PENS DEPARTMENT

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Science, Not Blame: Pediatric Obesity Update

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With the global increase in obesity, pediatric nurses should identify children who are at risk and provide advice when a child becomes overweight. Many health care providers believe that they are experts on the topic of obesity; it is "common knowledge" that those who are obese are overeaters who have made poor choices. Dogma colored with blame is quickly detected by children and their parents (Teachman & Brownell, 2001) and does not foster a compassionate and effective interaction. While excess caloric intake and lack of activity are the primary reasons for most obesity today, this is a simplification of a complex problem.

This paper provides an update of factors associated with the development of obesity—epigenetics, endocrine disruptors, and gut microbes (Fleisch, Wright, & Baccarelli, 2012). Current knowledge is essential in providing the thoughtful care and advice that children and their families require and reducing a culture of blame.

Epigenetics

Epigenetics describes the effect of the environment on genes. Genes are inherited, but all humans have unique environmental exposures, from conception to adulthood (Hochberg et al., 2011). One example of epigenetics is taller stature. As access to food improved, children became taller than their parents and grandparents. Genes did not change but were expressed differently due to better food availability. This epigenetic effect has led to stable changes in height for subsequent generations through gene expression (Hochberg et al., 2011). Epigenetic transgenerational inheritance occurs when this changed gene expression is passed along during pregnancy. These changes can be permanent and thus heritable (Manikkam, Guerrero-Bosagna, Tracey, Haque, & Skinner, 2012).

Low birth weight and inadequate fetal nutrients are linked to metabolic syndrome later in life (Newbold, Padilla-Banks, Jefferson, & Heindel, 2008). Children who are born small for their gestational age may have rapid weight gain around the time of puberty, a startling development for a child whose birth size was impaired and whose early years were marked by underweight and slow growth. There is evidence that fetal visceral fat plays a key role in this process, part of the "thrifty gene" theory (Gluckman & Hanson, 2008). An obese pregnancy is likely to create an obese child in the milieu of gestational diabetes (Fall, 2011). The mechanism for obesity results from high insulin levels in the mother and the fetus (Gluckman & Hanson, 2008). In theory, an environment that is nutritionally limited (prenatal factors) predisposes the child to conserve calories. This is a significant disadvantage after birth: a child emerging into our richly caloric world with a pre-programmed metabolism developed to cope with insufficient calories.

Environmental Endocrine Disruptors

Endocrine disruptors are exogenous substances found in food, environment, and consumer products that alter hormonal and homeostatic systems (Diamanti-Kandarakis et al., 2009). Plastics, acting as estrogen-like substances, may play a role in obesity and other growth disorders in children (Meeker, 2012). Most humans have measureable levels of dioxin and bisphenol in their blood (Diamanti-Kandarakis et al., 2009). Heating food in plastic increases the transfer of

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The Pediatric Endocrinology Nursing Society (PENS) is committed to the development and advancement of nurses in the art and science of pediatric endocrinology nursing and to improve the care of all children with endocrine disorders through the education of the pediatric healthcare community. To aid in achieving that goal, the purpose of the PENS department is to provide up-to-date reviews of topics relevant to the PENS membership and to the general readership of the *Journal of Pediatric Nursing*.

these materials; thus it may be the container, and not the food, that undermines normal weight (Meeker, 2012).

The age of exposure to endocrine disruptors may be important (Diamanti-Kandarakis et al., 2009) as children are more vulnerable than adults. In gestating rats exposure to plastics creates three generations impacted by endocrine disruptors: mother, fetus, and fetal germ cells (Manikkam et al., 2012). This transgenerational, epigenetic effect is not in the control of the child or even the mother (Meeker, 2012). In other words, endocrine disruptors may have affected maternal grandmothers, the genesis of epigenetic weight changes in a grandchild.

Gut Microbes

Digestion is largely controlled by gut microbes. Some microbes are so efficient that they increase the caloric total of an ingested meal. This helps to explain why many obese individuals claim to not overeat yet gain weight (Everard & Cani, 2013). Infants acquire their gut microbes after birth, and the system is dynamic throughout life (Reinhardt, Reigstad, & Bäckhed, 2009). Obese individuals often have different microbe populations from those in lean individuals. Dominant gut microbe phyla in humans are firmicutes and bacteroidetes. The population ratio is often reversed in obesity, with increased firmicutes and decreased bacteriodetes. Staphylococcus aureus may be increased in obese children (Han, Lawlor, & Kimm, 2010). Lower levels of bifidobacterium are seen in those with type 2 diabetes and obesity (Sanz, Rastmanesh, & Agostonic, 2012). An unhealthy population of microbes creates an inflammatory environment and is linked to obesity, type 2 diabetes and insulin resistance.

Do obese individuals eat differently and therefore acquire an unhealthy microbe population, or does the microbe population contribute to obesity? This is unclear. Families carry similar microbial guests and food choices significantly influence gut flora. Prebiotics and probiotics also play important roles. Prebiotics are nondigestible compounds, such as inulin, that improve fermentation of nondigestible carbohydrates. Their presence in the gut has been found to increase satiety and decrease food intake (Everard & Cani, 2013). Probiotics are microorganisms with potential to influence digestion and gut microbe population. These are widely available in foods such as yogurt and available as over the counter supplements such as L. acidophilus. This field offers significant potential, but there is no clear evidence to inform practice (Sanz et al., 2012).

Implications for Nursing Practice

The best advice pediatric nurses can offer to prevent or treat excessive weight gain is to increase caloric expenditure through activity and decrease caloric intake. Suggest a wide variety of foods, especially fresh and raw foods, with varied microbial populations. Promote live culture yogurt, because of the evidence of potential benefits of probiotics. Processed foods should be limited as the impact of preservatives and chemicals is unknown.

Complete avoidance of endocrine-disrupting chemicals is impossible in our developed world, but parents can take some simple steps. Advise parents to choose glass containers for food storage, avoid microwaving in plastic, and use fresh or frozen foods instead of cans. It is particularly important to educate that microwaving formula in a plastic bottle is unacceptable. Parents should be informed that a plastic odor means that their child is inhaling this chemical. Household items, such as new shower curtains, should be aired out before being used in the home.

Information related to obesity should be delivered without blame. Pediatric nurses must stay up to date on the emerging science on obesity etiology to be equipped to offer evidence-based interventions to youth and their families.

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