



# Artificial colours in local and imported food products

- Confectionery (imported only)
- Sauces and pastes

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## Executive Summary

Over the years there has been considerable debate on the effect of colours on children's behaviours.

Artificial colours are added to food to enhance naturally occurring colours and help to improve the visual appearance of the products. These colours are manufactured for use as 'dyes' or 'lakes' which differ in their physical and chemical properties. Dyes are water soluble and are commonly used in dairy products, beverages and dry mixes. Lakes are water insoluble and are typically used in products such as chewing gum and boiled lollies due to the fat and oil content or limited moisture in the food matrix (IFIC & FDA, 2010).

Any substance that is added to a food or beverage that imparts or changes its colour is known as a food colouring. Food colourings are routinely added for many reasons such as:

- to offset colour loss due to exposure to light, air, temperature extremes, moisture and storage conditions
- to correct natural variations in colour
- to enhance colours that occur naturally
- to provide colour and identity to colourless and "fun" foods
- to protect flavours and vitamins from damage by light. Food colouring has evolved over the past decade, with a growing number of natural colours commercially available, consumers are making more informed choices to the food they eat.

From 2010 to 2013, the Authority conducted two surveys on artificial colours in foods in response to a number of public complaints and surveys by international organisations identifying potential food safety concerns.

The public complaints were about labelling statements such as 'For sale in Indonesia only' and 'Not for sale in Australia and New Zealand' on some imported confectionery products. The practice of importing identically branded products manufactured for sale in Australia is commonly termed 'parallel imports'. Although parallel importing is not illegal, it is possible that these products, in addition to not meeting labelling requirements, might not meet the compositional requirements of the Code in terms of food additives such as colours.

Surveys conducted by international organisations identified potential food safety concerns in sauces and pastes, in particular the concentrations of artificial colours used in them.

Between August 2010 and August 2013, a total 321 imported confectionery products and 105 Australian manufactured and imported sauces were collected throughout Sydney metropolitan. Analysis was performed to evaluate the levels of permitted artificial colours and presence of non-permitted colours in imported confectionery and sauces and pastes. Results were assessed against the Australian New Zealand Food Standards Code *Standard 1.3.1* food additives. These products were targeted due to public complaints regarding labelling statements or overseas compliance observations.

*Standard 1.3.1* of the Australian New Zealand Food Standards Code (the Code) sets out the colours that are permitted to be added to food, the maximum levels at which colours may be added and the type of foods that may contain permitted colours. The Code permits the use of twelve artificial colours at a maximum level of 290mg/kg (singly or in combination).

There is special permission in the Code for amaranth (123) to be permitted in confectionery at a maximum level of 300mg/kg as a single colour or in combination. The two surveys focused on fifteen artificial colours, thirteen approved in confectionery and twelve approved in sauces and pastes.

Key findings from the artificial colours in imported confectionery survey:

- A total of 27 samples (8.4%) claimed 'no artificial colours' or '100% natural colours'. Of these samples, 23 were found to adhere to these claims. The remaining 4 samples were found to contain undeclared permitted synthetic colours.
- Of the 321 samples with added colours, 51 (15.9%) of them did not comply with the Code. The main reason for non-compliance was the use of permitted artificial colours that were not declared in the ingredient list
- For products with added colour, the most commonly used was allura red. It also had the highest maximum and mean concentrations of 819 mg/kg and 49.4 mg/kg respectively.
- Six samples (1.8%) were found to contain artificial colour above the maximum permitted level (generally 290 mg/kg except for amaranth which is 300 mg/kg).
- Nine infringement notices were sent to importers during the first year for various non-compliances. Retests were completed on four samples, all of which complied with the Code. The remaining five samples were unavailable in NSW. During the third year of testing no samples from the previous year were found, this was due to the majority of samples appearing in show bags from the 2012 Royal Easter Show and not being sold in retail shops.

Key findings from the artificial colours in sauces and pastes survey:

- The results from the Authority's survey found 92.3% (97/105) of samples complied with the Code.
- Six (5.7%) samples had undeclared artificial colours. Follow up samples were collected by the Compliance, Enforcement and Investigation branch and retested after warning letters were issued.
- Four (3.8%) samples were found to exceed the maximum level of artificial colours (290mg/kg) singly or in combination. The highest level of combined permitted artificial colouring was detected at 5625 mg/kg followed by 1831 mg/kg, 1153 mg/kg and 386 mg/kg.
- Samples that did not comply with the Code were followed up by enforcement officers to educate manufactures in regards to specific requirements. Enforcement officers contacted two NSW manufacturers and two Australian importers to issue infringement notices and provide corrective actions. Retests of the products show that one importer and manufacture complied with the Code with the other parties ceasing production or discontinuing their products into Australia.

Overall, the compliance rate for imported confectionery was 84.1% and 92% for sauces and pastes. A total of ten samples, six confectionery and four sauce samples were found to exceed the maximum permitted limit of 290mg/kg as a single colour or in combination. Twelve confectionery samples were found to contain levels of the red dye erythrosine a food colour not permitted in confectionery or sauces in Australia.

Products that were found to contain non-permitted artificial colours or exceeding the maximum level of colours, posed little health risk to the average population. The acceptable

daily intakes (ADI) of each artificial colour have been developed to ensure a large safety margin is factored in to provide a safety factor should health standards be compromised. The population at most risk are children aged between 2-5 years old, due to their low body weight and age artificial colours in large quantities may cause adverse reactions. Samples that were found to be exceeding the maximum level may also cause reactions to sensitive populations who consume these products.

Due to the nature and type of the products, consumption would not be a daily occurrence and therefore pose little effect to the average population.

It should be noted that even though some of the samples found in this survey did not comply with the Code, they are not considered as unsafe. The importers of all of the non-compliant samples were contacted as part of the Authority's food importer project and asked to rectify the breaches or face possible prosecution under the Food Act.

The survey highlights the need for manufacturers and importers to scrutinise their product formulations carefully and ensure that labels are updated when product formulations are changed. Importers should be not assuming that international manufactures are aware of individual countries food regulatory requirements and therefore be aware of any changes or updates relating to the Food Standards Code.

## Introduction

### Permissions for added colours in the Australian New Zealand Food Standards Code

Under the Australia New Zealand Food Standards Code (the Code) the level of food colours permitted in foods are included in *Standard 1.3.1*, schedule 4 food additives. The Code sets out the colours that are permitted to be added to food, the maximum levels at which colours may be added and the type of foods that may contain permitted colours.

*Standard 1.3.1* of the Code sets out the colours that are permitted to be added to food, the maximum levels at which colours may be added and the type of foods that may contain permitted colours. The Code permits the use of twelve artificial colours at a maximum level of 290mg/kg (singly or in combination). There is special permission in the Code for amaranth (123) to be permitted in confectionery at a maximum level of 300mg/kg as a single colour or in combination.

The Authority conducted two surveys, which focused on fifteen artificial colours, thirteen approved in confectionery and twelve approved in sauces and pastes. The Standard does not permit the use of Erythrosine (127) in any confectionery or sauce products. Erythrosine was targeted in both surveys for its high use in confectionery from overseas manufacturers and prevalence in non-permitted food items.

*Standard 1.3.1 - Food Additives* sets out the permissions for the use of food colours in Schedule 1, 3 and 4.

- Schedule 1 outlines the permitted use of added colours by food type and the Maximum Permitted Levels (MPLs) for added colours that are not included in Schedule 3 or 4
- Schedule 3 outlines the added colours permitted to be used in accordance with Good Manufacturing Practice (GMP) in processed food in Schedule 1
- Schedule 4 outlines the maximum level of artificial colours (290mg/kg singly or in combination) in processed foods, and a combined maximum level of 70mg/L in beverages, except where expressly prohibited in Schedule 1

*Standard 1.2.4 - Labelling of Ingredients* prescribes the labelling requirements for food additives. Colours added to food must be declared in the ingredients list, except if the colours are present in ingoing food ingredients amounting to less than 5% of the total food and are not performing a technological function in the final food product. Where an additive must be declared, the additive must be declared by the name of that class (as indicated in Schedule 1) followed by the additive's specific name or code number in brackets (as indicated in Schedule 2).

Sauces and toppings (including mayonnaise and salad dressings) are included in the Schedule 1 of the Standard 1.3.1.

**Table 1. Artificial colours permitted singly or in combination to a maximum level of 290 mg/kg in processed foods (Standard 1.3.1 Schedule 4)**

INS Number	Additive Name
129	Allura red AC
123	Amaranth*
122	Azorubine / Carmoisine
151	Brilliant black BN
133	Brilliant blue FCF
155	Brown HT
143	Fast green FCF
142	Green S
132	Indigotine
124	Ponceau 4R
104	Quinoline yellow
110	Sunset yellow FCF
102	Tartrazine
127	Erythrosine**
N/A	Sudan I**

\* Confectionery - maximum level singly or in combination to 300mg/kg

\*\* Erythrosine (127) and Sudan I are not permitted in confectionery or sauces and pastes.

Over the years there has been considerable debate on the effect of colours on children's behaviours. In 2012, FSANZ published a supplementary report on added colour in food available in Australia and it reiterates that the current estimated dietary exposure of children to added colours in food and beverages in Australia remains well within the Acceptable Daily Intake (ADI)<sup>1</sup>. For each colour investigated in the FSANZ report, the estimated dietary exposure was <5% of the ADI in all cases, including for high consumers.

The findings of that report confirm that dietary exposure to added colours in food and beverages does not pose a public health and safety concern for children in Australia. However, FSANZ recognises that some people prefer to avoid certain food colouring for this reason, any colouring additive in a food must be declared on the label of that food. Consumers can use this label information to identify products where they are present and avoid such products if they wish to do so (FSANZ, 2012)<sup>2</sup>.

<sup>1</sup> The ADI is defined as an estimate of the amount of a chemical that can be ingested daily over a lifetime without appreciate risk to health

<sup>2</sup> A food additive is a substance deliberately added to food by the manufacture to facilitate processing or to improve appearance, texture, flavour, keeping quality or nutritional value

## Imported Food Inspection Scheme

Imported foods are also subjected to the Code which applies to all food sold in Australia. To ensure compliance and border security the Imported Food Inspection Scheme (IFIS) was implemented. Foods under the scheme are placed under two categories, "risk foods" and "surveillance foods".

Risk foods pose a high to medium food safety risk to the public and are inspected and tested at a rate of 100% of consignments, while surveillance foods are tested at 5% due to the low risk. Confectionery is classed as a surveillance food and only 5% is tested at the border. Confectionery is tested for artificial colour levels and the compliance of permitted colours. For sauces, the only test performed is for chloropropanols in soy sauces.

### Foods Targeted

The survey on artificial colours in imported confectionery and in sauces and pastes was conducted due to a number of public complaints to the NSW Food Authority regarding labelling statements on imported confectionery products and overseas reports of undeclared or excessive levels of artificial colours in sauces and pastes.

Survey findings are reported in two parts:

- Part A – Artificial colours in imported confectionery
- Part B - Artificial colours in sauces and pastes

## Part A - Artificial Colours in Imported Confectionery

The survey was in response to a number of public complaints regarding labelling statements such as 'For sale in Indonesia only' and 'Not for sale in Australia and New Zealand' on some imported confectionery products. The practice of importing identically branded products manufactured for sale in Australia is commonly termed 'parallel imports'. Although parallel importing is not illegal, it is possible that these products, in addition to not meeting labelling requirements, might not meet the compositional requirements of the Code in terms of food additives such as colours.

To date, there have been two surveys of colours in confectionery conducted in Australia. In 2005, South Australia tested sixteen confectionery samples (5% was imported) and found that none of the samples contained colours (singly or in combination) at greater than the permitted level of 290mg/kg.

In 2006, FSANZ conducted a survey of added colours in foods available in Australia and tested 36 confectionery samples (it was not stated if samples were imported or locally manufactured). None of the samples contained colours (singly or in combination) at greater than the permitted level of 290 mg/kg. Erythrosine was not detected in any of the samples (FSANZ, 2008).

Four other surveys have been conducted overseas (Appendix 1), however, differences in which colours are permitted and maximum permitted levels mean that direct comparisons between those results and the Australian situation cannot be achieved.

## Materials and Methods

From August 2010 to August 2013, a total of 321 confectionery products were tested<sup>3</sup>. They were purchased from retail outlets across Sydney with the addition of 82 samples that were sold as part of the 2012 Sydney Royal Easter show bags.

Samples purchased in the first year of sampling (2010) were targeted for their claims of 'no artificial colours' or '100% natural colours'. Products that declared natural colours in the ingredients list, as well as products that contain artificial colours declared in their ingredients list were selected in 2011 and 2012.

Samples were sent to the General Chemistry Laboratory at NSW Forensic Analytical & Science Services (NSW FASS) at Lidcombe. All samples were tested for a range of permitted artificial colours as specified in *Standard 1.3.1* of the Code. They were also tested for non-permitted artificial colours namely Erythrosine (E127) and Sudan I.

Individually wrapped confectionery was tested individually based on flavour or colour, while confectionery packed in a single packaging was tested as one sample. The levels of permitted artificial colour in each sample were calculated by adding up the individual colour level.

## Results

Of the 321 samples, 270 (84.1%) complied with requirements in the Code. Of the samples that claimed to be '100% natural' and 'contains no artificial colours' (n=27), twenty-three were negative for artificial colourings.

A total of 298 samples contained artificial colours, of these samples 17.1% (n= 51) did not comply with the Code. The main reason for non-compliance was undeclared colours in 62.7% of samples (n=32), followed by the detection of erythrosine in 23.5% of samples (n=12) (Figure 1). Samples containing erythrosine were found in concentration levels ranging from 1 mg/kg – 52 mg/kg (mean concentration of 15.75 mg/kg). In Australia and New Zealand, this artificial red colour is not permitted to be added to confectionery. However, it is permitted in countries where the samples were manufactured (China, India, USA, and Thailand).

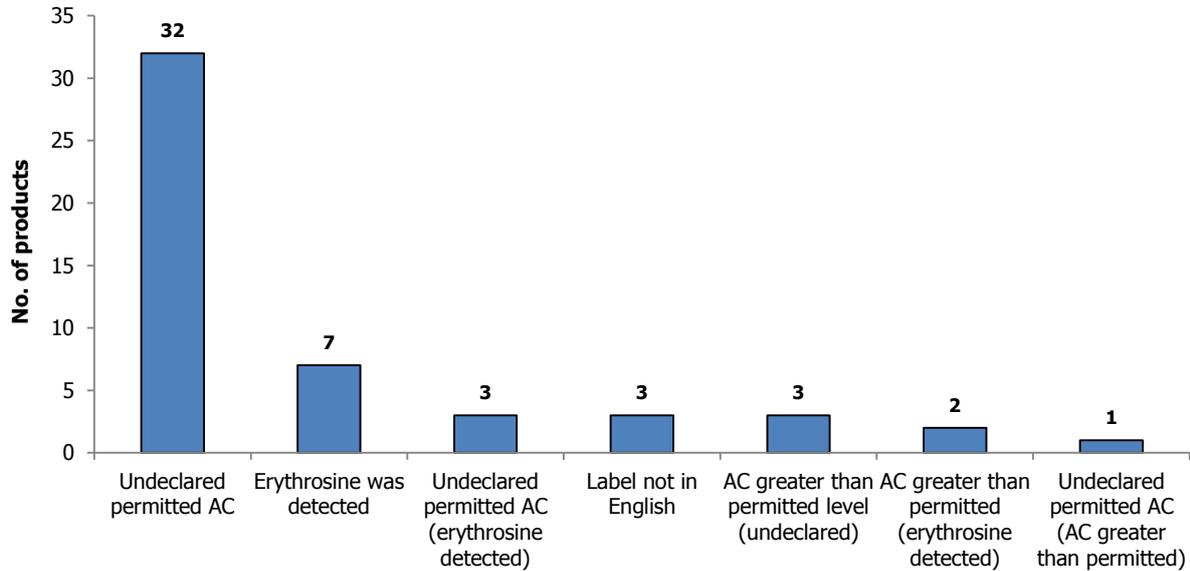
Six samples (11.7%) were found to contain artificial colours at the level greater than 290 mg/kg, either singly or in combination (the Australian permitted level). Of the six samples, four were manufactured in Mexico and the USA where there is no limit for added colours.

The most commonly used colours were brilliant blue (n=138), allura red (n=144) and tartrazine (n=111). The maximum amount of colour detected in a sample was allura red at 819 mg/kg and mean concentration of 49.3 mg/kg (Figure 2). This was followed by tartrazine and brilliant blue with maximum levels of 247 mg/ kg and 278 mg/kg respectively.

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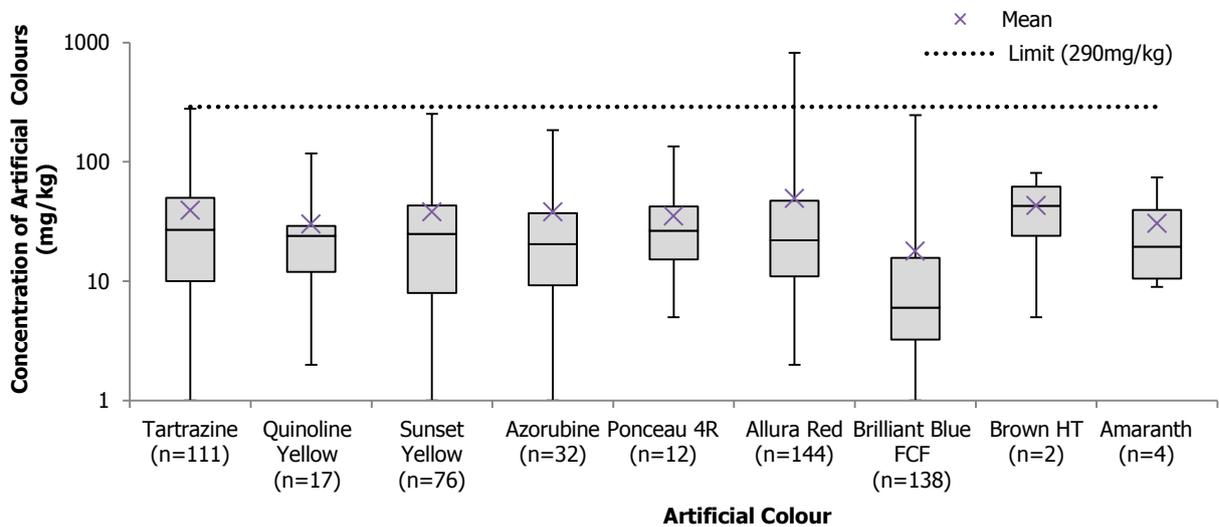
<sup>3</sup> 2010-2011 – 100 samples  
2011-2012 – 100 samples  
2012-2013 – 121 samples

**Figure 1. Non-compliant confectionary samples and their reason for non-compliance**



Of the fifty-one samples that did not comply with the code, 62.7% (32/51) were due to undeclared permitted colours. This was the main cause of non-compliance throughout the survey.

**Figure 2. Artificial colour levels over three year sampling period in confectionary products**



## **Dietary Exposure to Artificial Colours**

A dietary exposure assessment estimates the maximum amount of food that can be consumed before health reference standards are exceeded. When reference health standards are developed, large safety margins are factored in to provide a greater level of safety should the reference health standard be compromised.

There are two health reference standards used for the addition of food additives and pesticide residues for food sold in Australia, the acceptable daily intake (ADI) and acute reference dose (ARfD). The ARfD is the amount of chemical that can be consumed in a single meal or over a day without any immediate health effects being apparent. The ADI is considered to be the level of intake of a chemical that can be ingested over an entire lifetime with out any appreciable health risks. ADI reference standards are lower than ARfD as long term health effects require low exposure for a longer period whereas short term health effects require higher levels of exposure. Due to the low concentrations and low health affects of artificial colours, ARfD's have not been set. ADI's are established for colours surveyed in this report (JECFA, 2007).

The highest concentration of artificial colouring in a sampled product was allura red at 819 mg/kg. Although this sample does not comply with regulatory requirements, consumption of this product poses little health concern. The population at most risk are children aged between 2 and 5 years. A child would need to consume 150g of the sampled product each day throughout their life before consumption exceeds the ADI (Appendix 2).

The lowest ADI level of a permitted colour in confectionery is amaranth (123) at 0.05mg/kg/bw. This limit was re-evaluated in 2010 by FAO/WHO Expert Committee on Food Additives previously set at 0.08mg/kg/bw back in 1984. At the level of 0.05 mg/kg, children's exposure was estimated to be 30 times lower than the ADI (EFSA, 2010).

Four samples were found to contain amaranth in the survey with the highest level at 74 mg/kg and mean concentration of 30.5 mg/kg. A child aged between 2 to 5 years of age would need to consume 11g of the sampled product each day over a lifetime before the consumption exceeds the ADI. Amaranth levels do comply with the Code in these samples, it is noted the ADI does account for consumption throughout the persons lifetime with corrections in body weight as they age. The occurrence that a child would consume this product throughout their entire lifetime poses little risk. The reason for such a small ADI is reported cases of adverse reactions including allergic reactions. It has not been possible to determine whether the reactions have been caused by the colouring agent or other active ingredients in the product (EFSA, 2010).

Note that even though some of the samples found in this survey did not comply with the Code, they are not considered as unsafe. The importers of all of the non-compliant samples were contacted as part of the Authority's food importer project and asked to rectify the breaches or face possible prosecution under the Food Act.

## Conclusion

The results from the Authority's 2010-2013 survey show an overall compliance of 84.1% (270/321). Majority of non-compliant samples were from undeclared colours (62.7%, 32/51) followed by samples containing erythrosine (23.5%, 12/51) an artificial colour not permitted in confectionery.

Through out the three year survey there was a statistical improvement ( $P < 0.05$ ) in compliance with the Code. A comparison between the first and second years shows a decrease in the second year by 2.6% to 84.4%. This increased in the third year by 8.4% to 92.8%.

The area with the largest number of non-compliances was undeclared permitted colours. Yearly compliance did not change significantly between the first and second years<sup>4</sup>, during the third year of testing compliance increased by 3.8% to 94.5%.

A comparison between the three years can not be concluded on all non-compliant samples due to the discontinuation of products and intermittent availability.

Samples that were non-compliant were followed up by the Authority. Importers were issued warning letters of non-compliance and issued correctional actions before importing any further products. Products were not recalled due to their low food safety risk and low danger of over consumption. Authority officers collected samples in consecutive years to observe if compliance was being met by these importers. Where importers did not comply, infringement notices were followed up and fines were issued. Importers who did not comply in the first year were unaware of the requirements stipulated in the Code. Compliance increased once importers were educated of the Food Standards Code.

Care must be taken when comparing the results of the 2006 FSANZ survey, 2005 South Australian survey and the present survey as the scale, reported detail and type of samples targeted varies. The surveys collectively show a trend of compliance with the Code.

The Authority's survey focused solely on confectionery at the retail level and special events (Sydney Royal Easter Show). The Authority wanted to capture a greater overview of confectionery sold in NSW and compare the findings to recently completed surveys from governing bodies and other state authorities. The increased time frame of the survey allowed the Authority to issue infringement notices where necessary, work with businesses to assist with compliance, and retest samples in the consecutive year.

The present survey highlights the need for manufacturers and importers to scrutinise their product formulations carefully and ensure that labels are updated when product formulations are changed. Importers should be not assuming that international manufactures are aware of individual countries food regulatory requirements and therefore be aware of any changes or updates relating to the Food Standards Code.

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<sup>4</sup> Compliant in first year - 91.0%  
Compliant in second year - 90.8%

## **Part B - Artificial Colours in Sauces and Pastes**

Surveys conducted by international organisations identified potential food safety concerns in sauces and pastes with regards to concentrations of artificial colours used in them. In 2013 the Authority conducted a snapshot survey to identify whether international surveys showed a trending food safety risk to the NSW population. The survey was conducted to examine the presence of artificial colours in locally manufactured and imported sauces and pastes. Samples were purchased from small independent retailers as well as large supermarket chains by Science and Technical Officers.

Two overseas surveys were conducted between 2000 and 2006. The studies were carried out to identify the level of artificial colours in condiment sauces and curry pastes. A distinctive comparison between overseas food regulations and Australian regulations can not be achieved due to a difference in permitted and maximum levels of artificial colours.

To date, two surveys of artificial colours in foods have been conducted in Australia. In 2005 the South Australian Department of Health compared fifteen samples. All samples were found to be compliant with permitted colours and levels of artificial colours. The second survey was completed in 2006 by FSANZ to identify artificial colours in imported sauces and pastes, twelve sauces and pastes were tested and found to be compliant. It was not stated whether samples were imported or locally manufactured.

Samples that did not comply with the Code were followed up by enforcement officers to educate manufactures in regards to specific requirements. Enforcement officers contacted two NSW manufacturers and two Australian importers to issue infringement notices and provide corrective actions. Retests of the products show that one importer and manufacture complied with the Code with the other parties ceasing production or discontinuing their products into Australia.

### **Materials and Methods**

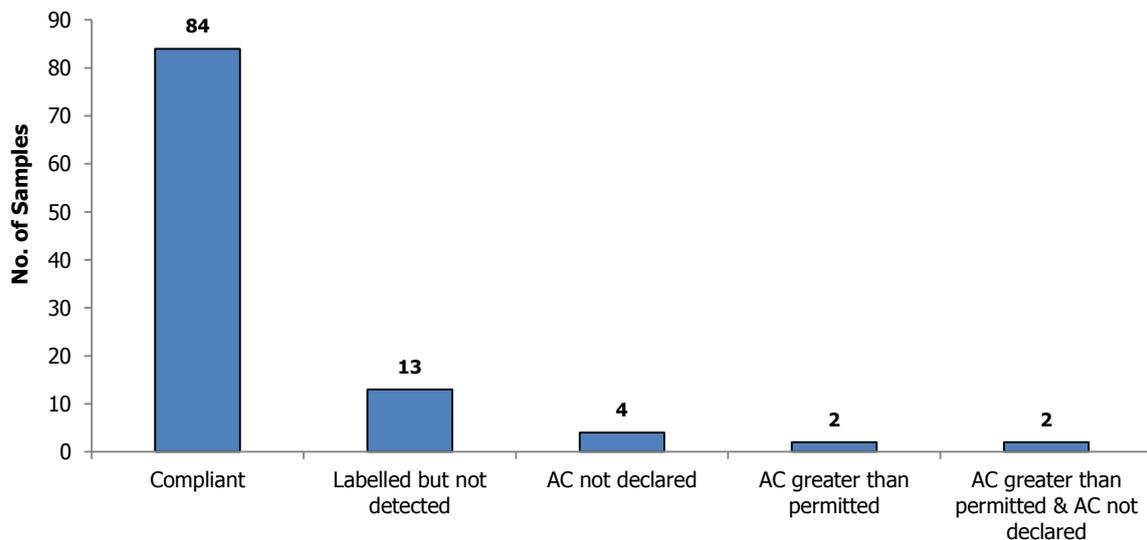
A total of 105 samples were tested, these included curry sauces, pastes and condiment sauces (such as sweet chilli, BBQ sauce and chutneys). Samples were purchased from a range of retail outlets across Sydney.

Samples were sent to the General Chemistry Laboratory at NSW Forensic Analytical & Science Services (NSW FASS) at Lidcombe. All samples were tested for a range of permitted artificial colours as specified in *Standard 1.3.1* of the Code. They were also tested for non-permitted artificial colours in sauces namely Amaranth (123), Erythrosine (127) and Sudan I.

## Results

A total of 105 samples were randomly selected for testing, 97 (92.3%) samples complied with the requirements of the Code. The rest of the samples were deemed to be non-complaint for a variety of reasons as outlined in Figure 3.

**Figure 3. Compliant and non-compliant samples in this survey**



As can be seen from Figure 3, eight samples were non-compliant. Thirteen samples declared artificial colour in the ingredients list, but were not detected through laboratory analysis. This could be caused by recipe alteration, addition of ingredients affecting the final colour of the product or mislabelling of the ingredients list. These samples were deemed to be compliant as there was no food safety concern.

Four samples (3.8%) were found to contain undeclared colours between the ranges of 7 – 80mg/kg. These samples were followed up by the Authority with warning letters for explanations and corrective actions in regards to a breach of the Code.

Four samples were identified to be exceeding the maximum level of artificial colour permitted (Appendix 4). The maximum concentration of artificial colours<sup>5</sup> detected was 5625 mg/kg.

The other three samples contained artificial colour at levels of 1831 mg/kg, 1153 mg/kg and 386 mg/kg. All four samples contained sunset yellow in excess of the maximum level as a single additive.

Samples that were found to contain excessive levels of artificial colours, two were manufactured in NSW with the remaining samples manufactured overseas. Officers from the Authority investigated the breach in the Code and informed the manufactures of the results. Failed samples were retested after warning letters were issued along with follow up inspections.

<sup>5</sup> Combination of artificial colours

Food Authority officers visited two local manufacturers to investigate and issue warning letters for non-compliant samples. After visiting both manufactures, it became apparent both were unaware of the requirements stipulated in the Code. Retests of the products were completed within one month of issuing the notice. Results showed one manufacturer had met the requirements with the second manufacture no longer in production.

Warning letter were issued to the importers of the two international manufacturers, retests were completed with in a few weeks and found that one product was compliant with the second product no longer being imported into Australia.

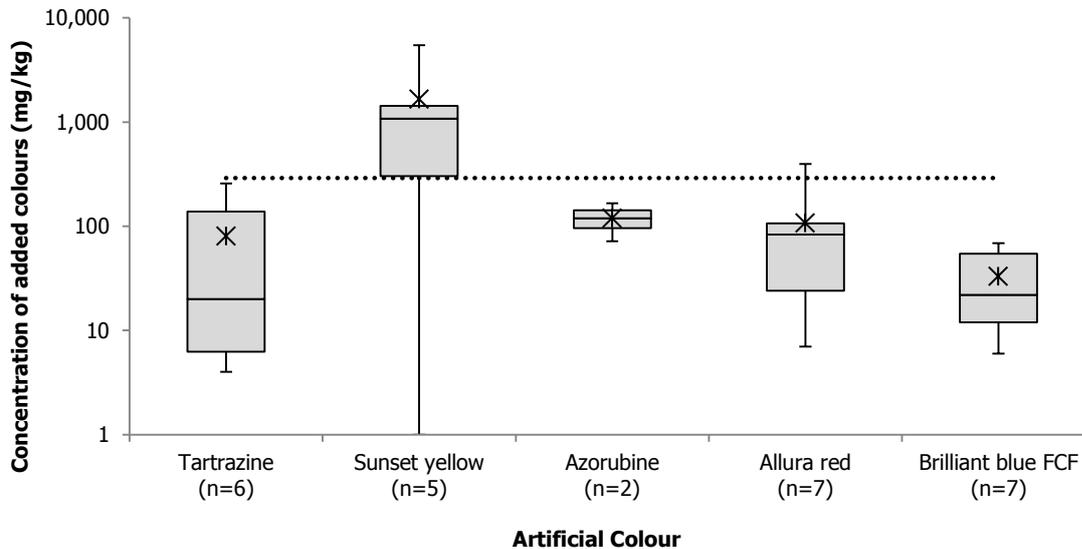
Twenty-three percent of samples (n=25) selected were manufactured in Australia. The following seventy-six percent (n=79) were manufactured overseas. The origin of one sample could not be determined due to the packaging containing no English.

Of the samples that claimed to be '100% natural' and 'contains no artificial colours' (n=74), all were negative for artificial colourings.

A total of seventeen samples contained artificial colours, of these samples 47% (n=8) did not comply with the Code. The main area of non compliance was undeclared colours in 35% of samples (n=6), followed by artificial colours exceeding the maximum levels with 23% of samples (n=4).

The most commonly used artificial colours were allura red (n=7), brilliant blue (n=7), tartrazine (n=6) and sunset yellow (n=5). Excessive concentration of a single colour was detected in four samples, each containing sunset yellow at levels of 5459 mg/kg, 1434 mg/kg, 1081 mg/kg, and 303 mg/kg (Figure 4). Allura red was found in one sample with a maximum and median concentration of 397mg/kg and 83mg/kg respectively. The median levels of artificial colour throughout the survey ranged between 20mg/kg and 1081mg/kg.

**Figure 4. Artificial colours detected in this survey**



### Dietary Exposure to Artificial Colours

The highest concentration of artificial colour in this survey was sunset yellow at 5459 mg/kg. Although this sample does not comply with the Code, consumption of this product poses little health concern. A child would need to consume 16g of the sampled product each day throughout their life before consumption exceeds the ADI (Appendix 3). It should be noted that the sample was a Tandoori paste and would be diluted through out the meal, decreasing the amount of colour consumed.

Allura red was the second colour that was found to be exceeding the maximum limit. The highest recorded level was also found in a Tandoori paste at 397mg/kg. A child aged between 2 and 5 years would need to consume 300g of the sampled product each day before consumption exceeds the ADI.

### Conclusion

The results from the Authority's survey found 92.3% (97/105) of samples complied with the Code. The areas of non-compliance were undeclared colours (n=4) and artificial colours exceeding the maximum limit (n=4). The Authority carried out investigations on manufactures and importers who did not comply with Code. Infringement letters were sent to two Australian manufactures and two international importers. Results after the issue of infringement notices showed one local manufacture and importer meeting the Code. The remaining two products were no longer being sold in Australia.

The 2006 FSANZ survey and this survey show that the majority of sauces and pastes sold in Australia comply with the Code. FSANZ sampled only twelve sauce and pastes and did not report if the samples were imported or Australian made. The FSANZ survey looked at the food supply as a whole, and information of sauces and pastes is limited and can not be used as a conclusive comparison to the NSW Food Authority results.

This survey identified a number of non-compliant samples where artificial colours exceeded the maximum level (singly and combination) by as much as eighteen times. The survey

highlights the need for manufacturers and importers to scrutinise their product formulations carefully and ensure that labels are updated when product formulations are changed. Formulations and labels for internationally traded products must also meet the importing country's requirements.

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## Appendix 1. Selected surveys of colours in confectionery

Year	Country	No of samples tested	Findings	Reference
Unknown	India	1,049	<ul style="list-style-type: none"> <li>- 438 samples contained colours above the prescribed limit of 100 mg/kg</li> <li>- 165 samples contained non-permitted colours</li> </ul>	Dixit, Khanna & Das, 2013
2008	United Kingdom	Not specified	<p>Colours were detected above regulatory limit:</p> <ul style="list-style-type: none"> <li>- Tartrazine in ethnic sweets</li> <li>- Tartrazine &amp; Sunset yellow FCF in decorative sprinkles</li> <li>- Sunset yellow FCF in fudge</li> </ul> <p>Non-permitted colour, Sudan I, was found in coloured sweets</p>	RWG, 2008
2006	Australia	36	<ul style="list-style-type: none"> <li>- None of the samples contained colour (singly or in combination) at the level of greater than 290mg/kg</li> <li>- Amaranth was detected in 5 samples</li> <li>- No sample contained Erythosine</li> <li>- The highest maximum and mean concentrations were reported for Allura Red (160 mg/kg and 8.3 mg/kg respectively) and Azorubine (160 mg/kg and 6.8 mg/kg respectively)</li> </ul>	FSANZ, 2008b
2005	Australia (SA)	16 (1 was imported)	<ul style="list-style-type: none"> <li>- None of the samples contained colour (singly or in combination) at the level of greater than 290mg/kg</li> </ul>	Dept of Health SA, 2005

Year	Country	No of samples tested	Findings	Reference
2002	United Kingdom	196	<ul style="list-style-type: none"> <li>- Five samples (2.6%) contained levels of either Sunset yellow FCF or Carmoisine in excess of the maximum permitted limit of 50 mg/kg</li> <li>- 14 (7.1%) samples contained undeclared colours</li> </ul>	FSA, 2002
2001	India	504	<ul style="list-style-type: none"> <li>- 70 samples (13.9%) contained permitted colour in excess of the maximum permitted limit of 100ppm</li> <li>- 125 samples (24.8%) contained non-permitted colour</li> </ul>	Tripathi, Khanna & Das, 2007
2001	Australia (QLD)	30	17% of products contained permitted colours (102), (122), (132), (133) that were not declared on the label	FSANZ, 2002

## Appendix 2. Acceptable Daily Intake (ADI) for Individual Colours

INS	Additive	ADI
		(mg/kg bw)
102	Tartrazine	7.5
104	Quinoline Yellow	10
110	Sunset Yellow	2.5
122	Azorubine	4.0
123	Amarant	0.05
124	Ponceau 4R	4.0
127	Erythrosine	0.1
129	Allura Red AC	7.0
132	Indigotine	5.0
133	Brilliant Blue FCF	12.5
142	Green S	5.0
143	Fast Green FCF	25
151	Brilliant Black BN	1.0
155	Brown HT	1.5

### Appendix 3. Selected surveys of colours in sauces and pastes

Year	Country	Food tested	No of samples	Results	Reference
2006	Australia	Sauces, pastes, gravy (pre-packaged)	12	Total synthetic colour concentration (mg/kg): Max 95 Min 0 Mean 17.54	FSANZ, 2008b
2006	India	Tomato sauce Chilli sauces (pre-packaged)	93 25	No sample contained artificial colours	Dixit, Mishra, Khanna & Das, 2008
		Tomato sauce Chilli sauces (street vendor)	100 25	59% of tomato sauces were found to contain artificial colours. The most common colours found: Blends of Sunset yellow, Amaranth, Carmoisine, and Ponceau 4R  80% of chilli sauces were found to contain artificial colour, Tartrazine.	
2000	UK	Sauces (pre-packaged)	227	2 samples (0.9%) contained levels of individual colours that exceeded the maximum permitted limit of 500mg/kg	FSA, 2000

## Appendix 4. Non-compliant samples

Product Name	Country of origin	Result of analysis
Tandoori Paste	Australia	AC not declared
Spicy banana sauce	Phillipines	AC not declared
Fresh red chil-ee Paste	Australia	AC not declared
Coriander chutney	India	AC not declared
Tandoori Paste	Pakistan	AC greater than permitted
Panipuri concentrate	India	AC greater than permitted
Masti chutney	India	AC greater than permitted & AC not declared
Sweet chilli sauce	Pakistan	AC greater than permitted & AC not declared

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