

Milk Allergy & Intolerance in Infants and Children

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Introduction

The gastrointestinal tract is repeatedly exposed to potentially pathogenic substances in food. Adverse reactions to food which can be reproduced occur in less than 10 per cent of individuals.

Food components may cause adverse reactions by a variety of mechanisms (see table below).

Adverse Reactions to Food

Immune/Inflammatory

- Allergy*
- Enteropathy*
- Coeliac disease*
- Colitis*

Non-Immune

- Intolerance (food chemicals)*
- Lactase deficiency*
- Metabolic disorders*

Food allergy

is caused by an IgE antibody mediated immune reaction to specific proteins in foods such as peanut, egg and milk.

It is strongly associated with atopic eczema, and in highly sensitised children can lead to anaphylaxis.

Food intolerance

may account for a wide spectrum of clinical effects. They are non-immune reactions to various natural and/or added food chemicals. Mechanisms are poorly understood, and there is no specific pathology demonstrable in either small or large intestine.

Food induced enteropathy & colitis

can be triggered by foods such as milk and soy in susceptible infants. Mechanisms leading to small intestinal mucosal damage or inflammatory colonic lesions are uncertain.

Coeliac disease

is an enteropathy caused by a cell-mediated immune response to gluten in foods derived from wheat, barley, rye and oats.

Lactose intolerance

is associated with lactase deficiency and is more prevalent in certain ethnic groups.

Food allergy

A food allergy is an immunological (IgE-mediated) reaction to one or more food proteins. Most food allergies begin in infancy in highly atopic children. Nine out of ten food-allergic children have a history of eczema, though the rash may be quite mild and parents may not recognise it is related to food. Oral contact with the allergen almost always causes an **immediate** rash around the mouth, and after ingestion the child may vomit, have generalised urticaria, angioedema, breathing difficulty, and in extreme cases, anaphylactic shock.

Peanuts, eggs and cow's milk are the three most common food allergens. In infants and young children, allergic reactions to peanut and egg occur twice

as commonly as to cow's milk. Soy allergy is not commonly seen in Australian children probably because consumption of soy products is low, but the figure may be higher in countries where soy forms a larger part of the daily diet. Children with soy allergy tend to be highly atopic and usually have allergies to other foods as well. Older children and adults may develop an allergy to a single food such as prawns. Sensitisation to food protein usually occurs in the first few months of life, either from protein fragments absorbed from the mother's diet and transmitted in breast milk, or by giving the infant egg, peanut or cow's milk. Occasionally a mother may notice reactions in her baby while she is breast feeding, but mostly the first reaction occurs between 6 and 12 months of age when solid foods or other liquids are introduced. Sensitised babies often "fuss" and reject the offending foods.

Management of Food Allergy

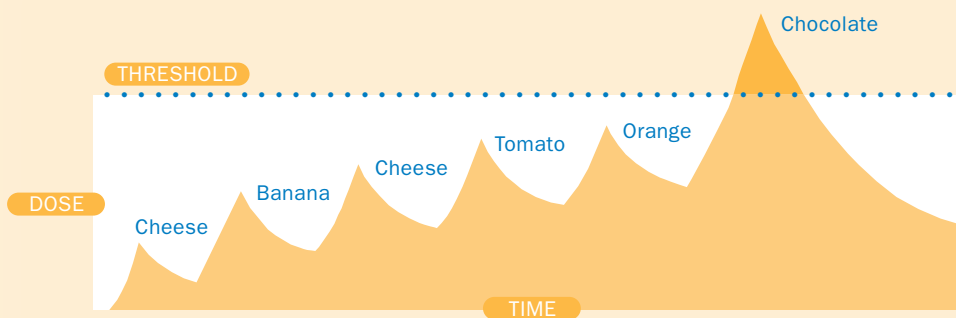
- 1. Avoidance** *caution and complete knowledge about foods*
- 2. Advice** *about substitutes*
- 3. Emergency treatment** *antihistamines, adrenalin, corticosteroids*

Food intolerance

Food intolerance is the term used for non-immune reactions to food. Allergic reactions are caused by proteins present in a particular food. **Intolerances** are triggered by adverse reactions to chemical constituents found in a variety of foods. The effects are dose-related and may be cumulative over days from eating a range of foods containing the same chemical substance. This makes it difficult to identify problem foods (see diagram below).

irritable behaviour. Symptoms can be isolated or occur in any combination. The timing may vary. The onset after eating a problem food may be rapid (within 30 minutes), intermediate (within a few hours) or delayed (up to 24–72 hours).

Food intolerance is often familial. Although symptoms may be provoked by eating foods to which a child reacts, immunological sensitisation does not occur as in food allergies. It is important to reassure parents that food intolerance is not caused by dietary excesses during pregnancy.



The small amounts of natural chemicals present in a particular food may not be enough to cause an immediate reaction. However, one substance common to many different foods can accumulate in the body, causing a reaction when the threshold is exceeded. On the graph, all the foods shown contain natural amines. The last food eaten (chocolate) is often blamed, but all the others have contributed.

Symptoms of food intolerance may include: recurrent hives, headaches, gastrointestinal symptoms (reflux, colic, wind and loose motions), blocked nose, leg cramps and

There is no direct relationship between food allergy and food intolerance, but intolerance reactions may aggravate atopic symptoms in children who have asthma and eczema.

Severity of symptoms depends on how sensitive the individual is, the range of intolerances, and the cumulative dose of the relevant substances ingested.

As a general rule, preservatives and natural salicylates are the most likely substances to cause reactions, but intolerances are idiosyncratic and other substances (such as biogenic amines, glutamate and colourings) may be involved in individual cases. The history may implicate fruit, fruit-flavoured food and drinks and savoury snacks as well as soy, wheat and dairy foods.

Diagnosis

The relationship between diet and symptoms may only become apparent when the foods that cause symptoms are tested on an appropriate elimination diet.

Tests for Adverse Food Reactions

Appropriate

Skin prick test or RAST to exclude food allergy

Food elimination and appropriate challenge for intolerance

Intolerances are not immune-mediated, so blood and skin tests are not helpful or appropriate to identify problem foods. For proper investigation, a detailed understanding of food composition is needed (see reading list) or the assistance of a dietitian experienced in this field. Simply telling parents to avoid foods such as dairy products can be

Distinguishing food allergy and food intolerance

	<i>Food allergy</i>	<i>Food intolerance</i>
Age	infants & toddlers	any age
Presentations	eczema, perioral and immediate GIT reactions	behaviour, GIT (infantile colic), rashes
Timing of reaction	immediate	delayed
Mechanism	IgE mediated	non-immune
Substances implicated	protein allergens in egg, milk, peanut etc	natural food chemicals, lactose, additives, milk, wheat
Tests	specific IgE (skin test, RAST)	elimination diet and challenge
Treatment	complete avoidance	reduce overall quantity
Outcome	most resolve	variable – many improve

misleading. Foods containing milk such as cheeses, chocolates, and many baked foods and processed foods also contain a variety of dairy and non-dairy substances (such as biogenic amines, gluten, and food additives) which may contribute to symptoms. If the full range of intolerances is not identified, symptoms may return at some stage when the child eats a food containing problem substances.

Symptoms which improve and do not recur on a suitably designed elimination diet, can be taken as evidence of food intolerance. The next step is to conduct a series of oral challenges to identify the specific substances involved.

Inappropriate tests include cytotoxic tests, Vega, Alcat, hair analysis and iridology.

Food Sensitive Enteropathy (FSE)

Rarely, damage to the mucosa of the small intestine is a histopathological feature of food intolerance in children. Cow's milk and soy are the most common foods that cause FSE. Other offending substances include egg, fish and wheat. With the exception of gluten-sensitive enteropathy (coeliac disease), FSE is usually a transient disorder that affects children in the first 12 months of life. Sensitivity to gluten in coeliac disease is permanent.

Symptoms of FSE include:

- **chronic diarrhoea**
- **vomiting**
- **inadequate weight gain, food refusal and failure to thrive**
- **other symptoms, such as eczema, and nappy rashes may be present**

The enteropathy and symptoms clear up completely when the offending foods are excluded from the infant's diet and recur when the foods are reintroduced. Usually after 12–24 months, the child develops tolerance to the offending foods.

Food induced colitis

Bloody diarrhoea from inflammatory lesions in colonic mucosa is a rare manifestation of food intolerance. It is seen almost exclusively in **infants less than six months of age** and may even be a sign of food intolerance in infants who are exclusively breast-fed. Food antigens from the maternal diet can be secreted into breast-milk after systemic absorption in the intestine. They then cause inflammation of the colonic mucosa in the infant. Cow's milk and soy are the most common causes of food-induced colitis. Like FSE, food-induced colitis is a transient disorder which responds well to eliminating the offending food from the diet. The range of foods that need to be eliminated may be extensive and elemental

amino acid formula may be necessary, for example, *Neocate*[®]. The guidance of an experienced dietitian is helpful for managing highly restricted diets.

Metabolic (biochemical mechanisms)

Some of the rare inherited disorders of metabolism associated with unique clinical features of intolerance are listed below.

Rare conditions:

Disorder	Symptoms	Milk related
Galactosaemia	Vomiting, Hypoglycaemia, Cataracts, Liver disease	yes
Amino acid disorders	Vomiting, Failure to thrive, Aversion to protein-rich foods, Episodic encephalopathy, Psychomotor delay, Seizures	yes
Favism	Haemolytic anaemia and jaundice	no
Hereditary fructose intolerance	Aversion to sweet foods, Vomiting, Hyperglycaemia, Failure to thrive, Liver disease	no

Specific problems with milk

Adverse reactions to cow's milk and infant feeding formulas based on cow's milk are commonly reported by parents and are also blamed for problems such as colic, reflux, diarrhoea, eczema and excessive mucus secretion. Parents and health professionals often refer to all such reactions as "allergies", but it is important to recognise that milk may cause several different adverse effects in susceptible children. The term **allergy** is best kept for those known to have an immunological basis.

When trying to evaluate the significance of food reactions, studies are often biased towards one age group, one food or one symptom. The full picture may therefore not be apparent. Reactions to cow's milk are most common in the first two years of life when milk forms the most significant part of any child's diet. Understanding the difference between the types of reactions is important for successful dietary management.

Milk is a complex food

1 IgE antibody responses are to the **protein** components such as lactoglobulin and lactalbumin. Symptoms are characteristic of immediate hypersensitivity.

2 Most infants with gastrointestinal reactions to infant formulas do not have clinical reactions to either protein or lactose, and the underlying mechanism is not clear. Milk intolerance in such children is often part of a broader tendency to food intolerances involving other natural food substances or food additives.

3 Reactions to **milk sugar (lactose)** are non-immune, and are associated only with gastrointestinal symptoms.

Cow's milk allergy

In breast-fed infants, milk allergy is rare before three or four months of age. It may be an exacerbating factor in 25 per cent of infants with eczema. Clinical reactions can vary in their severity. Although milk allergy may sometimes be an isolated problem, it often occurs with an allergy to egg and/or peanuts. In children with a typical clinical picture,

Diagnosis of Milk Allergy

1. Skin prick tests

(refer to local specialist)

2. Milk challenge

*must be performed under careful supervision in **HOSPITAL** as severe reaction may occur*

the diagnosis of allergy can be confirmed by skin prick testing. This can usually be carried out safely and reliably in children as young as three months of age. Blood testing by RAST is a satisfactory alternative if skin testing is not possible for technical or other reasons. Results must be interpreted carefully in the clinical context. **Always check** for other possible allergies such as egg and peanuts as symptoms are likely to continue unless all relevant allergens are excluded from the diet.

Management

The most important preventative measure is to avoid the allergen. If a breast-fed infant with eczema shows an allergic response after skin prick testing, breast feeding should continue, but changes should be made to the mother's diet. Because there is a high risk of a peanut, nut, egg and milk allergy in infants with eczema, avoidance of all these foods is a necessary part of the management. Breast milk is often the safest, least irritant and most nutritious diet for sensitive babies. Even if the baby is allergic to milk, occasional **small amounts of milk in the mother's diet** do not usually cause problems.

Always prescribe changes to formula milks with caution in infants with eczema. In highly atopic infants, hydrolysed protein formulas are the safest alternatives to breast milk, although all except *Neocate*[®] may cause reactions

due to residual fragments of cow's milk protein. Strict avoidance of the offending food is important at first, especially in highly allergic children, where even a trace amount of the food in contact with the mouth can cause a major reaction. Most children grow out of their milk allergy by school age. The skin tests can be repeated annually to find out when it is safe to reintroduce milk products.

In practice, however, it is difficult for children to completely avoid all milk and most will have an occasional accidental exposure. Some parents will therefore know when their child's reactivity has subsided and formal challenge may not be necessary. Where a previous reaction has been severe, it is not appropriate to ask the mother to check for tolerance by giving a little milk every 6 months, as some people suggest.

Natural history

Food allergies tend to disappear with time, and by school age most children with a history of milk allergy have no reaction to consuming milk and the skin test shows no significant response. Allergic reactions to milk are most common between six months and two years. In highly atopic children, reactivity may still be present in later years. Fatalities have been recorded, usually in children with chronic asthma.

Babies with a history of food allergy often later have allergic rhinitis, and less

often, asthma. The more highly atopic they are, as assessed by total IgE levels, the more likely this is. They often become sensitised to house dust mite which may be a significant irritant in their allergic disease.

Prevention

It is difficult to accurately predict which children will have food allergy but maternal avoidance of common food allergens, especially peanuts and nuts, during the early months of lactation, may prevent sensitisation. This must be planned and started before birth. Children at highest risk are those whose parents have a current history of allergic reactions to nuts or seafood, whose parents are both moderately or highly atopic, or who have a sibling with allergies.

Treatment of acute reactions

Parents should be advised to keep antihistamines in the home and at day-care or school, and to give an oral dose immediately if the child has been inadvertently exposed to a known allergen. If there is a history of generalised reactions, a pre-loaded adrenaline syringe (**EpiPen® Jr.**) should be available. Acute systemic reactions should be treated immediately with adrenaline and parenteral antihistamine. Steroids may also be given, but are only effective for preventing late-phase reactions.

Cow's milk intolerance

Milk intolerance, a different problem from cow's milk allergy, occurs most commonly in infancy. It is usually part of a broader range of intolerances to multiple food substances. The symptoms can include aggravation of reflux, vomiting, colic, discomfort, irritability, obstructive nasal symptoms, loose stools and disturbance of sleep because of discomfort. Skin reactions suggest other intolerances and/or a concurrent food allergy.

Dietary management

A Infants

A baby is often weaned because of unsettled, excessively irritable behaviour. The mother may not suspect food intolerance. A traditional cow's milk-based formula is usually given for weaning, but this may make the baby more agitated and provoke excessive reflux, more pronounced vomiting and/or diarrhoea. If the symptoms are less dramatic, another formula is often tried, but it is usually not until milk is removed from the diet and replaced with a soy-based or hydrolysed protein formula that symptoms disappear. If problems persist with soy formula or a hydrolysed protein formula then an elemental amino-acid formula such as *Neocate*[®] is indicated.

In some cases, premature weaning can be avoided by modifying the mother's diet. Even though the mother may not recognise any food-related symptoms in herself, substances from her diet transmitted through breast milk, may upset a food-sensitive baby. These can be identified by giving the mother an elimination diet for two weeks (see reading list) and doing systematic oral challenges, assessing the baby's response after each feed.

The most sensitive babies are likely to have multiple food intolerances, so it is important when introducing solids for mothers to know which foods are least likely to cause unpleasant reactions.

**A reasonable range to start with includes:
rice, pear, potato, swede,
beans, chicken and veal.**

Processed baby foods containing a variety of ingredients, and fruit juices should be introduced cautiously since they are more likely to cause adverse reactions.

Lactose intolerance

B The older child

Once a child's specific intolerances have been identified, he or she needs an appropriate plan for long-term dietary management. If cow's milk is excluded for a prolonged period, the mother needs advice about an appropriate substitute.

Remember to assess calcium intake in all children by asking how much milk, cheese, yoghurt, calcium-supplemented soy drinks and tofu are in their daily diet.

Natural history

In children with bowel symptoms it is unusual for cow's milk intolerance to exist as an isolated problem. Lactose intolerance is an exception, and often occurs for a short time after gastroenteritis in infants and toddlers. Milk intolerance is rarely permanent and regular cow's milk can generally be reintroduced by 2–3 years of age.

Lactose is a disaccharide found in similar quantities in all mammalian milks. It is made up of two simple sugars, glucose and galactose. It cannot be absorbed in the small bowel until it is split by the enzyme **lactase** which is in the brush border of the mucosal cells. Glucose and galactose are subsequently rapidly absorbed, quickly metabolised and are good sources of energy.

Lactose intolerance is a general description used for people who have some degree of difficulty in digesting lactose. It is due to a **deficiency** of intestinal lactase. The amount of the enzyme produced is usually low but is rarely absent. Those with lactose intolerance can still completely digest some lactose, and many will tolerate up to 10–12g of lactose without developing any symptoms. This is the amount present in an average glass of regular milk (250mL).

Lactose intolerance is common in:

- **Chinese and other Asian people**
- **Australian Aborigines**
- **People from the Middle East, the Mediterranean and Africa.**

Almost all infants produce normal amounts of lactase, but in the ethnic groups, listed on page 11, the levels can fade during childhood. Such children may develop symptoms of lactose intolerance if they become ill or change their diet.

Symptoms vary from person to person, but are usually mild. They range from abdominal discomfort to bloating and excessive wind and diarrhoea.

Symptoms may be confused with the irritable bowel syndrome and as the symptoms frequently develop an hour or two after ingesting lactose, the connection between symptoms and the dietary ingredient is often not made.

More severe symptoms may develop in infants for whom milk is the staple food.

The diagnosis of lactose intolerance is first suspected from the history and, unless the individual consumes large quantities of lactose, it is unlikely that lactase deficiency is the cause of all the symptoms. Milk products are the major source of dietary calcium, so it is important to diagnose the problem correctly in order to give appropriate dietary advice.

Diagnostic tests

1 In children with diarrhoea, the stools will be acid and contain reducing substances. A **litmus paper and Clinitest tablet** will show the acidity and the reducing substance concentrations.

2 Breath hydrogen tests.

If lactose is undigested, it is fermented in the colon. Hydrogen is a by-product and much of it is reabsorbed from the colon and expired in the breath.

An increase in breath hydrogen excretion after ingesting lactose is therefore diagnostic of lactase deficiency.

This test is available in many teaching hospitals and some pathology practices.

3 A lactose tolerance test.

After consuming a lactose drink, blood glucose is measured at intervals.

If blood glucose does not rise significantly, lactase deficiency may be present, and diarrhoea will probably occur.

4 Endoscopy and small bowel biopsy

for disaccharidase assay (lactase, sucrase and maltase) provides specific measurements of enzyme activity. This test is available in many teaching hospitals or through pathology practices.

Stool Test for Lactose Intolerance

- 1 Fresh stool collected on plastic-lined nappy or in a plastic bag (*Gladwrap*[®]).
- 2 Five drops of liquid stool + 10 drops of water + one Clinitest tablet.
- 3 Read the reaction after one minute.
- 4 Positive test :
[A] 0.5% or more of reducing substance.
[B] pH less than 6.

NOTE: In healthy breast-fed infants, this test may be positive and does not denote lactose intolerance.

Management

It is important to understand the lactose content of various foods (see table page 14). Milk, ice cream and yoghurt have significant amounts but other dairy products, apart from cream cheese, have almost none. Small quantities of lactose may also be present in chocolate, biscuits, cake and milk flavourings, but not enough to cause symptoms (see food intolerance). Yoghurt is less likely to cause symptoms than milk because the enzymes present may break down some of the lactose.

It is not necessary to exclude all dairy products since most patients tolerate small quantities of lactose.

Many people can adapt to high intakes of lactose over a period of time, perhaps because colonic bacteria (*E.coli*), which contain lactase, assume an increasing role in digestion. It is important not to make unnecessary changes to the diet which eliminate some of the best sources of dietary calcium. If children have persistent diarrhoea, lactose intolerance should be excluded as a cause of symptoms. This may also be important in patients with the irritable bowel syndrome.

Insufficient calcium intake increases the risk of osteoporosis, particularly in women, and if milk needs to be excluded, alternatives should be discussed.

Lactase products are available from many pharmacies in tablet or drop form (*Lactaid*[®]). When added to milk they break down the lactose making the milk a little sweeter because of the increased glucose content. Long-life versions of low-lactose milks are also available.

Other options include: soy, rice or other cereal drinks. Check that they have been fortified with calcium so there is at least 290mg of calcium for every 250mL. If not, calcium supplementation is necessary.

Lactose content of some common foods

<i>Foods</i>	<i>Serving Size</i>	<i>Lactose (mg)</i>	
Cow's milk	1 cup	12g	MAY CAUSE SYMPTOMS
Goat's milk	1 cup	10g	
Yoghurt (plain)	1/2 cup	10g	
Breast milk	1 feed	5–10g	
Ice-confection	2 scoops	5g	
Ice-cream	2 scoops	5g	
Quiche	1 slice	2g	USUALLY TOLERATED
Lasagne	1 serve	1g	
Custard tart	1 tart	1g	
Cottage cheese	1/2 cup	1g	
Cream	2 tbsp	1g	
Cream cheese	1 tbsp	1g	
White milk bread	2 slices	0.5g	
Plain or chocolate cake	1 slice	negligible	
Fruit cake	1 slice	negligible	
Plain or fruit bun	1	negligible	
Chocolate	4 squares	negligible	
Biscuits, plain sweet	2	negligible	
Biscuits, cream-filled	1	negligible	
Butter	1 tsp	negligible	
Margarine	1 tsp	negligible	
Soy drinks	1 cup	negligible	NO PROBLEM
Bread, white/wholemeal	2 slices	negligible	
Muesli bar	1	negligible	
Cheese - cheddar, edam, gouda, Swiss	1 slice	negligible	
Cocoa	1 tsp	negligible	

Clinical presentations

<i>Symptoms</i>	<i>Age</i>	<i>Common Foods</i>
Food Allergy		
Eczema	Infants	Egg
Acute skin & GI reaction	Toddlers	Milk protein Peanut Nuts, sesame (others uncommon)
Food Intolerance		
Irritability	Any age	Multiple foods (natural food chemicals and additives) eg, fruit, chocolate, vegemite milk & soy
GI symptoms		
Reflux		
Pain reaction		
Diarrhoea		
Wind		
Lactase Deficiency		
Bloating	Older children	Milk
Wind	Adults	Foods made from milk
Loose stools	Infants (transient after gastroenteritis)	
Pain		
Food-sensitive Enteropathy		
Failure to thrive	Infants younger than 6 months	Milk
GI symptoms		Soy
Food-induced Colitis		
Bloody diarrhoea	Infants younger than 6 months	Milk Soy

Calcium requirements

a simplified guide

Babies	300mg
Toddlers and young children	600mg
Older children and adults	900mg
Teenagers, pregnant and lactating women	1200mg

Calcium supplements

Caltrate (WHITEHALL)	600mg/tablet
F.A.B. Tri-Cal (MEDICAL RESEARCH)	200mg/tablet

Breast milk is best for babies

Infant formula is intended to replace breast milk when mothers do not breast feed. Good maternal nutrition is important for preparation and maintenance of breast feeding. Introducing partial bottle feeding could negatively affect breast feeding and reversing a decision not to breast feed is difficult. Infant formula should be prepared and used as directed. Unnecessary or improper use of infant formula may present a health hazard. Social and financial implications should be considered when selecting a method of infant feeding. Professional advice should be followed.

References

- 1 The European Society for Paediatric Gastroenterology and Nutrition Working Group for the Diagnostic Criteria for Food Allergy. Diagnostic criteria for food allergy with predominantly intestinal symptoms. *J Pediatr Gastroenterol Nutr* 1992; 14:108-12.
- 2 Lake AM, Whittington PF, Hamilton SF Dietary protein-induced colitis in breast fed infants. *J Pediatr* 1982; 101:906-10.

Reading list

The Feeding Guide

3rd Edition 1998-08-03

Available from Kid's Health

The New Children's Hospital

PO Box 3515 Parramatta NSW 2124.

Friendly Food—Avoiding allergies, additives and problem chemicals

Available from bookstores, newsagencies, the publisher (Murdoch Books) or the Allergy Unit,

Department of Clinical Immunology

Royal Prince Alfred Hospital

Missenden Road Camperdown NSW 2050.

Salicylates, Amines, MSG and Simplified Elimination Diet

Available from the Allergy Unit,

Department of Clinical Immunology

Royal Prince Alfred Hospital

Missenden Road Camperdown NSW 2050.

Dealing with Food Allergy – VIDEO & KIT

Available from the Allergy Unit,

Department of Clinical Immunology

Royal Prince Alfred Hospital

Missenden Road Camperdown NSW 2050.