THE AUSTRALASIAN COLLEGE OF TROPICAL MEDICINE

Table 2: Ingested pathogens, toxin producing organisms and chemicals causing predominantly gastrointestinal symptoms in travellers

Pathogen, toxin producing organism or chemical	Acute GIT symptoms	Chronic GIT symptoms	Symptoms	Epidemiology & route of transmission
Bacteria				
Escherichia coli	X	x	Watery diarrhoea +/- blood; Nausea, vomiting, fever, malaise and abdominal cramps vary according to strain of *E. coli.* Mild to severe effects	Most common cause of traveller's diarrhoea; Latin America, Caribbean, Africa, Middle East, Asia (Leung, 2024; Adler, 2022; Boddhidatta, 2019; Lopez-Velez, 2022) Contaminated food and water, faecal-oral route; more common if taking histamine blockers (LaRocque, 2025)
Shigella spp	X	x	Fever, anorexia, malaise; initially watery diarrhoea but blood and mucus often develop (depends on species). Tenesmus common. Nausea and vomiting usually absent. Can develop severe complications (bacteraemia) as well as long term sequelae (GI obstruction/perforation, seizures, encephalopathy, reactive arthritis) (Agha, 2023).	More common in SE Asia, but also found in South Asia, Latin America, Caribbean, Sub-Saharan Africa (Adler, 2022; Lopez-Velez, 2022). Contaminated food (raw vegetables are a common cause), drinking water or recreational water. MSM more likely to be infected Survives stomach acid (Agha, 2023).

Camplyobacter jejuni	X	x	Abdominal pain, cramps and diarrhoea, +/- fever, rigors, aches, dizziness, delirium. Children more likely to have nausea, vomiting, bloody stools. Severe complications can occur. Reactive arthritis, Guillian Barre can occur (Allos, 2025: Steffen, 2017; Leung, 2024; La Rocque, 2025).	More common in SE Asia, but also found in Western Asia, Latin America, Caribbean, Sub-Saharan Africa, North Africa (Adler, 2022; Lopez-Velez, 2022; LaRocque, 2025). Contaminated food (mostly chicken but can be any meat or any foods contaminated by raw meat), unpasteurised milk and water (fresh or salty). HIV patients more likely to be infected (Allos, 2025).
Salmonella spp Non typhoidal Salmonella	X	can shed in stools for weeks to months (usually no symptoms)	Diarrhea, nausea, vomiting, abdominal cramping (blood rare but more common in children), fever, fatigue, malaise, chills and headache. Severe complications <5% (see risk factors next column) (Hohmann, 2024)	Asia, Africa, Latin America, Caribbean (Adler, 2022; Lopez-Velez, 2022; Andrews, 2024). Contaminated food (poultry, eggs, milk products, fresh produce, meats), contact with pets, reptiles, contaminated water. More common in infants, > 60 years, steroid use, malignancy, previous antibiotic use, advanced HIV, reduced gastric acidity, IS, those with atherosclerosis, prosthesis (heart valves, joints) (Kotton, 2024; Hohmann, 2024).
S. Typhi, S. Paratyphi (A, B, C) (enteric fever)	X	Chronic carriage > 12 months in stool or urine (usually no symptoms) (Andrews, 2024)	Fever, chills, abdominal pain. Diarrhoea more common in children, constipation more common in adults. GI symptoms often not major complaint. Can become very severe (Andrews, 2024; Hohmann, 2024)	Common SE Asia, South-Central Asia, southern Africa. Less common Latin America, Caribbean and Oceania (Adler, 2022; Lopez-Velez, 2022; Andrews, 2024). Contaminated food and water. Unvaccinated (for S. Typhi) at higher risk of disease. (Andrews, 2024)

Vibrio spp *V. cholerae*	X		Watery diarrhoea +/- vomiting. Can be very severe diarrhoea – rice water stools with significant hypovolaemia and death. Rare for travellers to be infected but potentially life-threatening (LaRocque, 2023; LaRocque, 2024; Leung, 2024)	Endemic 50 countries Asia, Africa, Caribean and Central America. (LaRocque, 2023; Leung, 2024; Adler, 2022) Contaminated food and water, faecal-oral route. More common in those with hypochlorhydria or partial gastrectomy (LaRocque, 2024).
Non cholera vibrios - *V, parahaemolyticus, V. vulnificus*)	X		Diarrhoea, cramps and less often fever, nausea, vomiting. Blood even less common (*V. p*). *V. v* more likely to present with non-GIT (see Table 3) but if GIT symptoms, diarrhoea predominates (Morris, 2024; Morris, 2024).	Global distribution. Found in estuarine and marine environments (warmer climates). Associated with seafood consumption and water activities (swimming, boating). More common in those with liver disease, alcohol, DM, CRF, RA, other IC conditions. (Morris, 2024; Morris, 2024).
Aeromonas spp	X	X	Can be mucus, bloody or watery diarrhoea; Can be acute and chronic (Morris, 2023). Non-GIT symptoms see table 3	Common SE Asia (Steffen, 2015) but has global distribution (Morris, 2023; Boddhidatta, 2019). Can survive in fresh, brackish, surface, drinking and polluted water. Risk factors include liver disease and haematological malignancies (Morris, 2023).
Plesiomonas shigelloides	X	Can be prolonged (2 weeks – 3 months) (Morris, 2023)	Mostly watery but can be secretory or occasionally bloody. Abdominal pain/cramps common in adults, vomiting in children (Morris, 2023).	Found in fresh or brackish water; secondary to undercooked seafood, contaminated water; outbreaks in Asia (South, SE, East) (Bodhidatta, 2019; Adler, 2022; Morris, 2023). More common with liver disease, IC, haematological malignancies (Morris, 2023).

Clostridioides difficile	X	X	Can be acute, persistent, chronic, recurrent diarrhoea but may develop severe illness (megacolon, perforation, death). (Neuberger, 2013). Diarrhoea is usually water and associated with abdominal pain, cramping, nausea, anorexia (Lamont, 2025).	Reported in travellers visiting Asia, Latin America, Caribbean, Africa (Steffen, 2015; Adler, 2022; Lopez-Velez, 2022; Neuberger, 2013) Environmental organism but can also be a gut coloniser (asymptomatic). More common in those who have used antibiotics however can cause TD without use of antibiotics. Other risk factors include >65, severe underlying medical disorders (Lamont, 2025).
Yersinia spp	X		Abdominal pain, diarrhoea (UTD) and fever (Steffen, 2015; Tauxe, 2024). Nausea and vomiting in some. Blood more common in children than adults. More subacute than other causes of TD. Bacteraemia in infants and iron overload (high mortality) (Tauxe, 2024).	More common northern Europe. Zoonotic disease (found in pigs, birds, mammals) and occasionally waterborne. Often due to consumption uncooked pork products. Risk factors include those with iron metabolism derangement (cirrhosis, haemachromatosis, aplastic anaemie, thalassaemia, sickle cell disease), IC, malignancy, diabetes and severe malnutrition (Tauxe, 2024).
Staphylococcus aureus enterotoxin	X		Nausea, vomiting, abdominal cramps 1- 6 hours post eating foods with heat stable enterotoxin. Diarrhoea and fever uncommon. (LaRocque, 2025).	Ingestion of food contaminated with enterotoxin producing *S. aureus* (LaRocque, 2025)
Bacillus cereus enterotoxin	X		Nausea and profuse vomiting 1-6 hours post ingestion (LaRocque, 2025).	Ingestion of food contaminated with enterotoxin (often rice left at room temperature) (LaRocque, 2025).

Listeria monocytogenes	X		Acute infection – diarrhoea, fever, headache, myalgia Severe invasive disease – fever, myalgia, septicaemia, meningitis (including in neonates born of infected mother). In pregnant women, listeria infection can cause spontaneous abortion, stillbirth or congenital or neonatal infection. (WHO, 2018)	Global distribution. found in water, soil, environment, intestines of animals hence any infected water or foodstuffs may be ingested. Higher risk products include unpasteurised milk (and any of its products), soft cheeses, raw vegetables, processed meats. Listeria will grow at fridge temperatures therefore any pre-packaged ready to eat meals can be contaminated (including uncooked vegetables, pre or under cooked meat, seafood etc). Pregnant women, elderly, IC (steroids, TNF inhibitors, malignancy, HIV, DM, CRF, liver disease, transplant recipients) at higher risk (Gelfand, 2025; WHO 2018).
Viruses				
Norovirus	X	Chronic possible with haem malignancies and transplant patients (O'Ryan, 2023)	Abrupt onset of vomiting (predominately) and watery diarrhoea +/- fever, myalgia, malaise, headache (O'Ryan, 2023).	Global distribution. Contaminated water and food (leafy greens, fruit, shellfish), person-to-person, fomites, aerosolised vomitus. Commonly caught at restaurants, on cruises, staying in dormitories/groups etc (Jiang 2017; O'Ryan, 2023; Bodhidatta, 2019; Adler, 2022; Steffen 2015)

Rotavirus	X		Vomiting (predominately), watery diarrhoea (non-bloody) +/- fever, respiratory symptoms. Children more common and more severe than adults. IC more likely severe and prolonged symptoms (O'Ryan, 2024).	Global distribution. Year round in tropical regions; cooler months in temperate regions. Faecal-oral route. More common children < 5 years. Reported in travellers. (Jiang 2017; O'Ryan, 2024; Bodhidatta, 2019; Adler, 2022; Steffen 2015)
Hepatitis A	X	Rarely but can be prolonged illness in adults	Nausea, vomiting, anorexia, fever, malaise and abdominal pain (symptoms more common in adults). Up to a week later, pale stools, bilirubinuria, jaundice, pruritis (as early symptoms have waned). Children < 5 years often asymptomatic or mild symptoms (30%), older children 70% jaundiced. Fulminant hepatitis more likely in patients who have liver disease from HBV, HCV and those > 50 years (Lai, 2024; WHO, 2022).	Global distribution; medium-high prevalence-sub-Saharan Africa, North Africa, Middle East, Central and South Asia, Latin America, Caribbean and Oceania (WHO, 2022). Contaminated food or water and person-to person transmission. Long incubation period (average 28 days) so may be sick only on return. Pregnant persons increased risk pre-term labour and gestational complications (Lai, 2024; WHO, 2022).
Hepatitis E	X	Can be prolonged in HIV, transplant patients.	Mild fever, nausea, anorexia, vomiting, abdominal pain followed by jaundice. Often asymptomatic in children. Fulminant liver failure rare (Sherman, 2023; WHO, 2023).	Global distribution but most common South and East Asia, Africa (Sherman, 2023; WHO, 2023). Transmission depends on serotype but includes water and food contamination (under cooked pork, deer, shellfish, wild boar), perinatal, blood transfusion. More common in young adults (15-40). Severe in pregnant women, liver disease, haematological malignancies and transplant patients (Sherman, 2023; WHO, 2023).

Polio virus	Only with meningism	Virus may persist in stool for up to 6 weeks but no GIT symptoms (Simionescu, 2023)	Mild illness is more common than severe Mild includes fever headache, sore throat, fatigue. Severe includes paralytic polio (severe illness with acute flaccid paralysis and pain) and non-paralytic polio (severe illness (fever, headache, vomiting, meningismus with no motor signs) (Simionescu, 2023; WHO, 2024).	Infection from wild or oral vaccine derived types. Wild type still circulating in Pakistan and Afghanistan. Some sub-Saharan African countries have vaccine derived polio. Most common in children < 5 yrs. Faecal-oral, contaminated food/water or pharyngeal secretions (Simionescu, 2023; WHO, 2024).
Parasites				
Protozoa				
Giardia lamblia	X	X	Diarrhoea, foul smelling and fatty stools, flatulence, cramps and bloating. Nausea, malaise and less common fever. Chronic infection common with loose stools, steatorrhoea, bloating, flatulence, weight loss, malaise, malabsorption.	Global distribution but common for travellers visiting South Asia (especially Nepal), SE Asia, Latin America (Adler, 2022; Jiang, 2017; Steffen, 2015). Food and waterborne (raw and under cooked foods); cysts resistant to chlorination (Leder, 2024).
Cyclospora cayetanensis	X	X	Acute presentation – anorexia, nausea, flatulence, fatigue, abdominal cramping, water diarrhoea +/- mucus or blood. Can lead to prolonged waxing and waning course of sustained diarrhoea,	Latin America, the Indian subcontinent, Southeast Asia and sub-Saharan Africa (Leung, 2024; Weller, 2023; Adler, 2022). Food, water and soil transmitted protozoa; chlorine insensitive (Weller, 2023).

			anorexia, upper GI symptoms for weeks or months (Weller, 2023).	
Entamoeba histolytica	X	X	Majority of infections are asymptomatic. Subacute symptoms over 1-3 weeks ranging from mild to severe dysentery, abdominal cramps and mucus diarrhoea. Fever is absent which is distinguishing feature for other organisms causing dysentery (Shigella spp, *E. coli* etc). Fulminant colitis possible with high mortality. Not as common as other protozoal infections but can be associated with prolonged diarrhoea (may not be bloody), weight loss, liver abscesses (Leder, 2024).	Global distribution but common in India, Africa, Mexico, Central and Southern America (Leder, 2024). Contaminated food or water, sexual transmission (faecal-oral route), chlorine resistant (at levels used for water supplies); iodine may be effective. Severe disease more common in very young, pregnancy, steroid use, malignancy, alcohol, malnutrition (Leder, 2024).
Cryptosporidium parvum	X	X	Asymptomatic, mild or severe. Diarrhoea can be acute or chronic, transient, intermittent or continuous; scant or voluminous. Diarrhoea is watery and often associated with malaise, nausea, anorexia, crampy abdominal pain and low-grade fever. Can become persistent or relapse with severe wasting. Joint pains (knees, ankles, feet) associated and ongoing GIT symptoms (Leder, 2024)	Global distribution but more common in Asia, Latin America and sub-Saharan Africa (Adler, 2022; Jiang, 2017; Leder, 2024). Waterborne predominantly (drinking water, swimming pool and recreational water facilities) but also food borne. Chlorine and iodine resistant. More common in HIV positive (low CD4 count), those on immunosuppressive therapy including transplants (Leder, 2024).

Helminths				
Anisakis spp	X	X	Nausea, vomiting and epigastric pain 1-8 hours post ingestion. Can also get intestinal anisakis 5-7 days post ingestion with abdominal pain, distension, diarrhoea (blood or mucus)	Humans are incidental host. Ingestion of undercooked, raw or pickled infected marine fish containing nematodes. Most common in Japan but increasingly in Europe and Americas (Leder, 2024).
Liver flukes				
○ Opisthorchiasis	x	X	For both Opisthorchis and Clonorchis Acute symptoms less problematic than sequelae - chronic liver and bile duct disease. Acute symptoms can include nausea, vomiting, RUQ pain, diarrhoea, fatigue 2 to 4 weeks. Late manifestations include biliary obstruction, cholangitis, cholecystitis, liver abscess, pancreatitis, hepatitis and cirrhosis, Cholangiocarcinoma is often seen with heavy infections (Leder, 2024).	Cambodia, Thailand, Laos, Vietnam, China & Myanmar (*O. viverrini*); SE Asia, Central and eastern Europe *(O. felineus)*. Ingestion of raw, pickled, salted, smoked or undercooked freshwater fish (Leder, 2024).
○ Clonorchiasis	x	X		Korea, Japan, Taiwan, Southern China, eastern Russia. Ingestion of raw, pickled, salted, smoked or undercooked freshwater fish (Leder, 2024).
○ Fasciola spp (*F. hepatica, F. gigantica*)	x	x	Sub-acute symptoms (6-12 weeks) – fever, RUQ pain, nausea, vomiting, weight loss, myalgia. Late manifestations include epigastric and RUQ pain, nausea, vomiting, diarrhoea, hepatomegaly, jaundice, biliary obstruction, cholangitis, cholecystitis and pancreatitis	Infection is endemic in Europe, Central and South America, Asia (East and SE), Africa and Middle East. Ingestion of contaminated water and uncooked freshwater grown plants e.g. morning glory, watercress, water chestnuts (Leder, 2024).

Lung fluke ○ Paragonimiasis	x mostly respiratory symptoms	X Respiratory symptoms most common; GIT complications rare	Acute infection – fever, malaise, diarrhoea, epigastric pain, urticaria followed by SOB, cough, malaise, pleuritic chest pain. Chronic respiratory symptoms – recurrent haemoptysis, SOB (Leder, 2023).	Asia (Thailand, China, Korea, Japan, Taiwan, Cambodia, Laos, Vietnam, Philippines, Malaysia, India), Western/Central Africa, North/Central/South America Ingestion freshwater crabs and crayfish (Leder, 2023).
Hookworm *(Ancylostoma duodenale, Necator Americanus, Ancylostoma ceylanicum)*	X		Acute infection – as establishes in GIT may cause nausea, vomiting, diarrhoea, epigastric pain (Weller, 2024).	Various species found in different areas including Iran, India, Pakistan, Mediterranean countries, North and South America, Central Africa, Indonesia, SE Asia, Pacific Islands, northern Australia. Ingestion of raw vegetables contaminated by helminths although not major mode of transmission. Faecal-oral route is a minor route compared with skin contact with contaminated soil (see table 3). (Weller, 2024).
Strongyloidiasis *(Strongyloides stercoralis)*	X	x	Acute infection - establishes infection in small bowel - anorexia, abdominal pain, diarrhoea or constipation are possible but not common. Often asymptomatic Chronic infection - usually mild but can include peri-umbilical pain, diarrhoea, constipation, intermittent vomiting and borborygmi.	Endemic in tropical and subtropical regions including SE Asia, Pacific, Africa, northern Australia, USA (Leder, 2024). As with hookworm, infection is predominantly through skin penetration however, faecal oral route is well recognised (Leder, 2024).

			Respiratory symptoms rare. Can develop disseminated disease that can be fatal (Leder, 2024).	
Toxins				
Mushrooms	X		<u>Onset of symptoms < 6 hours:</u> Nausea, vomiting, abdominal cramps, diarrhoea 1-3 hours post ingestion. May also have CNS excitation or depression, hallucinations, seizures, symptoms of cholinergic poisoning (muscarine toxin producing mushrooms). <u>Onset of symptoms > 6 hours:</u> Vomiting, diarrhoea (cholera like), abdominal pain and dehydration with progressive liver toxicity (encephalopathy, coagulopathy, renal failure etc) (Wiegand, 2023).	Global distribution. Numerous mushrooms cause poisoning. Symptom onset < 6 hours post consumption rarely life threatening (compared with those where symptoms begin after 6 hours) (Wiegand, 2023).
Shellfish poisoning	Neuro		<u>Paralytic shellfish poisoning</u> – many neurological symptoms including perioral tingling, ataxia, dysphagia, dizziness, paresthesias, weakness prior to paralysis and respiratory failure. Onset few minutes to four hours. Death in around 12% if untreated (Marcus, 2024).	Global distribution but mostly found in temperate climates, although described in shellfish from tropical waters. Ingestion of shellfish (mussel, clams, scallops, oysters, crabs, snails) contaminated with neurotoxins formed by algae, primarily saxitoxins (not destroyed by heat, marinating or freezing) (Marcus, 2024).

	X (GIT and neuro symptoms)		Neurotoxic shellfish poisoning – 2 modes of transmission: *Ingestion*: from 30 mins to 3 hours GI symptoms (nausea, vomiting, diarrhoea, abdominal pain) and neurological symptoms (paraesthesias of face, mouth, limbs, dizziness, ataxia, myalgia, temperature related dysesthesias; may proceed on to paralysis, seizures and coma). *Inhalation*: toxins inhaled from sea spray with rhinorrhea, bronchoconstriction and other respiratory symptoms. Asthmatics and those with chronic respiratory disease are susceptible (Marcus, 2024).	USA, Gulf of Mexico, Caribbean and New Zealand. Toxins produced by algae taken up by bivalve shellfish which are then ingested as well as aerosolised during algal blooms. Seafood smells, tastes and looks normal (Marcus, 2024).
	X		Diarrheic shellfish poisoning – chills, nausea, vomiting, diarrhoea, abdominal cramps about 2 hours after eating mussels or scallops (Marcus, 2024).	Global distribution; mostly due to ingestion of contaminated mussels and scallops (Marcus, 2024).
Pufferfish Poisoning (tetrodotoxin)	Mostly neuro symptoms		Symptoms rapidly occur after ingestion and include weakness, dizziness, paraesthesiae of face and limbs, nausea. Severe hypotension and paralysis can occur with higher	Most commonly reported in Japan and SE Asia (TG, 2020). Micro-organisms associated with the fish produce neurotoxin which concentrates in liver, visceral organs and skin of various fish which are considered delicacies in Japan. The neurotoxins are resistant to washing, cooking and other food preparation. The toxin can also

			doses ingested (Marcus, 2024; TG, 2020).	be found in some frogs and octopus (Marcus, 2024).
Ciguatera fish poisoning	X plus neuro and cardio-vascular symptoms		Symptoms affecting three systems are common however geographical differences in predominance and severity. GIT symptoms usually the first to develop; vomiting, diarrhoea, abdominal cramps 3-6 hours after eating contaminated fish. Neuro – peri-oral paraesthesiae, pruritus (no rash), metallic taste, painful teeth, dysuria, blurred vision, ataxia and temperature related dysesthesias. 10% paresis in South Pacific. Onset 3- 72 hours post ingestion CVS – bradycardia, heart block, hypotension within hours of consumption (Marcus, 2023).	Foodborne illness found mostly in tropics and subtropics (particularly Pacific and Caribbean) (TG, 2020; Marcus, 2023). Ingestion of reef fish contaminated with ciguatera toxin produced by algae like organism on coral reefs. Fish do not taste, smell or appear abnormal. Cooking, marinating, freezing does not destroy toxins. Perinatal transmission is possible e.g. pregnant person poisoned can transmit to foetus; breast feeding should be avoided as toxin passed through milk (TG, 2020; Marcus, 2023).
Scombroid poisoning	x		Symptoms usually begin within one hour of consumption of contaminated fish/cheese. Flushing of face, neck, rash on upper torso, diarrhoea and headache are the most common symptoms however peri-oral burning, itching or oedema, nausea, vomiting,	Global distribution; consumption of contaminated fish e.g. tuna, mackerel, bluefish, swordfish, herring, sardines, tilapia, trout as well as contaminated Swiss cheese. Bacterial overgrowth and conversion of histidine to histamine if fish not refrigerated at appropriate

			abdominal pain, dizziness, palpitations, chest tightness, SOB are also possible. Can become hypotensive; respiratory distress and cardiac arrythmias are rare (TG, 2024; Marcus, 2023).	temperatures. Cooking and freezing do not destroy histamine. Patients taking isoniazid or monoamine oxidase inhibitors may have more prolonged or severe symptoms. Those on antihistamines may be protected somewhat (TG, 2024; Marcus, 2023).
Botulism	X		Prodromal GIT symptoms of nausea, vomiting abdominal pain and diarrhoea followed by neurological symptoms (cranial nerves and descending weakness) (Pegram, 2023).	Global distribution; neurotoxin produced by environmental and soil bacteria *Clostridium botulinum*. Often found in canned, preserved and fermented foods contaminated by preformed botulinum toxin. Heat and gastric acid resistant; sensitive to 20 minutes of chlorine. No smell or taste (Pegram, 2023).
Chemicals				
Heavy metals				
Arsenic	X	x (non GIT)	Acute poisoning is rare – nausea, vomiting, diarrhoea, abdominal pain, peripheral tingling/numbness, muscle cramping (Anderson, 2019; Goldman, 2024; WHO 2022). Cumulative effects from chronic ingestion are more common - skin lesions (hyperkeratosis), cancers, cardiovascular disease, neurological (Anderson, 2019; Goldman, 2024).	Naturally occurring in groundwater. Also in some pesticides, insecticides and herbicides hence could be ingested if drinking from wells or unfiltered river water/run-off (Goldman, 2024; WHO 2022). Clinical cases well described in Bangladesh, India (West Bengal), Pakistan, Cambodia, China, Vietnam, Chile, Argentina, Mexico (WHO, 2022). Children more susceptible to ill effects. Inorganic arsenic can cross placenta with increased risk of spontaneous abortions,

				stillbirths, low birth weight, increased infant mortality (Anderson, 2019; Goldman, 2024; WHO 2022).
Lead	X	x (non GIT)	Acute symptoms – vomiting, abdominal pain, constipation, headaches, muscle weakness, paraesthesia (CDC, 2014; TG, 2024). Chronic effects –intellectual and behavioural disorders in children; adults high blood pressure, cardiovascular and kidney damage; pregnant women – miscarriage, stillbirth, premature, low birth weight (CDC 2014, WHO 2023)	Naturally occurring in groundwater. Can also leech into water systems from industry (mining, manufacturing), recycling or leeching of batteries, lead pipes or parts, 'traditional' medicines including moonshine) (WHO, 2022; WHO 2023). Children and unborn babies are more susceptible as absorb more than adults (TG, 2024; CDC 2014; WHO 2023 Pregnant person at risk of miscarriage, stillbirth, premature, low birth weight (CDC 2014; WHO 2023)
Fluoride	X	x (non GIT)	Acute symptoms - nausea, vomiting, diarrhoea, abdominal pain, excessive salivation. Seizures, paraesthesiae and muscle spasms may also occur. (Gessner, 1994: WHO 2019) Chronic effects – teeth and bone effects (Anderson 2019).	Naturally occurring in groundwater (at least 30 countries) (Nizam 2022). Can also leech into water systems from manufacturing, fertilisers, (WHO 2019). Fluoride hotspots found in India, China (WHO 2019), Bangladesh, Iran, Pakistan, Vietnam, Kenya, Tanzania, Mexico, Argentina, (Nizam, 2022)
Insecticide poisoning				
Organophosphate and carbamates	x		Acute poisoning is uncommon however can be severe. Oral or respiratory exposures lead to symptoms within 3 hours however	Commonly found in insecticides. Can be ingested (run off into rivers) or inhaled (Bird, 2024).

			dermal absorption is often delayed up to 12 hours. Symptoms are due to cholinergic excess including bradycardia, miosis, salivation, lacrimation, diaphoresis, bronchospasm, urinate, vomiting and diarrhoea. Cardiac arrythmias and heart block are rare (Bird, 2024).	