



The role of peanut-free school policies in the protection of children with peanut allergy

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Abstract

Peanut allergy that affects 1.4–4.5% of North American children, has increased in prevalence in the past 20 years, is often diagnosed early in life, and outgrown in fewer than 20–32% of children by age 6. Recent self-reported data suggest that over 50% of peanut allergic individuals have had a severe reaction. Because food (and peanut in particular) is a ubiquitous part of school attendance, this raises the potential for reactions to accidental peanut ingestion at school. Accordingly, there is increasing interest in creating policy to protect peanut allergic children in the school environment—sometimes as a ban on peanut-containing items either in the classroom, the lunchroom, or even in the entire facility. We review the evidence for, and against, peanut bans in schools.

Keywords Peanut allergy · Epinephrine · Anaphylaxis · Peanut bans · School food allergy

Peanut allergy affects 1.4–4.5% of North American, European, and Australian children and its prevalence has increased in the past 20 years. Diagnosis often occurs early in life, but fewer than 20–32% of children outgrow the allergy by age 6 [1–3]. Food allergy is more common in high-income countries [2]. While prevalence estimates are less robust in low to middle-income countries, evidence suggests that food allergy is increasingly a global issue [4, 5]. The World Allergy Organization focused on food allergy as a global problem for World Allergy Week 2019 [6].

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Recent self-reported data suggest that over 50% of peanut allergic individuals have had a severe reaction [7]. Reactions from accidental peanut ingestion occur; many food allergic children experience a reaction at school [8–10]. Because food (and peanut in particular) is a ubiquitous part of school environments, so too is the potential for reactions there. Thus, increasing interest focuses on creating policy to protect peanut allergic children at school. Some schools ban peanut-containing items in the classroom, the lunchroom, or in the entire facility. The goal of this article is to review the evidence for, and against, such peanut bans in schools.

Neither the United States (US) federal government, state governments, the Centers for Disease Control and Prevention, National Institutes of Health, nor any allergy professional society formally endorses any class or school-wide peanut ban [11, 12]. Some allergy societies, such as the Australasian Society of Clinical Immunology and Allergy (ASCIA), specifically advise against it [12]. Nonetheless, concern about reactions that may occur outside the home has driven elective implementation of peanut-free school policies in many districts in certain westernized countries where peanut allergy is prevalent [13]. One school district in the United Kingdom (UK) not only banned peanut from schools but also recommended banning it from breakfasts children eat prior to arriving school [14]. Proponents of such bans argue that restricting the presence of peanut reduces the risk of cutaneous or inhalational exposure to peanut (often termed ‘casual contact’) and the risk of ingestion of peanut-containing products, providing a “community approach to safety” [13]. Such policies lack evidence of efficacy and systematic evaluation. As noted in a recent review, “the question of ‘to ban or not to ban’ peanuts remains unresolved” [13].

A primary argument for banning peanut in schools arises from misperception of the risk of exposure and reaction from particular mechanisms of peanut exposure. Little evidence supports a risk to a peanut allergic individual apart from ingesting peanut. Instead, studies demonstrate that inhalational or cutaneous casual environmental peanut exposure is highly unlikely to result in a systemic allergic reaction. As the Australasian Society of Clinical Immunology and Allergy (ASCIA) guideline on prevention of anaphylaxis in schools state, “oral ingestion is almost always required to trigger anaphylaxis” [12]. While many perceive that peanut allergen can aerosolize and trigger reactions, research shows this to be inaccurate. Studies have not demonstrated airborne circulation of peanut dust; peanut butter vapors are volatile organic compounds that do not contain peanut protein, and skin contact with peanut butter or dust induces only localized skin reactions at the site of contact. We review two such studies from the early 2000s below.

The first attempted to detect and quantify the amount of airborne peanut allergen resulting from proximity to someone shelling or consuming roasted peanuts [15]. Participants de-shelled and ate peanut, discarded the peanut shells on the floor and walked on them—intentionally in a small unventilated room to decrease the air exchange rates. Air samples from filters at the neck level of participants eating peanut and sitting next to the peanut eater (or from distances 5 to 10 feet) consistently demonstrated no detectable levels of peanut protein. These investigators also found that 5 ml of peanut butter smeared either on the hands or on a table surface could be abated to undetectable levels using soap and water or commercial detergent agents such as wipes, but not using only gel-based hand sanitizer.



The second study focused on the proximity risk related to peanut butter in a target population of 30 children with histories of severe peanut allergy (including reported airborne reactions). In a placebo-controlled study of cutaneous or vapor inhalational exposures to peanut butter (or soy butter as the control), no patient had a systemic reaction from inhaling peanut or control vapors at 12 in. from the nose, or from having peanut butter (or the control) applied to their skin (approximately 10% experienced a mild localized rash at the site of skin contact to both peanut butter and the control, which dissipated after washing of the skin). The authors concluded with 95% confidence that at least 90% of children with significant peanut allergy would not experience systemic reactions from casual contact to peanut [16].

Two more recent studies, using newly available highly sensitive probes to detect peanut allergen, re-affirmed that circulating peanut dust cannot be detected and that washing with commonly used cleaning agents can abate peanut from surfaces [17]. Given evidence of how unlikely it is that a reaction will occur without oral peanut contact, and that peanut-contaminated skin and surfaces can be effectively cleaned, why have jurisdictions enacted unproven restrictive policies in favor of evidence-proven, less-restrictive measures?

A second factor supporting bans stems from misperception of the potential risk of fatal anaphylaxis from accidental peanut ingestion. The risk of fatal food-induced anaphylaxis in the population is roughly equivalent to death by being struck by lightning (1 in 10 million) [18]. A common misperception is that the rate is much higher. Quality data regarding food allergy fatality risk are hard to ascertain and are biased by reliance upon large self-reported fatality registries where small numerators of known events may be mis-extrapolated—without knowing the denominator of all fatal and non-fatal reactions—to determine actual relative risk. Even so, over the past 15 years, “food allergy” became “life-threatening food allergy” [19]. While this nomenclature change reflects increased awareness of the rare but potential consequences of a food allergy, it is alarmist language that exaggerates the risk: Jerchow et al. reviewed tracking data in a US national fatality registry and identified approximately 150 deaths in a 10-year period (2010s) [20].

Some commonalities appear in the case results. Fatality is more common in the second and third decades of life, in asthmatics, and is associated with prolonged delay in administering epinephrine or not using it at all [18]. In addition, over-represented among these data are teens with compounded risk, either from eating something not verified to be peanut free and/or not having self-injectable epinephrine available to use, or not using it when a reaction occurred [21]. Investigators in the UK and Ireland reported occurrence of food allergy-related fatality in primary school aged children far more commonly with milk than peanut [22]. A 10-year UK retrospective review of pediatric anaphylaxis fatalities found incidence of 0.006 deaths per 100,000 children per year, with milk having caused 50% of those deaths [22]. No child under the age of 13 years is known to have had fatal anaphylaxis to peanut, and only a few such events are known worldwide [23, 24]. In the US, for example, while peanut bans are often in place in schools, milk bans are not despite persistent availability of milk supplied in the US by the Department of Agriculture through federally subsidized school meals.



Ten years ago, as peanut bans appeared more commonly, experts opined that that peanut-free schools provided a “community approach to safety” [13]. Bans are not supported by the evidence of exceptionally low risk and the unlikely mechanism. Instead, the evidence points to the efficacy of mitigating casual contact of hand/surface residue and the lack of enforceability of the ban; it is neither possible, nor practical to check all food brought into a school [25].

A 5-year retrospective study of rates of epinephrine administration in all public schools in the US state of Massachusetts showed no difference among peanut policies (peanut-free school, peanut-free classrooms, peanut served in schools) for epinephrine administration rates; and every school, irrespective of policy, reported some student/s with a reaction [26]. A Quebec study of 252 peanut allergic children found that 80% of who had a reaction to peanut attended schools that banned peanut from the premises [27]. In a 2008 US self-reported study of 504 members of a large food allergy advocacy group, 20% reported that their child had a reaction to peanut despite attending a peanut-free school [28]. A recent Canadian allergy cohort study of 567 accidental exposures in 429 allergic children (over 4589 patient-years) showed more reactions at schools/daycare centers that prohibited peanut than at those that allowed it (4.9% [95% CI 3.3–7.1] vs 3.0% [95% CI 1.8, 4.8], respectively). The investigators speculated that the policy may have promoted a false sense of security and reduced vigilance. Then, the largest Quebec school board lifted the ban [29, 30]. Research has not shown peanut-free school policies to completely prevent peanut from lunches brought to school by students [31].

Peanut bans are not universally desired by families with a peanut allergic child. A 2014 CS Mott Children’s National Poll of parents ($N=816$) of children aged 5–12 years (unselected for food allergy) found that among parents of children with nut allergy (5% of respondents), 47% preferred their child to eat in a lunchroom with no restrictions on what other children were eating [32]. Only 22% preferred lunchroom or school bans on peanut, and 31% preferred that schools designate an eating location where no nuts would be allowed, and seat the nut allergic child there, for example, at a nut-free table. This report concluded that “schools, governments, parents, and doctors who may be involved in the decisions around school nut policies should not presume that all parents of nut-allergic children have the same preferences” and that “seeking a broad range of input will help to craft a policy that meets the needs of all children” [32].

Peanut bans have the potential for unintended consequences. One is conveying a message to children that may increase anxiety that casual contact with peanut is dangerous. Food allergy quality of life literature has long highlighted that anxiety in families of food allergic children has multifactorial influences, but “paramount among them is risk perception” [33]. A study in the *European Journal of Allergy and Clinical Immunology* demonstrated effects of food allergy on the emotional quality of life, physical functioning, psychosocial health, and anxiety in children [34]. Peanut bans may send a message to a child and caregiver that *any* environmental peanut exposure is dangerous. Although the message is not true it could prevent use of adaptive coping skills to navigate environments in which peanut will be omnipresent. In addition, peanut-free schools may create a false sense of security



that could prevent development of skills to navigate safely where peanut may be present.

Another unintended consequence of peanut bans could be decreased school preparedness to treat anaphylaxis. Several studies found a lack of school preparedness to manage allergic reactions at school, including incomplete anaphylaxis action planning, and deficiencies in recognizing and treating allergic reactions [13]. Our review of two US studies from the early 2000s identified two where only 16–36% of students had an allergy action plan, and these were not followed in at least 25% of cases [35, 36]. A 2016 survey of US schools showed training of only about 36% of school staff for detecting an allergic reaction, and over half of schools restricted which school staff could administer epinephrine autoinjectors (registered nurse only versus other administrative staff) [37]. To our knowledge, no studies have investigated the impact of peanut bans on school preparedness.

The worst-case scenario about school preparedness occurred in 2010, when a peanut allergic Virginia girl suffered fatal anaphylaxis to a peanut she found on the playground and ingested [38]. This child could not afford an extra epinephrine auto-injector to keep at school, and despite having an action plan, the school did not consider administering another student's epinephrine that was available (following the action plan instructions), and responders were unable to resuscitate her. This event initiated a push, in the US, for federal and state laws for schools to stock 'undesigned' epinephrine for use by any child in need (by mandate or by allowing districts to 'opt-in'). All but one of the 50 states enacted such a law (often referred to as 'stock epinephrine policy'). No research yet assesses the effectiveness and implementation of these policies; studies to date address only frequency of use of devices from this stock.

Managing children's reactions to peanut exposures still focuses on the individual level, meaning that each student has a management plan and is meant to carry an epinephrine device. Universal school-level plans with a shared stock of epinephrine remain scarce. A recently published cost-effectiveness analysis demonstrated that current execution of stock epinephrine policy at an individual level is not cost-effective, and that the optimal school policy to prevent fatal peanut-induced anaphylaxis (in terms of both health and economic outcomes) would be a universal plan with shared undesignated stock units for every school and a universal treatment plan for all students, without requiring any to have an individual epinephrine device and management plan [39].

School policies need to be revamped. As the ASCIA guideline on prevention of anaphylaxis in schools emphasizes, "Routine food bans...have not been proven to reduce risk, are difficult to enforce, may result in a false sense of security, may trigger resentment and lack of co-operation with more important measures and may at times result in bullying of the individual with FA" [12]. Policymakers should abandon recommendations that are not evidence-based and replace them with measures of proven efficacy. This means revising the ineffective singular focus on banning peanut (or all nuts) because it is unnecessary, and, in our opinion, divisive among parents and students. Policies that focus on diligently increasing handwashing and washing of surfaces with soap and water are evidence-based. Schools can manage restrictions to avoid food sharing and provide peanut/nut-restricted tables—without



forcing all allergic individuals to eat there. Given the evidence that more restrictive policy does not deter reactions, schools should focus on preparedness to identify and treat allergic reactions that occur, with universal school-level management and sharing of devices and action plans [25]. And for families preferring the child to carry a device, schools should support this approach, not insist upon locking that device in a school office.

Peanut bans, or peanut-free zones, may be practical for very young children (or children with developmental delay) who may be prone to impulsive food sharing and placing contaminated items such as toys into their mouths [40]. Milk may be the larger danger for younger children, and schools should reconsider why they focus on peanut rather than milk. School policies may need to adapt based to the ages and developmental stages of children. Peanut-free areas or peanut bans are likely unnecessary for older children (secondary or high school aged children) who comprehend their allergy and avoidance strategies [13].

More limited restriction, such as peanut-free or peanut-aware tables (with increased staff supervision) offer another option for younger children. This approach protects the susceptible child without affecting non-peanut allergic children. The CS Mott survey demonstrated that parents of nut allergic children prefer nut-free tables to nut-free schools [32]; and, the Massachusetts study found only the peanut-free table policy to have an association with reduced epinephrine use [26]. Peanut-free tables or zones put children with peanut allergy at risk of stigmatization or social isolation [13].

Further research can help us to better understand parental preferences for peanut bans and the impact of these policies on anxiety. Schools should strive to balance the desire to shelter peanut allergic children against the risk of isolating these children with potential consequences of creating a sense of ‘otherness’ in their social environments and heightened anxiety about exposures unlikely to provoke reactions. Fixing the problem means emphasizing evidence-based practices to identify and treat anaphylaxis rather than concentrating on wholesale banning peanut from the school.

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