Baby Food: *A Puree of Plasticizers and Heavy Metals*

Introduction

There is nothing in the world more vulnerable and sensitive to the harsh environment than a baby. Though they may appear complete on the outside, on the inside their immune system and brain functions are still developing. The events immediately following birth all the way to three years old can affect a child's health and well-being for the rest of his or her life[1]. The immune system is all of the cells and proteins in the body that fight off infections within the body[2]. Brain functions are essential to control body movements, learn about the outside world, and to communicate[3]. These unique sensitivities need to be protected, especially in terms of nutrition and what enters a baby's body. Parents are given the important responsibility of introducing the first outside foods to their baby in the form of "baby food." Baby food can come in many types: cereals, jars, pouches, formulas, drinks, and snacks[4]. While many parents still feed their babies conventional baby food, there is an increasing shift to organic baby food and hand-making baby food in the home. In fact, the market for organic baby food in North America is projected to become increasingly popular in the next four years due to concerns about farming practices and fear of dangerous chemicals reaching the food supply[5]. On the other side of the spectrum, some parents have started to make purees with fruits and vegetables in their own kitchens. This eliminates the worries of harmful preservatives, dyes, and possible food allergies from a baby's diet[6]. However, it can be costly and time consuming to prepare. Conventional store-bought baby food is a cheaper or more convenient option, but can still hold dangers of its own. Imported baby food and formulas might pose serious health risks when not reviewed by the FDA7. This means they may be tainted with additives that are prohibited by FDA standards or are not meeting FDA food safety guidelines[7].

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Increase in Attention to Heavy Metals

Being a parent to a baby is stressful enough without worrying if the food you are feeding is contaminated with heavy metals. However, guidelines regarding heavy metal content and food safety in baby foods didn't always exist. The first regulation made specifically for baby foods was the Infant Formula Act of 1980 that ensured the quality of formulas produced and the nutritional value[8]. Another major milestone for baby food safety was in the 1990s when President Clinton signed the Food Quality Inspection Act9. This unique act required the EPA to disclose all food exposures to pesticides and ensure that baby and infant food was safe and free of these residues[9]. Following this act, many pesticides have been banned in food production and their residues substantially lessened[9]. Now, in the modern age, food safety quality for babies and infants is still a problem. An organization

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called the Healthy Babies Bright Futures released a study in 2019 that shocked the world and terrified parents. Their investigation of 168 different baby foods found that 95% contained at least one heavy metal[10]. The Healthy Babies Bright Futures 2019 of 168 baby foods revealed that 95% of baby foods contained at least one heavy metals, and 25% contained all four. Even scarier, they found that one in four baby foods contained all four heavy metals: arsenic, lead, mercury, and cadmium[10]. Healthy Babies Bright Futures urged parents to push for more FDA regulations in regards to the production of foods for infants and babies. Many Americans do not yet understand the dangers of heavy metal exposure and the long-term effect. In 2014, after switching from the Detroit water system to receiving water from the Flint River, residents of Flint, Michigan were poisoned with lead-contaminants coming through their taps[11]. This horrible crisis was the result of poor water testing and quality control systems[11]. For 18 months, the complaints from residents of rashes, hair loss, and skin irritations were discredited. The long-term effects of the Flint, Michigan lead exposure has been reduced IQ and a variety of cognitive and behavioral issues. For children, long term effects of the lead exposure has led to lower IQ levels as well as a variety of cognitive and behavioral issues[12].

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Health Risks Associated with Dietary and Heavy Metal Exposure in Children

Children and babies are vulnerable to bodily harm caused by exposure to heavy metals. These effects can appear in many forms depending on the length of time and potency of exposure. The "big four" of heavy metals are lead, arsenic, cadmium, and mercury. The impact of heavy metal exposure on children differs from adults because children are still developing. Lead exposure affects children by impairing their cognitive and mental capabilities, kidney damage, and anemia[13]. Arsenic exposure, commonly caused by contaminated water, has been linked to long-term effects such as cancers, cardiovascular disease, and impaired cognitive ability[14]. Cadmium, which is difficult for the body to eliminate, can cause impaired immunity and motor skills in children[15]. As the children grow into adults with continued exposure, the results can develop into kidney toxicity and osteoprosis[15]. The last heavy metal, mercury, can be the most dangerous and highly toxic[16]. Mercury is highly toxic to all systems of the body, but a child's central nervous system is most vulnerable to mercury poisoning[16], the impacts of which are likely to be

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permanent. No safe level of Mercury is known to exist[16]. In the past, heavy metals were used in our daily lives and the adverse effects were not known. Since then, these elements are extremely regulated for public health and safety reasons.

Health Risks Associated with Pesticide and Plasticizer Exposure in Children

Heavy metals are not the only contaminant in foods that have been known to cause long-term health defects. Pesticides are used to control and eliminate pests and weeds which could carry diseases from crops[17]. However, pesticide use can also cause residues to linger within the crops and enter the body through the human consumption of agricultural products. An example is glyphosate, which is used as a major herbicide with the tradename Roundup. While very effective at controlling weeds, exposure to residues found in foods have been linked to the development of cancers, kidney and liver damage, and reproductive issues[18]. Eating just one tomato contaminated with glyphosate residues is unlikely to cause immediate affects; instead, it is the constant consumption of contaminated foods which compounds the negative impact over time. Many foods can be contaminated with glyphosate. Over 250 million pounds of glyphosate is used each year on crops[19] such as corn, soybeans, oats, as well as various fruits, nuts, and veggies[20]. There are also many other pesticides, herbicides, and insecticides out there that can leave residues. According the World Health Organization, "Insecticides tend to be more toxic to humans than herbicides[21]," meaning that not all pesticides were created equal and they have varying levels of toxicity.

On the other end of the spectrum are acrylamides and plasticizers. Acrylamides are a chemical compound that forms during high temperature cooking such as baking and frying as the byproduct of sugars and amino acids that were already present in the foods[22]. Unfortunately, acrylamides do have negative health risks. Organizations such as the US National Toxicity Program and the EPA list acrylamides as reasonably likely to be a carcinogen, or cancer-causing substance[23].

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However, even with the severity of the side effects, the FDA does not have regulations in place to protect consumers, only recommendations[24]. Another high-risk threat to consumers is plasticizers which are components added to plastics to make them more flexible and increase their overall strength[25]. Sometimes, food and beverages come into contact and are contaminated with plasticizers; either in the production process or through their packaging[26]. Plasticizers have been linked to endocrine disruption and the formation of cancers[27].

How Our Study Was Conducted

Clean Label Project conducted a study of over 530 baby and toddler food products such as formulas, cereals, jars, pouches, juices, drinks, and snacks. These products were chosen because they were the most commonly purchased by consumers. Both

Methodology

Contaminant	Instrumentation	Test Method	LOD/LOQ
Heavy Metals (Total Arsenic, Cadmium, Lead, and Mercury)	ICP-MS	EPA 6020 modified	≤ 4 ppb
Pesticides	LC-MSMS	AOAC 2007.01 modified	≤ 10 ppb
Acrylamide	LC-MSMS	EA_AC02	≤ 40 ppb
BPA/BPS	LC-MSMS	EA_BP02	≤ 40 ppb

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the conventional and organic products were chosen for the study. Instead of requesting product from the various companies to test, Clean Label Project follows the consumer chain of custody; which means purchasing samples in the same way that the consumer buys their baby foods: in the grocery store and online marketplaces. By doing this, the results are more accurate and authentic as to what is in spoonfuls at highchairs across the country. The main points the study focused on was heavy metal content, acrylamide content, and presence of plasticizers.

Overview of the Findings

The results of the baby food study were shocking. Heavy metal content was concerning in the products tested. Lead was detectable in 36% of the products. Cadmium, also found in batteries, was detected in 58% of the products. Soy-based formulas contained 7 times the amount of cadmium as compared to other formulas. Among all of the products tested, arsenic was detected in 65% of them. However, arsenic was found in nearly 80% of all formulas tested. Even more surprising, certified organic products contained 2 times more arsenic than the conventional products tested. A plasticizer called BPA was found in 60% of the products claiming to be "BPA-free." The last finding, acrylamides, were found in only 10% of the products tested.

How Did Heavy Metals and Pesticides Get into Baby Food and Formulas?

So how did these harmful chemicals and metals get into the baby food in the first place? There are actually several ways this happens. The first and most prevalent is water and soil contamination. Water is extremely susceptible to contamination which can happen through pesticides runoff into the water source, industrial waste, and oil pollution[28]. Soil can also be a source of contamination through pesticide use, oil spills, construction, and erosion[29]. The use of leaded paints and leaded gasoline have increased the lead content in today's soil[29]. Processes such as industrial farming and fracking/mining can also contaminate the surrounding water and soil. Industrial farming involves the large-scale use of fertilizer, pesticides, and other chemicals to grow primarily one crop in a short amount of time[30]. The chemicals used in these industrial practices can seep into the soil and cause contamination. Fracking is a process where millions on gallons of water are pumped into air pockets within the earth to extract natural gas or oil[31]. These high-pressure systems can also force contaminated water through unpredictable fissures through the Earth's crust into the human and agricultural water supplies[32]. Finally, the soil can already have naturally occurring heavy metals within it because these metals are part of the earth's crust with varying levels around the world[33].

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What Should a Concerned Consumer Do?

1. If a consumer is concerned about the safety of the food he/she is feeding his/her baby, it is always best to ask questions. Going to the company's website can give insight to their current testing protocols and their food safety programs. If something is not listed on the website but is important to you, contact the company and ask them to test for it or add it to their procedures.

2. Look for verifications and certifications. Clean Label Project is a great source because their certifications are backed by laboratory results and studies.

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3. Talk to your pediatrician about what brands are best for your baby to ensure all nutrition needs are met and that you are introducing something safe into your baby's diet.

What Should a Concerned Brand Do?

1. Given the statistics of contaminated baby food it is justly that a brand should be concerned about the safety of the products they produce. A brand should trust their products but still test for heavy metals, pesticide residues, acrylamides, and plasticizers to ensure that their product is safe and wholesome.

2. Consider Clean Label Project as a certifier. CLP offers certificates that verify the safety of the product and the purity of the contents. Also, it is a great marketing tool that shows parents that you care about the quality and safety of your products.

3. Stay up to date on regulations regarding food production for babies and infants. If new regulations are made, the production practices should be changed accordingly to accommodate.

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