# PENDING CHANGES TO THE USE PATTERNS OF CERTAIN INSECTICIDES IN THE POSTHARVEST PHASE OF FRUIT AND VEGETABLE PRODUCTION AND THE POTENTIAL FOR USING IRRADIATION AS AN ALTERNATIVE TREATMENT.

## Executive summary

1. The use of certain fumigants and insecticides on fruit and vegetables continues to be a major public health and environmental concern in Australia.
2. Because of these concerns, the Australian Government is currently reviewing the use of two insecticides – Dimethoate and Fenthion – in the control of fruit fly and other pests in fruit and vegetable crops.
3. For many fruits and vegetables grown in Australia, there are currently only limited commercially feasible alternatives to the protection provided by these two insecticides.
4. Some of these alternatives carry their own suite of risks and unwanted quality side-effects and, in the case of many commodities, are considered unviable and undesirable e.g. Methyl Bromide fumigation. Other options – like seasonal approaches (e.g. 'Winter Window' for strawberries) – offer at best only limited and part-seasonal solutions.
5. If the Government decides to change or phase out the use of Dimethoate and Fenthion, then growers will need to find suitable alternatives.
6. Irradiation technology, including X-rays, present an immediate solution-to-a-problem by providing growers with an alternative treatment of fruit and vegetables that is safe, viable and sustainable.
7. The use of irradiation for breadfruit, carambola, custard apple, litchi, longan, mango, mangosteen, papaya and rambutan has already been approved by Food Standards Australia and New Zealand (FSANZ), Australia's top food safety regulator. Australian mangoes are also irradiated for export to New Zealand in growing quantities.
8. International and national agencies responsible for setting standards to protect the health of consumers and to protect plant health (including quarantine/biosecurity issues) have also put standards in place to facilitate the irradiation of food moving in trade.
9. It is time to allow the horticultural industry to take advantage of irradiation as a proven and safe process for controlling the spread of fruit fly infestation.

## Current situation

10. As part of their quarantine and biosecurity protection systems, countries are entitled to demand that any importer of fresh produce takes measures pre- or post-harvest, to ensure that no harmful pests or diseases cross their borders.
11. Registered insecticides are a vital part of quarantine biosecurity systems.
12. The Australian Government is currently considering restricting the current use of two insecticides – Dimethoate and Fenthion. Both chemicals are widely used as key disinfestation treatments to control fruit fly, either as part of an in-field application protocol, or as a post-harvest freedom assurance strategy.
13. Fruit Fly in particular requires strict control to prevent incursions into market regions that are free of the pest.
14. The government authority responsible for the assessment and registration of pesticides, the Australian Pesticides and Veterinary Medicines Authority (APVMA), is currently well advanced in undertaking a review of the potential health, environmental and trade risks of Dimethoate and Fenthion. The Authority plans to release an expert report (Preliminary Review Findings) in 2011, followed by a program of public and industry consultations to assess responses.
15. The current approvals for the active constituents of both Dimethoate and Fenthion are being carefully revisited and reassessed because of toxicological, OHS and residue concerns, which have been identified from their current use patterns, including dipping, flood-spraying, or infield crop cover sprays. Dimethoate's relative ease of usage has made it an insecticide of primary choice among most Australian fruit and vegetable growers. Products containing the chemical are registered for controlling more than 80 insect pest species. Fenthion is also an insecticide of choice for the growers of fruit and vegetables for which registrations have been granted.
16. APVMA recognises that any changes in the use of Dimethoate and Fenthion for fruit fly control "….*could* have a significant economic impact throughout Australia, affecting the whole fresh produce supply chain" (emphasis added).
17. Steritech contends that this statement significantly underplays the real situation facing growers and, ultimately, consumers if the Australian Government decides to phase out, ban or significantly restrict the use of Dimethoate and Fenthion.
18. The main concern is that, for many fruits and vegetables grown in Australia, there are currently only limited commercially feasible alternatives to the protection provided by these two chemicals.
19. Some of these alternatives carry their own suite of risks and unwanted quality side-effects, and, in the case of many commodities, are considered unviable and even eminently undesirable e.g. Methyl Bromide fumigation.

20. Those crops most likely to be immediately affected by substantial changes in the ability to use Dimethoate and Fenthion in the control of fruit fly, include:

- Strawberries
- Tomatoes
- Capsicums
- Eggplants
- Peaches
- Nectarines
- Citrus (orange and mandarin)
- Mangoes
- Avocadoes
- Persimmons
- Apples
- Table grapes
- Minor tropical fruits
- Cucurbits (zucchini, melons, cucumber and pumpkin)

21. The rejection or conditional reduction of Dimethoate or Fenthion presents a serious problem to a sector that employs many thousands of Australians and contributes millions of dollars of fresh produce value to the economy.

22. Steritech strongly supports the thorough investigation of suitable replacement treatment regimes so that new restrictions on Dimethoate or Fenithion do not reduce the productivity, value and prosperity of an important Australian industry.

## Queensland most likely to be adversely affected

23. The impact of changing the use patterns of Dimethoate or Fenthion will be particularly acute in Queensland, where sales into southern States are critical to their marketing strategies.

24. At present, Queensland growers depend upon these two chemicals to control insect pests and meet the strict quarantine standards of those interstate markets deemed to be free of such pests and/or diseases (e.g. Victoria and South Australia).

25. In the absence of approved and viable alternative pest control measures, the industry faces a serious disruption to the supply chain.

26. Some experts estimate that Queensland growers stand to lose around $350 million per annum from not being able to have unfettered access to viable and consistent alternatives to the current use of Dimethoate or Fenthion. The impacts of these losses are expected to be most severe in the Wide Bay Burnett, Mackay, Brisbane and Sunshine Coast regions.

## Potential Solution

27. In response to this serious situation, Steritech is in the process of making an application for the variation of the Food Standards Code (Standard 1.5.3 – Irradiation of Food, Clause 4), which will seek the approval of individual fruit, and vegetable commodities, for post harvest treatment by irradiation (e.g. tomatoes and capsicums). Without approval this process has been unable to be used by the hoticulture industry, despite strong interest from a number of industry leaders.

28. Steritech's non-invasive irradiation treatment provides an effective alternative to chemical treatments:

- It is penetrating and can be applied while the fruit is in its final packaging, and is effective on both surface and interior insects;
- It has the potential to be introduced in a short timeframe, as approved treatment facilities are already in place;
- Irradiation is a totally non-chemical procedure, so it leaves absolutely no residue in product once treated;
- It is non-invasive and does not heat the fruit to any discernable degree;
- The irradiation treatment is more efficient and less phytotoxic than thermal, cold or fumigation treatments in tropical fruits;
- It is totally sustainable and convenient in that such treatments involve minimal disruption to logistical issues, resulting in minor delays to normal supply chain timings.
- It facilitates new international trading opportunities (e.g. Australian mangoes to New Zealand).

29. Irradiating eliminates the threat from insects by ensuring that they cannot reproduce successfully. It does this in the relatively low dose range of 0.1-0.4kGy (a KGy is a convenient dose unit). A dose of 0.4kGy is accepted, for example, by the US Department of Agriculture, to be a generic treatment for all insect pests of quarantine concern.[1]

30. Therefore, irradiation is a broad-spectrum quarantine treatment for all insects. This is important as insects can show a wide range of sensitivity and even resistance to other alternative treatments such as chemicals.

31. All treatments or processing of fresh produce can have unwanted effects on sensory or nutrient quality. With a maximum dose of 1kGy applied to fresh produce, the sensory and nutrient loss is minimal and generally less than for other methods.

32. International and national agencies responsible for setting standards to protect the health of consumers and to protect plant health (including quarantine/biosecurity issues) have put standards in place to facilitate the irradiation of food moving in trade.

33. The Codex Alimentarius Commission has issued a General Standard that declares any food irradiated up to 10kGy to be of no toxicological concern and to have no special microbiological and nutritional concerns. Such food is safe for human consumption. Many countries have approvals from health authorities for fresh fruit and vegetables to be irradiated up to 1kGy, including the UK, USA and several European countries.

34. For Australia and New Zealand, FSANZ has approved nine tropical fruits for irradiation treatment for quarantine purposes.

35. The International Plants Protection Convention (IPPC) has issued an international guideline for the use of irradiation as a phytosanitary measure (i.e. for quarantine purposes). The US Department of Agriculture has followed this guidance in permitting irradiation as an accepted method for quarantine purposes for exporting fresh produce into the USA. The US Department of Agriculture has also stipulated that 0.4kGy is a generic dose suitable to treat all insects of quarantine concern.

1. A kGy (kiloGray) is a unit of irradiation dose. 1 kGy = 1000 Gy. 1 Gy is 1 Joule of energy deposited in each kg of irradiated material.

36. Irradiated mangoes and increasing amounts of litchis from Australia have been shipped for sale to New Zealand in recent years, with over 1,000 tonnes shipped in 2010. The USA has accepted about 2000 tonnes of irradiated tropical fruits from three Asian countries in both 2008 and 2009, as well as guava and mangoes from Mexico.

**Exports from Australia to New Zealand**
**Irradiated fruit (tonnes)**

| | 2004-06 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Mango | 256 | 228 | 261 | 585 | 1,095 |
| Litchi | 0 | 10 | 21 | 57 | 110 |
| **TOTAL** | **256** | **238** | **282** | **642** | **1,205** |

37. In Australia, an Interstate Certification Assurance (ICA) National Protocol has been completed for irradiation treatment of FSANZ approved fruit and vegetables for insects (Arthropoda), and detailed procedures will be released soon.

38. Steritech believes that, in the very likely event that the use of Dimethoate and Fenthion will be either stopped or severely restricted in Australia, irradiation technology must be seriously considered for phytosanitary purposes by appropriate authorities as an immediate "solution-to-a-problem", by providing growers with a safe, viable and sustainable alternative treatment of fruit and vegetables.

39. The benefits of irradiation are many:

- Irradiation will ensure minimal economic loss to these industries, and reduce disruptions in supply as well as limit fruit spoilage. Environmental benefits will result with the reductions in the use of pesticides and storage in farm sheds;
- Initial testing of commodities has already identified significant opportunities for shelf life extension, resulting in much reduced wastage. The savings this would generate would be shared throughout all supply chain sectors, from growers through to retailers and end consumers;
- Horticultural industry partners could expect enhanced export opportunities for trade between Australia, New Zealand, USA and other WTO member nations with whom Australia seeks increased trade, particularly the revitalisation of significant export market opportunities;
- Consumers could expect fresh fruit and vegetable products with absolutely minimal levels of agricultural chemical contamination, increased shelf life and reduced spoilage.

40. Steritech believes that progress towards the general commercial adoption of irradiation is long overdue - it is time to take a fresh look at irradiation as a proven and safe process for controlling the spread of fruit fly infestation.

41. To that end, Steritech is currently consulting with many of the key participants in the fruit and vegetable supply chain, partnering with all levels of production, wholesaling, retailing and final consumption.

42. Many of these key players have not only endorsed the use of irradiation as the viable alternative to chemical treatments, but have also committed to working with Steritech to continue researching and modelling how to best facilitate the orderly introduction of irradiation as a key element within their production post-harvest regimes.

Steritech operates the only commercially available irradiation plants in Australia (Melbourne, Sydney and Brisbane). It ranks as the most prominent contract sterilisation and decontamination processor in the Asia-Pacific region, and is one of the largest worldwide.

Steritech is fully approved by the Australian Quarantine and Inspection Service (AQIS) and is compliant with all International and Australian regulations and standards in Radiation Safety, Good Manufacturing Practice and Good Radiation Practice.

Steritech routinely processes over 100 different products in the following product categories:

- Medical (hypodermic syringes, dressings, etc.)
- Pharmaceutical, Veterinary and Cosmetics
- Feedlot (Cereals, Grains and Animal Feed)
- Quarantine Goods
- Packaging

Steritech has State Government licenses and approvals to operate its plants, including: Manufacturer's Licence from the Therapeutic Goods Administration; Manufacturer's Licence from the Australian Pesticides and Veterinary Medicines Authority; Approved Premises for Quarantine from the Australian Quarantine and Inspection Service; and State Radiation Health and EPA Licences.

**Showing the regulatory approval of irradiation on various foods in the United States – 1963 to 2008 (FDA)**

| Approval Year | Food | Dose | Purpose |
|---|---|---|---|
| 1963 | Wheat Flour | 0.2 - 0.5kGy | Control of mold |
| 1964 | White Potatoes | 0.05 - 0.15kGy | Inhibit sprouting |
| 1986 | Pork | 0.3 - 1.0kGy | Control of Trichinella spiralis parasites |
| 1986 | Fruit & Vegetables | 1.0kGy | Insect control, extend shelf life |
| 1986 | Herbs & Spices | 30kGy | Sterilization |
| 1990 - FDA | Poultry | 3kGy | Bacterial pathogen reduction |
| 1992 - USDA | Poultry | 1.5 - 3.0kGy | Bacterial pathogen reduction |
| 1997 - FDA<br>2000 - USDA | Meat<br>(Frozen) | 4.5kGy<br>(7.0kGy) | Bacterial pathogen reduction |
| 2000 - FDA | Shell eggs | 3kGy | Bacterial pathogen reduction |
| 2000 - FDA | Seeds for sprouting | 8kGy | Bacterial pathogen reduction |
| 2001 - FDA | Packaging equivilency for electron beam and x-ray | Levels as used for gamma source | Allow gamma approved packages for other sources |
| 2005 - FDA | Molluscan shellfish | 5.5kGy | Bacterial pathogen reduction |
| 2008 - FDA | Fresh iceberg lettuce and spinach | 4.0kGy | Bacterial pathogen reduction and shelf life extension |

## Safety and uses of irradiated food

43. There are several uses for the irradiation of food which depend on the dose applied and the food treated, including:
    - Inhibition of spouting (potatoes, onions, garlic) or maturation control (e.g. bananas) – approximate dose range 0.05-0.20kGy.
    - Disinfestations of insects for quarantine purposes – approximate dose range 0.15-0.5kGy.
    - Reducing spoilage due to disease or decay process caused by bacteria, fungi and other causes – approximate dose range .05-3kGy.
    - Reducing bacterial and other pathogen (decontamination) that can cause human illness and death when ingested via food – approximate dose range 3-30kGy.
44. Irradiation is a physical means of sterilisation of insects, bacterial decontamination or other benefits provided to the food. Energy is passed through the treated product causing the biological changes required in the food or its associated contaminants.
45. The irradiation process used does not make food radioactive. When the treatment stops, energy does not remain in the food. The gamma rays of radioactive Cobalt 60 do not have enough energy to make food radioactive. Also, the food does not come into contact with the energy source, so it cannot become contaminated by radioactive material.
46. The safety of irradiated food has been intensively studied by many international and national scientific committees. The overwhelming consensus is that food irradiated up to 10kGy is safe and wholesome.
47. Any irradiated food must go through a strict safety assessment by Food Standards Australia New Zealand (FSANZ) and, if approved, must be labelled as having been treated by radiation.
48. The safety of irradiating tropical fruits has been examined by FSANZ. The available studies on fruits indicate that there are no safety concerns. There are no changes to the composition of the fruits following irradiation that are likely to cause public health and safety concerns.
49. Irradiation of tropical fruits up to a maximum of 1 kGy (kilogray), employing good manufacturing/irradiation practices, is considered safe for Australian and New Zealand consumers.
50. Irradiation is known as a 'Cold Process' as the temperature of the processed product does not significantly increase. It is not dependent on humidity, temperature, vacuum or pressure. Thus, the packaging remains intact, as the seals are not stressed. The only variables are dosage strength and exposure time.
51. In Australia, irradiation is currently permitted only for the treatment of herbs and spices, the export of tropical fruits (breadfruit, carambola, custard apple, litchi, longan, mango, mangosteen, papaya and rambutan), and for pest disinfestation of herbal infusions.
52. More than 60 countries currently use irradiation for food safety reasons and more than 30 of these are actually using food irradiation technologies to ensure food safety and for disinfestation. These countries include: China, USA, India, Mexico, Thailand, Vietnam, Indonesia, Australia, Russia, The Netherlands, South Africa, Korea, Israel and France.

### Other benefits of irradiation

53. Irradiation can decrease the incidence of fungal rots, spoilage rots and the speed of decay process in fresh produce. This results in an extension of shelf life, with benefits to the consumer, the food trade and the economy, through decreased wastage.
54. Commercial success has been achieved in several countries with an extension to the shelf-life of strawberries of up to three weeks. The dose required is between 1.5-3kGy, which strawberries tolerate well. Other fruit may not tolerate the required dose without losing quality.
55. The scientific literature shows that successfully extending shelf-life without any adverse affect on quality depends on many factors (e.g. ripeness of harvest, temperature, handling and storage, dosage, etc.).

56. Irradiation is an effective and efficient means of killing bacteria. A dose of 1kGy can provide a useful decrease in bacterial numbers. In the USA, low dose irradiation has been approved for use, to ensure specific bacterial contamination of lettuce and spinach. Good agricultural practice should ensure fresh produce is free of significant bacterial pathogens. However, irradiation for quarantine purposes will provide an extra safety margin.

57. Other benefits of irradiation disinfestation include:

- Less harm to the environment
- Nutritional value is essentially unchanged
- No change in taste
- May result in better quality fruit, since the fruit can be harvested at a more mature stage
- Approval of irradiated tropical fruits may increase marketplace competition
- Increased economic development in rural and regional Australia
- Increased availability of tropical fruits in some markets
- Improved access to overseas markets for Australian growers

## Conclusion

58. Stertiech contends that Australian fruit and vegetable growers and consumers will be adversely affected if the Australian Government decides to phase out, ban or significantly restrict the use of Dimethoate and Fenthion. Irradiation needs to be seriously considered as an alternative treatment to chemicals for the horticulture sector and Steritech strongly supports Government and industry initiatives to investigate irradiation as a treatment option.

59. Steritech's main concern is that, for many fruits and vegetables grown in Australia, there are currently only limited commercially feasible alternatives to the protection provided by these two chemicals.

60. Steritech believes that, in the very likely event that the use of Dimethoate and Fenthion will be either stopped or severely restricted in Australia, irradiation is an immediate "solution-to-a-problem" by providing growers with safe, viable and sustainable alternative treatment of fruit and vegetables.

61. After more than 20 years of research and testing, as well as the establishment of the appropiate processes and procedures, Steritech believes progress towards the general commercial adoption of irradiation in Australian horticulture is long overdue. It is time to allow industry to take advantage of irradiation as a proven and safe process for controlling the spread of fruit fly infestation to areas free of such pests.

**Contact:**
Murray Lynch
CEO Steritech
03 8726 5566

**Steritech Offices:**
Victoria (Head Office)
160 South Gippsland Highway
Dandenong Victoria 3175

New South Wales
5 Widemere Road
Wetherill Park NSW 2164

Queensland
180-186 Potassium Street
Narangba Queensland 4504