



**2011 White Paper:
Why White Rice Cereal for Babies Must Go**

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Introduction

Evident even before children's first birthdays, we are experiencing a true epidemic of childhood overweight and obesity in the United States today. This early onset heralds both great need and opportunity for achievable change.

Meanwhile, the Institute of Medicine progress report on Preventing Childhood Obesity asserts that in school-aged children frank obesity has increased more than four-fold since 1971.ⁱ One out of three US children are already overweight or obese.

This vexing and recalcitrant problem has serious present and future health implications. In the Framingham offspring cohort, 2/3 of high school students already exhibit one or more of the defining characteristics of metabolic syndrome (i.e., hypertension, dyslipidemia, abnormal glucose tolerance, or excessive abdominal girth).ⁱⁱ Moreover, by age 9, type 2 diabetes, previously so rare in teens or young adults as to have recently been called adult onset diabetes, has already overtaken type 1 diabetes (previously juvenile diabetes) in prevalence.ⁱⁱⁱ

The obesity epidemic provides clear, visible evidence that the way America's children are fed is failing them. Moreover, that this wave of obesity is already present by 9 months of age suggests that how America's babies have been fed in recent decades has been failing them as well. It's difficult to imagine a successful, efficient solution to the obesity epidemic that doesn't include a major change in infant feeding practices.

For decades now, without adequate practical or scientific justification, white rice flour cereal has been the predominant food recommended by pediatricians across the United States for babies' first solid food. This choice has been supported by grandparents, marketed by major corporations and widely adopted by parents such that infant cereals – predominately white rice flour cereal – have become the dominant source of solid food calories throughout infancy.

It is time for simple, inexpensive, but profound change: Feeding whole foods as the first solid foods, and whole grains as the first grains can provide superior nutrition with relative ease and comparable cost. We can and should eliminate the practice of starting babies on processed white flour products.

Updated USDA Guidelines urge us to transition from refined grains to whole grains for all Americans age 2 and up. These evidence-based guidelines make the recommendation based on links to obesity, diabetes and heart disease – all significant public health threats.

Of the 10 foods and nutrients that the USDA recommends increasing in the American diet, including the need for more fruits, more vegetables, more fiber, more calcium, etc., Americans are further behind on the whole grain goal than on any of the other nine other goals. And we average 200% above the recommended limit for refined grains.^{iv}

This is hardly surprising. Twenty-first century evidence suggests that many taste preferences form during the window prior to learning to walk, when most children are given large amounts of cereal made from processed white rice flour, and little if any whole grains.

Before birth, the status of maternal nutrition can effect changes in the body, mind, and metabolism^v of her offspring, for better or worse. Beyond this, early feeding practices can alter metabolic settings in a way that predisposes to insulin resistance and obesity.^{vi}

What follows is a brief overview of how our infant feeding practices are at odds with our evidence-based goals for improved nutrition in children and adults.

Development of Taste Preferences

After babies learn to walk, a phenomenon known as neophobia often begins where toddlers and preschoolers develop an increasing suspicion and fear of new flavors, new food sources and new styles of eating.^{vii} Historically this makes sense. It could be counterproductive for a child to toddle away from parents, pick a berry or a leaf and eat it: they could be poisonous. Not trusting new fruits, vegetables, or other foods is a normal, protective mechanism.

Before neophobia sets in, babies will happily put almost anything in their mouths to sample, even if they will spit it out if unfamiliar or unpalatable.

Food preference development is more complex than simple learned behavior.^{viii} There is also an important genetic component to flavor preference acquisition.^{ix x}

Some taste preferences are hardwired. And different babies experience taste differently, in part because of heritable differences in taste bud density. But careful studies of human twins and of young animals suggest early exposures and social interactions outweigh genetics when it comes to food preferences.^{xi}

Indeed, up to 85 percent of the variability in eating patterns is due to environmental, not genetic factors.^{xii xiii xiv xv xvi}

Babies are naturally drawn to foods that are sweet from long before birth, and to foods that are salty by four months old.^{xvii} They naturally shy away from sour or bitter foods—at first.^{xviii}

Genetically, some babies (and adults) have heightened taste perceptions, which can make bitter accents even more noticeable to them.^{xix xx} But babies can come to love even sour and bitter foods.

At this age it *normally* takes between six and sixteen experiences with a flavor before it becomes accepted. Somewhere between six and ten times is the most common. Again, this makes historic sense: it functions as a protective mechanism, to make them less likely to eat something toxic, spoiled or otherwise unhealthy.^{xxi}

During this critical window for taste acquisition, repeated offerings – even of a rejected flavor – are likely to result in acceptance and pleasure in the food.

New flavor experiences do not guarantee acceptance, but they are a necessary precondition of flavor acceptance. And they are perhaps even more important among those children genetically less likely to enjoy certain foods.

In one illustrative study, researchers identified babies whose mothers had given up on some particularly protested vegetable after the babies had rejected it on two or three occasions. This disliked vegetable was then offered again every other day. At first, the babies' intake of the disliked vegetable was low. Yet by the time the babies had sampled it seven or eight times in the study (nine to eleven times in their lives), over 70 percent of the babies not only accepted the previously spurned vegetable, but really liked it—readily eating as much of it as they did of their previous favorites.

Nine months after the study was over—and the babies were now toddlers—more than 75 percent of them were still readily eating that vegetable. For 15 percent we don't know what would have happened: the families never served that vegetable again.^{xxii}

Sadly, in 21st century America, a large study of thousands of children found that about a quarter of parents gave up on a food after only one or two tries, concluding that their baby didn't like it. Only 6 percent of parents would stick with a new food six to ten times. And only 1 or 2 percent would try more than ten times.^{xxiii}

In stark contrast to vegetables and fruits, processed white flour cereals are often given to babies more than a dozen times *before another food is even introduced*. And they go on to be a staple and predominant source of calories throughout infancy.

We know in animals that the first bite of solid food can be particularly influential.^{xxiv} For human babies the moment of the first bite is laden with positive associations.

The child has often been staring at the parents' food choices, eager to learn what eating is all about. The child is the center of attention at an emotionally charged moment, often with a camera capturing the event.

The processed white rice flour is often mixed with breast milk or formula, giving it an even stronger positive association.

Conversion of the white rice flour to glucose begins while the cereal is still in the baby's mouth, lighting up the hard-wired preference for sweets (and the cereal is nearly 100% glucose by the time it is absorbed in the intestines).

Given this “perfect storm” of extrinsic and intrinsic factors, both initially and throughout the formative months, it is easy to see how a preference for processed refined grain products could become firmly established, and later in life, challenging to change.

It should come as no surprise, then, that when the U.S. Department of Agriculture and U.S. Department of Health and Human Services reported in 2011 the top source of calories throughout all of childhood from age 2 through 18, in this our most obese generation in history, the top culprit was empty calories from refined grain treats.^{xxv}

Given that the predominant paradigm of giving processed white rice flour cereal to babies lacks adequate scientific justification, and given that this practice could be predicted to result in unhealthy eating patterns that we see throughout childhood, and given that our current feeding methodologies have been accompanied by an unprecedented wave of overweight and obese babies, the time has come to abandon white rice cereal in favor of healthier choices for babies.

Metabolic Development

Recent decades have seen a growing recognition of the role played by early developmental factors in the likelihood of later childhood and adult disease.^{xxvi} Life-course biology teaches us that trajectories established very early in life profoundly influence the extent to which exposures and lifestyle choices later in life will impact

health. This means that even modest interventions at the beginning of life can have disproportionately large impacts on obesity and disease risk in future years.

Even before birth, the status of maternal nutrition can effect changes in the body, mind, and metabolism^{xxvii} of her offspring, for better or worse.

To the point of this paper, prenatal nutrition deficits have also been linked to increased long-term obesity in the offspring. This connection began with the classic, landmark 1976 Dutch cohort study of 300,000 people by Ravelli, Stein, and Susser, which showed that maternal under-nutrition during pregnancy *and early infancy* correlated with obesity rates at the age of 19 years.^{xxviii} Studies over the last three decades have expanded and deepened this metabolic programming connection.

Both infancy and the prenatal period have been shown to be critical windows of effect.¹ Numerous epidemiologic cohort studies in humans have found links between either birth size (reflecting the prenatal environment) or weight gain in infants (reflecting the postnatal environment) with subsequent conditions such as type 2 diabetes, hypertension and coronary artery disease.

It is believed that these changes are mediated by epigenetic changes in DNA methylation changing gene expression.^{xxix} Well-controlled animal studies, which eliminate extraneous variables, support this hypothesis.

A 2008 animal study kept everything identical in their lives but the food.^{xxx} In one arm of the study, half of the animals were exposed only to a balanced selection of healthy food prenatally and throughout infancy. The other half were exposed to some healthy food, plus free access to treats such as cookies, crackers, donuts, muffins, potato chips, candy and chocolate. They were exposed to a lot of junk food.

¹ Obesity is a very complex issue, but clearly it is strongly influenced in the womb. With the obesity epidemic starting in the 80s, the question is not simply what was new about babies then, but also what was new about mothers then. For one thing, it was the first generation of mothers whose own tastes and metabolisms were influenced by white rice baby cereal.

Children born in the 60s, and just before and just after, usually had parents who were still raised on real food. Many of these babies did come to prefer processed foods, but not in excessive amounts and their metabolisms were mostly able to handle it.

However, when they grew up and started to have children of their own, this generation was exposed to heavily processed food both in the womb and in their earliest direct food exposures. This was when the childhood obesity epidemic started to take off.

After infancy, they all had free access to both the healthy food and the junk food (and as much as human parents want to protect their own children, they may well have free access to junk food and to peers eating junk food at some point in their childhood too).

The young animals in the study were followed all the way through adolescence to adulthood. When they became young adults, those exposed to the healthy diet during pregnancy and infancy were significantly more likely to have normal weight, normal blood sugar, normal insulin, normal triglycerides, and normal cholesterol than the other children—even though all the offspring were offered the same diets after infancy.

Or put the other way: those exposed to junk food (including refined grain treats) were significantly more likely to be fat, and to already have abnormal levels of blood sugar, insulin, triglycerides, and cholesterol by the end of adolescence.

Part of the dramatic difference in health outcomes could be explained by variations in the animals' food preferences, depending on early exposures, and differences in the amount that felt right for them to eat. But this was not the whole story.

A significant part of the difference was explained by the early diet measurably turning on or off at least ten different genes that change metabolism, appetite, weight, and health.^{xxx}

Processed refined grains, including white rice, have been linked to altered metabolic effects including serum insulin spikes. Could this lead to insulin resistance or even type 2 diabetes?

That's just what a 2010 Harvard study suggests. Researchers at the Harvard School of Public Health analyzed rice eating and diabetes in about 200,000 people. Those who ate white rice 5 or more times a week had a 17% increased risk of type 2 diabetes compared with those who ate it less than once a month. Separately, those who ate 2 or more servings of brown rice a week had an 11 % decrease of type 2 diabetes. But the biggest difference came in those who chose brown rice or another whole grain instead of white rice – with up to a 36% reduced risk.^{xxxii}

Brown rice is a whole grain food, packed with flavor and with protective nutrients. But the sugar-stabilizing fiber and the essential fatty acids are stripped out to make polished white rice, along with most of the magnesium, iron, B vitamins, and lignans, and half of the phosphorus and manganese.

To make baby food rice cereal, the white rice is even further processed. And this depleted, out-of-balance, processed white flour becomes the eagerly-anticipated first bite of solids for most babies in the US.

One in three babies born today is expected to develop diabetes in their lifetime, unless something dramatic changes. If we just made the simple switch from processed white rice to whole grain brown rice for babies we might cultivate a taste for whole grains and healthy metabolisms to prevent millions and millions of people from developing diabetes.²

If we have a future population of 300 million in the US, with 100 million expected to develop diabetes, a potential 36% reduced risk represents an enormous potential savings of life, limb, eyesight, money and health.

What are the potential benefits of continuing the ubiquitous practice of white rice cereal?

Arguments for White Rice Cereal

Iron. Many pediatricians recommend white rice cereal because it has been fortified with iron.

Indeed, babies require sufficient iron for their growing bodies and brains. Is the amount of iron in breast milk inadequate? It appears that babies are designed to get iron from both breast milk and directly from their mothers at birth.

In the 20th century it became vogue to clamp the umbilical cord within 10-15 seconds after the baby's head is delivered. If cord clamping isn't rushed, and takes place when the

² Note: even though whole grain oat or rice porridges have been used for babies in many cultures, this White Paper is not arguing for any grain as the first food.

The author prefers choosing something that doesn't come in a box or jar. Let babies see a real whole food in its natural state, something they've seen the parents eat before, such as a sweet potato, banana or an avocado. Let them handle the whole food. Let them smell it. Let them see their parents eat some, and then let them see them mash it up a bit, perhaps with some breast milk. If they are nursing, they will already have experienced the flavor in breast milk beforehand.

Babies strong desire to imitate and to learn from parents, coupled with this powerful combination of seeing, tasting, smelling, and touch creates a profound learning experience that is deeply satisfying and fun. Let a whole food mark this momentous occasion – or a whole grain cereal. But not processed white flour rice cereal.

umbilical cord stops pulsing (~60 to 180 seconds), as was the case throughout most of human history and is still the case in every mammalian species studied, the baby gets several tablespoons more iron-rich blood, which could be enough iron to tide them over for an additional 3 months. This time correlates with the later period when they are starting solids. What the scientific literature calls "delayed" cord clamping (perhaps more properly "optimal cord clamping") is now becoming more common.

There are several other options for ensuring or increasing the likelihood of adequate iron without resorting to fortified refined white rice cereal:

- Iron-fortified whole grain baby cereals, such as those made from whole oats.
- Supplemental iron drops. (Essentially what is added to the cereal.)
- Iron-rich weaning foods for baby such as legumes, meat, egg yolk and green leafy vegetables.
- Plentiful iron for nursing mothers.
- Using cast iron for cooking for the baby and mother.

Allergies. Some pediatricians recommend white rice cereal because children are unlikely to develop food allergies in response.

The American Academy of Pediatrics recognized, however, in 2008 that there is no evidence that delaying any food beyond four to six months of age reduces the likelihood of food allergies.

Preventing food allergies is no longer a credible reason for feeding white rice cereal to babies.

Bland Flavor. Babies around the world can and do enjoy the flavors and spices of their native cuisines. Turmeric, for instance, is a common first taste in India.

Regional cuisines can exert a strong influence on specific food acceptance.^{xxxiii} Adopted infants have demonstrated preferences for their native ethnic foods. This appears to result from spice patterns learned from flavor experiences before birth.^{xxxiv} Indeed, "food traditions... are among the last characteristics of a culture that is lost during the immigration of an individual or group into a new culture."^{xxxv}

Far from being an advantage, the bland, processed taste of white rice flour could predispose children to the flavors of nutritionally deficient Kids Meals that feature bland white flour products.

Easy Digestibility. Throughout most of human history, human babies have thrived on a variety of different first foods. In some cultures a whole grain porridge of oats or brown rice was the fashion. In others, meat, egg yolks or soft vegetables have been used.

Boxed processed white flour cereal was not prevalent until the mid-20th century. Its rapid absorption as glucose and unhealthy glycemic index is more of a disadvantage than an advantage.

Cost. How much does it cost to start a baby on different foods? A shopping trip to a major national conventional supermarket revealed that the most popular white rice (white flour) cereal was available at 29.4c per serving, or \$8.23 if fed twice a day for two weeks (as is often the case for those first weeks of solids).

The same brand also makes an organic whole grain brown rice cereal that sells for 39.9c per serving, or \$11.17 for two weeks. The switch both to whole grain and organic of the same brand would cost less than 3 dollars a month.

The premium organic brand came in at 49.9c per serving for whole grain cereal, or \$13.97 for two full weeks.

The store's proprietary label whole grain organic cereal was priced at only 26.9c per serving (not on sale). It cost *less* than the conventionally grown white rice flour that most babies get.

Switching from white flour cereal to organic whole grain sometimes saves money, even in the short run. For those who choose, investing in the most expensive organic whole grain option carried an additional cost above the conventional white flour cereal of less than 6 dollars per month.

There is an argument to be made for choosing a whole food such as avocado, banana, or sweet potato as babies' first food, teaching babies that food comes from the produce aisle or farmer's market – not from a box.

A trip to the produce aisle in the same store revealed the same amount of avocado for only 28.5c, organic sweet potato for only 16.8c, and organic banana for only 4.9c – all less expensive than popular boxed white flour baby cereal. Incidentally, the same amount of banana in a baby food jar was 28c, not organic.

Egg yolk is another good option for babies. Omega-3 eggs were available for only 26.6c apiece.

One option for babies is to give them a tablespoon or two of the most healthy foods the parents are eating, in a texture the babies can manage. This costs little, if anything extra.

Although cost is a common objection, it is possible to skip white rice cereal, provide better nutrition and save money at the same time. And even if parents opt for the most expensive switch, the value of starting children with a whole grain rather than white flour may be well worth an extra 6 dollars a month.

Better Sleep. Grandparents, in particular, may tell parents that babies will sleep better if fed rice cereal, especially if the cereal is in a bottle. This has not been shown to be true.

Lack of Harm. Some argue for white rice cereal on the grounds that it has been fed for decades without evidence of harm. Indeed, even though most babies receive white flour, most babies do not end up overweight or obese.

Similarly, most who smoke tobacco do not end up with lung cancer. Nevertheless, tobacco clearly increases the risk of lung cancer.

During the decades of white flour use in babies, the *risk* of obesity has increased at least four-fold, to become a major public health concern. Beyond this, the quality of diets throughout childhood has deteriorated, in much the way one would predict if the early repetitive offering of white flour altered the taste preferences of today's children.

Taking Obesity Seriously

Public health officials, politicians, foundations, and health plans are all calling for solutions to improving our pediatric obesity crisis.

Much discussion and many programs today focus on the remediation of childhood obesity once it has already occurred. As an example, the weight clinic at Stanford University's Packard Children's Hospital is only easily available to those children who are already obese and who already exhibit observable sequelae of obesity such as acanthosis nigricans, hypertension, or type 2 diabetes.

Many secondary and tertiary prevention programs aim to forestall obesity and improve nutrition by improving the nutrient quality of lunches in schools, by limiting the types of unhealthy ancillary foods and beverages available on school grounds, and by curtailing the advertisement of non-nutritious foods to susceptible youth. These are laudable efforts.

Nevertheless, the original Feeding Infants and Toddlers Study (FITS) has demonstrated that unhealthy eating patterns develop long before initiation of elementary education or even preschool. By 18 to 24 months of age, toddlers' consumption patterns reflect unhealthy patterns: most children eat no servings of whole grains on a typical day. A third of children eat no fruit on a typical day. For those who do, the variety is limited to a small handful of fruits that will not provide all the nutrients needed. By contrast, 91% of kids consume desserts and/or sweetened beverages on a given day. For those who eat vegetables, French fries are far and away the number one choice.^{xxxvi xxxvii}

Children learn much from their parents about what, when, and how much to eat before they reach their second birthdays.

And the obesity epidemic is already evident in the first year. The way that babies are fed in the United States today leads inexorably to the obesity epidemic we are all witnessing.

Childhood obesity will continue to threaten our societal well-being until we institute changes very early in life.^{xxxviii}

Clearly, for maximum results, a successful integrated feeding program should begin at some point in the first year, during the nascent development of organoleptic sensation

If the goals are to provide optimal nutrition in the short run, and to set children on their healthy weight trajectories, while also establishing adaptive short- and long-term preference patterns and metabolic patterns, it seems unlikely that these can be accomplished as long as white rice cereal is a predominant source of calories.

Conclusion: Nutritional Intelligence

Nutritional intelligence is defined as the age-appropriate ability to recognize and enjoy healthy amounts of nutrient rich food. Actual consumption data in the U.S. reveals that this skill is lacking in most children today.^{xxxix}

To some extent parents are already aware of these problems. In a major marketing survey:

- 95% of mothers believe there is a real obesity epidemic in the U.S.
- 86% say, “Establishing good eating habits is among the most important lessons I can teach my child.”
- 70% say that they don't have the TIME to feed their families the healthiest options.^{xl}

How we feed babies in those early days can make a difference in Nutritional Intelligence for years to come. Most core food preferences are learned during critical early windows of opportunity. In America we have raised a generation where most children learn to get zero servings of whole grains daily by the time they are 18 to 24 months old.

Shortly after babies begin to walk, neophobia begins to set in, the fear of new flavors, textures, or sources of food. It is reasonable to teach a preference for whole grains and other whole foods while they are still so eager to learn.

Ending white rice cereal for babies offers a critically timed, developmentally syntonc approach to reversing the obesity epidemic for coming generations. It is also consistent with the emerging research of epigenetic metabolic programming, environmental acquisition of taste preferences, public health goals, and mothers' inherent desire to provide optimal feeding for their children.

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