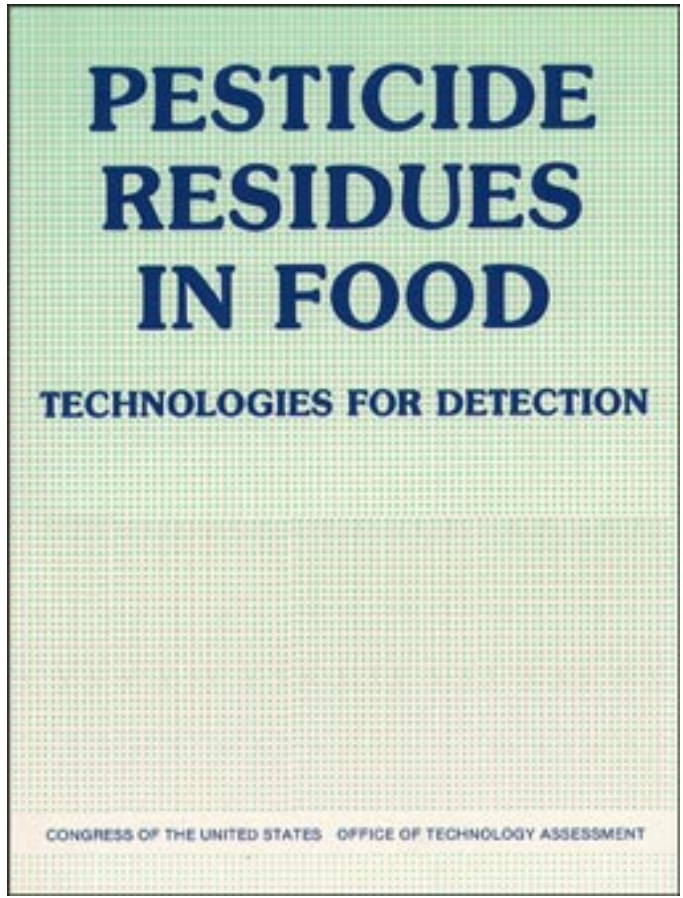

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Foreword

Pesticides are an integral part of agriculture today, but their use can lead to residues in agricultural products. Because of their potential adverse human health effects, the Federal Government sets limits on allowable levels of pesticide residues in food and animal feed and monitors these products to enforce those levels.

Federal monitoring and enforcement action is dependent on technical capability to detect pesticides. A major concern is that Federal regulatory agencies cannot practically monitor food for all pesticides of health concern. OTA was asked to assess whether existing and emerging technologies could improve Federal monitoring of pesticide residues in food. In addition, OTA examined the Federal research programs dedicated to improving Federal analytical capabilities for the detection of pesticides in food.

This study was requested by the House Committee on Energy and Commerce Subcommittee on Oversight and Investigations; the House Committee on Agriculture; and its Subcommittee on Domestic Marketing, Consumer Relations, and Nutrition. The Senate Committee on Agriculture, Nutrition, and Forestry and the House Agriculture Subcommittee on Department Operations, Research, and Foreign Agriculture endorsed the request.

OTA appreciates the valuable assistance of the study's workshop participants and observers, authors of commissioned technical papers, and the many other individuals from the public and private sectors who provided information throughout the course of this assessment and reviewed a draft of the report. As with all OTA studies, the content of this report is the sole responsibility of OTA.

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Technologies To Detect Pesticide Residues in Food, Mar. 14-16, 1988

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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the workshop participants. The workshop participants do not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Abbreviations and Acronyms

ADI	—Acceptable Daily Intake
AFID	—alkali flame ionization detector
AOAC	—Association of Official Analytical Chemists
CCPR	—Codex Alimentarius Committee on Pesticide Residues
CDFA	–California Department of Food and Agriculture
CES	—compound evaluation system
CFSAN	–Center for Food Safety and Applied Nutrition (of FDA)
DDT	—dichlorodiphenyl trichloroethane
ECD	—electron capture detector
EDB	—ethylene dibromide
ELISA	—enzyme-linked immunosorbent assay
EPA	—Environmental Protection Agency
FDA	—Food and Drug Administration
FFDCA	—Federal Food, Drug, and Cosmetic Act
FIA	—Federal Insecticide Act
FIFRA	—Federal Insecticide, Fungicide, and Rodenticide Act
FMIA	—Federal Meat Inspection Act
FOI	—Freedom of Information
FPD	—flame photometric detector
FR	—Federal Register
FSIS	—Food Safety and Inspection Service
FTE	—full-time equivalents
GC	–gas chromatography
GLC	–gas liquid chromatography
GPC	—gel permeation chromatography
HECD	—Hall microelectrolytic conductivity detector
HPLC	—high performance liquid chromatography
IR	—infrared (detector)
ITD	—ion trap detector
IUPAC	—International Union of Pure and Applied Chemistry
LC	–liquid chromatography
LIMS	—Laboratory Information Management Systems
LOQ	—limits of quantitation
LUO	—laboratory unit operations
MOG	—Mills, Onley, and Gaither
MOU	—memorandum of understanding
MRP	—multiresidue procedure
MRL	—maximum residue limits
MRM	—multiresidue method
MS	—mass spectrometry
MSD	—mass selective detector
NBS	—National Bureau of Standards
NOEL	—No Observable Effect Level
NPD	—nitrogen-phosphorus detector
NRP	—National Residue Program
NTIS	—National Technical Information Service
OMA	—*Official Methods of Analysis*
PAM	—*Pesticide Analytical Manual*
Pc	—paper chromatography
PCB	—polychlorinated biphenyls
PICRC	—Pesticide and Industrial Chemicals Research Center (of FDA)
RRT	—relative retention time
SF	—supercritical fluid
SFC	—supercritical fluid chromatography
SFE	—supercritical fluid extraction
SI	—Surveillance Index
SIM	—single ion monitoring
SPE	—solid phase extraction
SRM	—single residue method
TDRC	–Total Diet Research Center (of FDA)
TDS	–Total Diet Study
TLC	—thin layer chromatography
UAR	—unidentified analytical response
USDA/ARS	—United States Department of Agriculture/Agricultural Research Service
UV/VIS	—ultraviolet-visible (light detector)