Five possible sources of irritation in Pampers Dry Max diapers

By Jennifer and Jeremiah | May 19, 2010 | 21 comments / Comment now

Editor’s note: Thanks to generous donations from concerned parents, we’ve done our own amateur skin patch testing of Pampers Dry Max diapers. You can learn what we discovered here.

Now that we’ve discussed how and why Pampers brought Dry Max into the world and made an argument for three ways Pampers is understating the Dry Max problem, we’re ready for the third installment of our four-part investigation into Pampers Dry Max. In this post we will address differences we see between Dry Max and the previously sold Pampers diapers, and how the reformulation might create potential hazards that could explain the widespread reports we are seeing online of unusually severe rashes associated with the use of Dry Max diapers.

Dry Max is different, unless that bothers you

Throughout the nearly month-long debate over the safety of Pampers’ new "Dry Max" diaper design, Procter & Gamble has walked a tightrope between two contradictory claims.

The first of these ideas is that Dry Max is profoundly different than previous diapers, that its impact is significant and meaningful to consumers and that it represents a technological advance that makes Pampers stand out from its competition.

The second is that any criticism or questioning of Dry Max technology is either naive and misinformed, or vindictive and self-serving, because Dry Max is similar to previous diaper designs in every meaningful way.

As we have watched the drama unfold - first with mainstream media attention, then with government regulators and plaintiff's lawyers getting involved - Pampers has shifted from one to the other of these claims as it dealt with competing constituencies, placating mothers with "all we did was" while crowing to the press that they have invented the future of disposable diapering, then going into damage control mode and mixing up their messages even further.

This yin-and-yang approach to a product launch is remarkably flexible; given the position of perpetual cultural amnesia from which major newsmakers engage with transitory public stances of corporations, Pampers may, if forced,
abandon one of these themes entirely for the purposes of self-preservation, and call the other a public misreading of their corporate message. For the moment, however, the company is maintaining that they have created a game-changer without breaking any of the old rules. Our task today is to take a closer look at these new diapers and, in the process, address that apparent paradox.

**How (most) disposable diapers work**

To examine the diapers with us, you'll need to become an armchair expert in disposable diapering, a ZRecs-acquired skill that will serve you well alongside your abstruse knowledge of bisphenol-A leaching levels, your ability to identify unlabeled plastics and their associated properties, and your familiarity with drop-side crib politics. Once we're all up to speed with our newly-acquired knowledge of disposable diaper engineering, we'll compare Pampers Dry Max to the company's previous design in a comparative diaper dissection, to see what clues we can find to identify what might be causing such serious reactions in babies.

A disposable diaper is like a miniature aquifer designed to channel and control the flow of human waste.

In the typical disposable diaper, a **top layer** of plastic, or "nonwoven fiber," is treated with a **surfactant** that helps draw liquids into the diaper and away from the skin, and this one-sided coating also makes it more difficult for those liquids to come back out. The chemical composition of this surfactant is not publicly shared. Materials Safety Data Sheets (MSDS) are available only to those buying the chemical (like Pampers).

A hydrophobic (water-resistant) material, typically polypropylene, is used around the **leg cuffs** and at the **top of the diaper**, to discourage liquid from exiting the diaper.

An **acquisition and distribution layer**, or ADL, creates a path that shifts liquids from areas where the liquid is most likely to be deposited towards other areas of the diaper.

Wood pulp (cellulose, also called "fluff pulp"), typically from U.S. pine sources, is layered below the ADL as an **absorptive core** to store the liquid, with small pieces of **sodium polyacrylate**, a superabsorbent polymer, mixed into the pulp.

Since the introduction of SAPs in the 1980s, manufacturers have played with the ratios of these two absorptive materials, as each has its own benefits. The pulp, which actually absorbs liquids into the capillary spaces between the fibers, naturally distributes liquids throughout its mass, and can hold several times its weight in liquid. But the liquid also squeezes out of the capillaries when the cellulose is put under pressure (which a baby is constantly doing from one angle or another, whether sitting or lying down), which means liquid can be pushed back through the hydrophilic top layer or leak out the sides of the diaper.

To simplify the chemistry involved, SAPs like sodium polyacrylate are curled up in their dry state and have salts hanging onto them. When exposed to liquid, the salts dissolve, the sodium polyacrylate chain unfurls, and the hydrogen in water molecules takes the place of the salts, thus becoming "locked" to the SAP. Polyacrylates are "cross-linked" to create longer chains and help distribute wetness along their length.

Sodium polyacrylate can hold much more liquid in suspension than wood pulp can, forming a three-dimensional gel-like structure, but it isn't as "cooperative" as fluff pulp - it isn't able to shift liquids around to areas that are not yet saturated as easily as fluff pulp.

The diaper is finished with a **backing layer** (the outside of the diaper) made of polyethylene or another plastic.

Layers of the diaper are glued together with **hot melts**, mixtures of resins and oils derived from wood and/or petroleum-based sources. These adhesive cocktails are applied to the plastics in a molten state, and their composition is also a closely guarded trade secret. Again, Materials Safety Data Sheets (MSDS) are available only to those purchasing the actual materials from chemical companies.

So there's your crash course. Now we can look at the diapers, and identify both what has changed and what hazards it might expose infants and toddlers...
to that could be behind these rashes. Ironically, many parents whose children have not had reactions to Pampers Dry Max diapers are also frustrated by them, based on how they function; this no doubt makes up a significant portion of the social media advocates clamoring for a return to the previous design. We'll address some of those criticisms along the way.

Dissecting the diapers

Pre-Dry Max diapers are a rare commodity these days; since Pampers began gradually substituting the old diapers for the new ones a year ago, we are now at a point in the transition when diapers appear on many store shelves both with and without the Dry Max seal and marketing information, but contain the same reformulated diapers. So when we learned that Alexis (one of yesterday's two Dry Max case studies) still had some of the old Pampers Cruisers on hand, we quickly asked her if she'd do a side-by-side dissection of the two versions of the diapers. Here's a breakdown of what has changed in both Swaddlers and Cruisers; you'll find these changed diapers both in boxes labeled as "Dry Max" and boxes that look like they should have the old version of the diapers in them.

Below are two versions of Pampers Cruisers, side by side. The lefthand diaper is a Pampers Cruiser with the mesh lining from about April 2009, size 4. Alexis has had it in a storage bin (along with outgrown baby clothes) since that time. On the right is a Pampers Cruiser, size 5, from a recently opened package. Many parents, including Alexis, have reported to us that these diapers are much stiffer than the previous ones, and (at least on the exterior) are rougher to the touch.

Here is what the two diapers look like when opened. Note the color difference between the two diapers.
The removal of the mesh liner, shown in the older diaper, above, is one of the biggest non-rash complaints parents have expressed about Dry Max diapers. The liner was designed to contain bowel movements, keeping them from leaking up the back of the diaper and controlling their spread throughout the diaper's interior. Note its absence below.

In the photo above you can see that the color in the interior of the Dry Max diaper is not from a dye on the skin-contact surface of the diaper, but is inside. Is the color present in both, but simply showing through better when there's less fluff pulp? Alexis cut open the two diapers to separate the inside layers and see what's going on in there.

With the image below, we arrive at the other key functional criticism parents
have of Dry Max diapers: Pampers put total faith in its superabsorbent polymer for the back section of the diaper, and removed all fluff pulp. Hello, BMs up the back.

Here is the inside of the old design of the Pampers Cruiser, and here’s where your new disposable diaper engineering knowledge starts really coming in handy:

From right to left (interior to exterior) we see the mesh liner, the acquisition and distribution layer, the fluff/SAP layer, and the backing. The hydrophilic layer might be classified as the mesh itself, or the outermost portion of the ADL.

With your newfound knowledge of disposable diaper engineering, you should now see that the above represents a significant departure from the layering you’ll find in every diaper that competes with Pampers.

First, there is no acquisition and distribution layer at all. There is a top layer that brings the liquid in, and then a thin layer of fluff pulp that is itself affixed to a backing layer with a markedly different color.
The sodium polyacrylate SAP used in Pampers Dry Max diapers is actually adhered to the bottom layer of the diaper. “It was difficult to remove the pulp from the new version of the diapers,” Alexis reports. “I was scraping it with my nails…but managed to remove most of it. These did not have the numerous layers like the mesh diaper did. Really had to pry these apart.”

The main benefit to this is that it can then be distributed in a pattern and held in place, rather than mixed into the fluff pulp in a uniform distribution. Thus specific areas of the diaper can have more or less, in theory reducing the need for an acquisition and distribution layer to channel liquid to different areas of the diaper.

We believe the Dry Max absorptive core is made in one of two ways: Either an additional (and no doubt differently formulated) hot melt adhesive is used to affix smaller particles of sodium polyacrylate to the backing layer of the diaper, or the acrylic acid used in the production of sodium polyacrylate was itself affixed to the diaper, and then polymerized on the material itself. We’ll explain a bit more about that in a minute, but suffice to say this is the area of the diaper that has changed the most and is the most likely possible cause of the “extreme rashes” parents are reporting after using Dry Max diapers.

Here’s the amount of wood pulp found in each diaper.

As shown above, some of the beads of SAP can be separated from the fibers in the old version of the diaper. None can be separated from the Dry Max diaper, because they are not mixed in with the fluff pulp.

Possible sources of the problem

What follows is our shortlist of the changes that could potentially cause a child wearing a Dry Max diaper to have a significantly more serious and debilitating diaper rash than experienced with most diapers. Everything else in this post - the explanations of how diapers work, the teardowns - have been leading up to this, so feel free to reference the above as we discuss these potential hazards.

1. The missing mesh liner

Why did Pampers remove the mesh liner? The company’s public explanations
of the change dismiss the liner as "unnecessary," but surely it was put there for a reason. Was it really removed just to make the diaper thinner?

We'd like to propose an alternative possibility: The reliance on SAP and a small amount of fluff pulp without the use of an acquisition and distribution layer was incompatible with the layer of mesh; the hydrophilic top layer just didn't love water enough to successfully draw wetness away from the skin and/or far enough into the diaper, or the mesh layer interfered in some other way with the manner in which the liquid could best be distributed using a SAP-coated backing layer. Removing the mesh layer puts the baby's skin directly in contact with the top layer (treated, remember, with a surfactant), which could change the chemistry of the diaper-to-skin contact considerably from the old to the new diaper.

2. The hot melt adhesive

If the SAP is directly applied to the backing of the diaper, it seems likely that Pampers had to turn to an additional adhesive in order to attach the SAP to the backing layer; if the color is a guide, the design uses it quite liberally. Adhesives have long been a suspect ingredient contributing to diaper rashes, particularly because they are present in large quantities at the elastic leg cuffs of the diapers and this is a common area for diaper rash to spread from. We have no idea what the adhesive that Pampers has added actually is, but it could be derived from either wood or from petrochemicals, and is clearly a new substance in a diaper that has raised concerns with consumers for causing severe diaper rashes. There is also less fluff pulp to potentially shield the skin from whatever is on that bottom layer. Also, if the extent of the adhesive is indicated by the presence of the bluish color that is absent from the old Pampers diapers, this material is also present in the leg cuff areas of the diaper, further extending the potential area of exposure.

3. Fragrances

Pampers has stated in private emails to consumers that "small amounts" of "masking perfume" are "Added between the core and backsheet to mask the natural odors of diaper ingredients." Many parents (with or without infant rash issues) have complained about Dry Max diapers having a very strong chemical smell. If this odor comes from the sodium polyacrylate or the adhesive now used in the backing layer, it is possible that a larger amount of fragrances are used in an attempt to mask a stronger chemical smell. These fragrances might be irritating to the skin and lead to more severe rashes.

4. Acrylic acid

Sodium polyacrylate is made of acrylic acid that is polymerized using any of a number of other chemicals. Although Pampers officials have stated that they are using the same superabsorbent polymer they've used in the past (and admitted separately that sodium polyacrylate is indeed what they use) it is possible they are polymerizing the acrylic acid using a different chemical. Since polymerization of any substance is by definition incomplete, traces of the nonpolymerized substances remain in the material.

In addition to potential irritation from a new polymerization agent, if Pampers is polymerizing the acrylic acid on the backing layer itself rather than applying already produced sodium polyacrylate, the polymerization might result in differing levels of residual acrylic acid, or in acrylic acid being left in the material of the diaper, which could then mix with urine and create a more acidic environment in which diaper rash might be more severe. Sodium polyacrylate itself is classified as a non-toxic chemical, but acrylic acid is corrosive. Infant and toddler skin might have differing abilities to adjust to this higher level of acid.

5. Excessive dryness

Pampers have promoted Dry Max diapers as being "their driest ever," and discussions of diaper rash cite moisture against the skin as the leading cause of diaper rash. However, many parents who have reported severe diaper rashes with the use of Dry Max diapers (like Casey's story discussed yesterday) tried more frequent changes to see if it would solve the problem, and it failed. Could it be that the power of so much SAP being used in a diaper makes a baby's skin too dry? This might be consistent with the raw, cracked, and bleeding skin described by many Dry Max users.

We have other theories of possible hazards, but the five areas above are the ones we feel are most plausible, based on our research and understanding of the issue to date. Our point in presenting them is to show how simplistic...
statements like "we have not changed the superabsorbent polymer" or "we have not added any chemicals" are insultingly simplistic.

**Conclusions**

We believe that the most reasonable explanation for what is happening is that something in the design or materials used in Dry Max diapers are likely to be causing a dramatically increased severity of diaper rashes among users. We believe this because we believe mothers (and their doctors) can tell when a diaper rash is significantly worse than what a child has had previously, and believe that there are many cases in which linking causes and effects are far less complex than interested parties might like us to believe.

We base our opinion on our long-term reporting on how toxins introduced from multiple environmental sources can contribute to larger and longer-term health effects. We also suspect that in at least some cases individuals exhibiting allergic responses to products may be the "canaries in the coal mine" that alert us to underlying exposures that some of us do not exhibit symptoms of, but may be affected by nonetheless. We have no way of knowing if Pampers Dry Max is such a product or not, so have focused our reporting on what might be causing the symptoms described by parents using Pampers Dry Max - namely, more serious diaper rashes than they have seen with competing brands or, most tellingly, after switching from the previous version of Pampers to the Dry Max formulation.

We are not doctors, and our opinions should not be substituted for medical advice. That said, we believe that the best solution for any parent is to avoid Pampers Dry Max diapers - if not now, then when it's time to buy diapers again.

In our fourth and final installment of this series, we'll discuss the social media component of this story and its implications for the future of consumer activism and consumer research, as well as the future of disposable diapers.

**Update:** An update and safety note, and the results of our own in-home skin patch testing of Pampers Dry Max diapers.

Miss a previous installment of this series? Read Part 1 and Part 2.

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1. **AJsMomma** [5/19/10]

J&J- you did an AMAZING job interpreting my photos! Awesome research! Very glad I was able to help.

Just wanted to note that neither of those diapers were Swaddlers...I think the Swaddlers are the sizes Newborn - size 2 or 3, and then Cruisers are size 2 or 3 and up.

[Thanks, fixed it. - Ed.]

2. **Becky** [5/19/10]

I think you have some good points, however, the new chemicals are not the source of the blue coloration. I believe that is actually a dye, or a color of this inner layer. I'm stating this because as the new diapers were made, they weren't switched all at once. There were diapers packed in old bags that had the Dry Max technology and no mesh liner but had a white inner lining. [Here's a link.]

Rashes were reported with these dipes, too.
3. Alisha [5/19/10]
Appreciate all of the hard work you're putting into this report!

4. Lynette [5/19/10]
Awesome job! I have long suspected that acrylic acid monomer is present in larger quantities in the new drymax. Can't wait for part 4!

5. Stone [5/19/10]
Great research and article! Thank you so much for doing this. I would also like to add a couple things.

The "absorb-away" mesh liner was touted as a huge innovative advancement in diapers while Pampers was selling and marketing them. It was as you stated, supposed to help keep BMs away from the skin and from blowing up the back, as well as providing a barrier from urine and allowing air to be on the skin rather than right up against the top layers. IMO without this mesh, babies skin is not allowed to breathe and it is as you stated right up against the top layer and those chemicals. This mesh was one reason that we kept paying for the most expensive diaper on the market, and it WORKED very well for us starting with original Swaddlers then Cruisers.

It has also been confirmed and documented from many parents (see FB groups) that their children have been diagnosed with either, or both Irritant Contact Dermatitis (ICD), Allergic Contact Dermatitis (ACD) at the same time. Dermatologists suspect the Dry Max diapers.

6. Liana'sMomma [5/19/10]
Thank you for this article. It explains so much. I have used the Pampers Swaddler Sensitive for 3 yrs (the mesh inside)...on all 3 of my children. My youngest (6 months) is the only one in them now. We use both disposies and cloth diapers. I do not have a problem with disposies until recently. My little girl had a severe reaction to a dry max after being in it for 2 1/2 hrs. We were at the zoo and I forgot her diapers so I borrowed one. It was a size 3 Pampers Dry Max. I thought cool, I get to see how these new diapers do. Well, my daughter started crying and then it went to screaming. I couldn't figure out what was going on. I thought she just wanted to be held. I picked her up and tried to nurse her. Nope, that wasn't it, I put her down to change her diaper...bingo. Her tushie was bright red and had 3 blisters. Three blisters! Her tushie was normal looking 2 1/2 hrs ago. So, I made a note not to use the new dry max anymore. I went to order a month's supply of my Pampers Swaddler Sensitive (old kind with mesh) and when they arrived they were the new dry max. The diapers had changed, but the package was the old package. I could cry b/c I don't like Huggies. I just want my old mesh Pampers back.

7. Eric [5/19/10]
We use pamper's baby dry diapers. These are much thicker than cruisers, and haven't seen any new rash activity. Has the formula on the baby dry diapers not changed yet?

8. Ryles [5/19/10]
Thank you, thank you, thank you, for not making us mom's sound like idiots any longer.

I'm wondering if you plan to do any skin testing. A mom on the facebook group put a diaper on her leg to see if there was a reaction. Again, I dont suspect that EVERY person will be subject to a reaction, but some might..

9. Jeremiah [5/19/10]
@Becky, Jodi Allen explained early on in this whole mess that the reason for getting Dry Max diapers into unlabeled packages was because their manufacturing process had to be transitioned over a production period. This would explain any feature disappearing (diaper back changing, for example, as in the post you link to) before the backing itself was changed to the Dry Max system. In other words, he could have a hybrid that included fluff pulp/SAP in it rather than a Dry Max core. That would be consistent with our assumption that the blue coloration is something
that relates to the way the SAP is applied to or polymerized on the
diaper. I have added confidence in this theory based on the fact that the
blogger you link to does not describe any difference in the thickness of
the absorbent material, except that it is missing in the back.

We’ve asked the blogger whether she had one of those weird diapers
lying around. It’s a long shot, but stranger things have happened. If we
got aholt of one we could test our theory by seeing if it had SAP mixed
into the fluff.

10. **Tamara @ bynature.ca** [5/19/10]
Wow. Absolutely incredible breakdown of the disposable diaper. Good
work!!

11. **Christy** [5/19/10]
Thanks for the information! One thing that stands out to me is the
realization of how many chemicals and junk are put into diapers. Even
if its not causing my kids problems, its exposing them to chemicals. We
use cloth but can be lax at times and use sposies, ...no more!

12. **Sandy** [5/19/10]
I don’t use Pampers because they cost too much. We use cloth diapers
during the day and Luvs at night. It just occurred to me that Luvs may
also contain the "DryMax" liner and millions of Luvs users are none the
wiser. My Luvs diaper looks extremely similar to the diapers you’ve
posted in this article that contain DryMax. Do you have any information
on whether Luvs (also a P&G;product) contain the same "new"
technology?

I’m going to cut one open to compare it to your pictures.

13. **A. S.** [5/20/10]
Just wanted to let everyone know that after reading this, I opened up a
Pampers Baby Dry diaper, an old Swaddler with the mesh lining, and a
new Swaddler with Dry Max (as per the packaging). The Baby Dry
diaper shows all the signs of having Dry Max that are listed in the
"dissection" above. I had thought the Baby Dry diapers were
unchanged, but after seeing this and reading that the Dry Max was
added without packaging changes, I’m no longer comfortable using any
Pampers products at all.

14. **ChuckD** [5/20/10]
Kudos for the detailed, concise analysis. Far better than any currently
out there. Perhaps
Looked for but could not find bookmarking service buttons (digg,
stumbleupon, etc.). Dunno how much of a difference they make, but
what could they hurt?

15. **Jill** [5/20/10]
I love that the diapers were cut apart, I posted this on facebook, we had
the same blowout problem with Luvs (I think they have the same parent
company) and called and complained and they said too bad basically,
this was way before the pampers switch over, probably, oh, winter of
2008. tons of people were upset over that and boycotting the new
diapers because they dint work as well. We switched to pampers, but
they got too expensive, even for our 'night time only' use and went
ahead and invested in enough cloth to last us 2 days before washing
and haven’t looked back! Disposable diaper free for over a year!

16. **Mmspirit7** [5/20/10]
What scares me most is that hospitals are still using and sending
parents home with this diapers my cousin just had a baby and she broke
out in a nasty rash well she switched to huggies becuase it’s all our
family uses and then she read a link i posted on fb about this. is she
mad.

thank you for this it will educate many

17. **Nikki** [5/20/10]
The more I read, the more my stomach gets sick. Excellent job on the
pics and breakdown. I really wish consumers who use disposables would
take the time to do more research and be more open minded about alternatives.

18. **Chris** [5/21/10]
It's definitely eye-opening to have confirmed what I had already suspected: that diapers are loaded with frightening chemicals. What's scary is that the MSDSs are so tightly sealed. These articles are certainly making me think about a move to cloth diapers. It also explains why I've been so unhappy with my Baby Dry diapers, which function exactly as described in this article.

19. **Jennifer** [5/22/10]
Let me know if you need more regular and DryMax - I have a box of the new and a TON of the old in the garage.
Thanks again for all this! Now I'm freaking out about the times I've had to clean up all the little beads when the dog got into a poopy diaper left on the top of the pail by my sitter.

20. **Rebecca** [5/22/10]
I wouldn’t be surprised if one of these is the cause for the really bad rashes. My sister tried using the drymax Pampers Cruisers on her baby, although she never tried the original Cruisers as the baby wasn’t old enough when they were still around. Anyway as far as I know she never got a rash, but that may have been because my sister couldn’t stand the chemical smell of the diapers. I would not be surprised that something that smelled so nasty might have chemicals some children are very sensitive to. Pampers is definitely handling this very badly from a PR standpoint. The last thing a company should do is attack parents verbally and claim they aren’t properly taking care of their young children - yikes!

21. **BoycottPampers** [5/31/10]
Great dissections of possible causes. I peronally believe that perhaps their “tests” of the diapers weren’t using urine. And maybe, a chemical in the baby’s urine, such as ammonia, is mixing with a chemical in the diaper, causing some kind of reaction that is corrosive to the baby’s skin... That's just my theory though.

We need to band together on this one and let them know we won’t tolerate this kind of treatment!

[http://www.boycottpampers.com](http://www.boycottpampers.com)

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