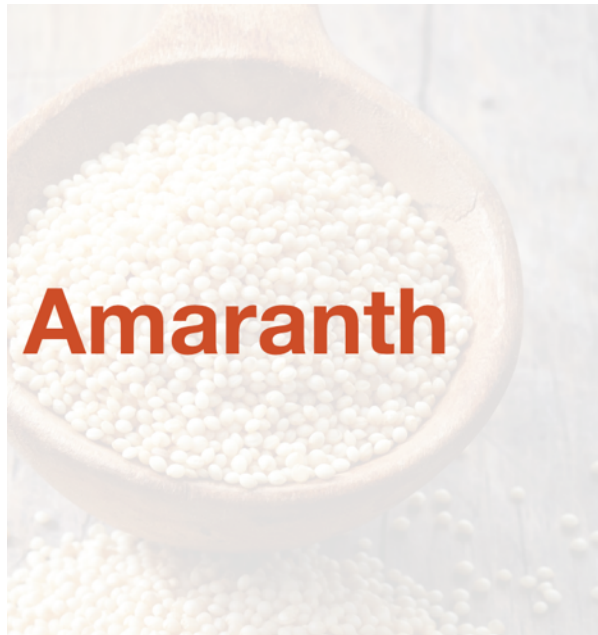


## Cyrex Array 4 – Part 3



**Pseudo-cereal** native to North America

Consumed as **whole grain**; also commonly used in gluten-free cereals and baked goods

**Associated with** allergy

**Cross reacts** with quinoa, rice, sunflower

Does not typically cross react with **gliadin**

Amaranth is what's known as a pseudo-cereal, native to North America. It's often referred to as a grain; it's not technically a grain, though, which is why it's called a pseudo-cereal. It's another one that's commonly used in gluten-free products like breakfast cereal and baked goods. It's associated with allergy, it cross-reacts with other pseudo-grains like quinoa and also rice and sunflower, does not typically cross-react with gliadin, so may be another safer choice for people with gluten intolerance.



**Pseudo-cereal** native to South America

Consumed as whole grain (actually a **seed**); common ingredient in gluten-free cereals and baked goods

**Associated with** anaphylaxis and secondary hyperoxaluria

**Cross reacts with** amaranth, rice, sunflower

Not known to cross-react with **gliadin**

Quinoa is another pseudo-cereal; this one's native to South America. It's consumed as a whole grain. Again it's not a grain—it's a seed in this case—and it's a common ingredient in gluten-free cereals and baked goods. Antibodies to quinoa are associated with anaphylaxis and secondary hyperoxaluria, oxalates in the urine. It cross-reacts with amaranth, rice, and sunflower, and like amaranth, it's not known to cross-react with gliadin.



Also known as **yuca, cassava, manioc**

**Tuber** that is cooked and eaten peeled

Also eaten as **pudding**, flatbread; used in gluten-free products

**Associated with** anaphylaxis and latex-fruit syndrome

**Cross-reacts** with banana, avocado, chestnut, kiwi

Not known to cross-react with **gliadin**

Tapioca: it's also known as, or more specifically it comes from yuca, which is also known as cassava or manioc, and it's a tuber that is cooked and eaten peeled. It's also eaten as a pudding, flatbread, and it's used a lot in gluten-free products. It's pretty hard to find gluten-free products that don't have tapioca. Antibodies to tapioca are associated with anaphylaxis and latex-fruit syndrome. It cross-reacts with banana, avocado, chestnut, and kiwi, but is not known to cross-react with gliadin, so yuca, cassava, manioc, whatever you want to call it, I typically refer to it as yuca, it's used a lot in Latin American cooking and it's a fantastic safe starch for people that are gluten-intolerant, provided they're not producing antibodies to it.

Okay, here's another test, and this test result here in this patient was reacting to a few antigens.

There are some that we haven't covered so far, one is sesame. So, sesame seeds are of course common ingredients in baked and processed foods, and sesame oil is used in a lot of processed foods. It's also found in tahini, sesame. Antibodies to sesame are associated with allergy, anaphylaxis, conjunctivitis, facial erythema, asthma, rhinitis, and urticaria. It cross-reacts with almonds, kiwi, poppy seeds, hazelnuts, and rye, and it's not known to cross-react with gliadin.

# Sesame

Sesame **seeds** are processed into oil and flour or eaten whole

Common ingredient in **baked and processed foods**

Found in **tahini**

**Associated with** allergy, anaphylaxis, conjunctivitis, facial erythema, asthma, rhinitis, urticaria

**Cross reacts** with almonds, kiwi, poppy seeds, hazelnuts, rye

Not known to cross react with **gliadin**

TEST	RESULT			
Array 4 – Gluten-Associated Cross-Reactive Foods and Foods Sensitivity **	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Rye, Barley, Spelt, Polish Wheat	0.50			0.4-1.4
Cow's Milk	1.00			0.1-1.3
Casein (Alpha & Beta)		1.37		0.1-1.7
Casomorphin	1.02			0.2-1.6
Milk Butyrophilin	0.80			0.2-1.8
Whey Protein	0.83			0.1-1.3
Chocolate (Milk)	0.82			0.1-1.4
Oats			1.40	0.2-1.0
Yeast			1.95	0.2-1.2
Coffee			2.59	0.3-1.9
Sesame			1.60	0.1-1.3
Buckwheat		1.21		0.4-1.3
Sorghum	0.60			0.3-1.2
Millet		1.14		0.3-1.5
Hemp	0.89			0.3-1.5
Amaranth		1.09		0.2-1.3
Quinoa	0.73			0.5-1.5
Tapioca	0.23			0.1-1.1
Teff	0.78			0.2-1.1
Soy	0.54			0.5-1.5
Egg	0.72			0.2-1.7
Corn	0.88			0.3-1.4
Rice	0.81			0.4-1.6
Potato	<0.60			0.6-1.4

# Chocolate milk

**Important:** this antigen is a combination of milk and chocolate, known to cross react with **gliadin**

Dark chocolate/cacao w/o milk not known to cross react with **gliadin**

**Associated with** allergy and CD

**Cross reacts** with tobacco, ragweed leaves, instant coffee

TEST	RESULT			
Array 4 – Gluten-Associated Cross-Reactive Foods and Foods Sensitivity **	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Rye, Barley, Spelt, Polish Wheat	0.69			0.4-1.4
Cow's Milk			1.60	0.1-1.3
Casein (Alpha & Beta)			1.85	0.1-1.7
Casomorphin		1.22		0.2-1.6
Milk Butyrophilin	0.68			0.2-1.8
Whey Protein	0.70			0.1-1.3
Chocolate (Milk)		1.38		0.1-1.4
Oats		0.82		0.2-1.0
Yeast			1.24	0.2-1.2
Coffee	0.89			0.3-1.9
Sesame			1.66	0.1-1.3
Buckwheat	0.89			0.4-1.3
Sorghum	0.81			0.3-1.2
Millet	0.84			0.3-1.5
Hemp			1.60	0.3-1.5
Amaranth	0.61			0.2-1.3
Quinoa			1.57	0.5-1.5
Tapioca	0.70			0.1-1.1
Teff		0.89		0.2-1.1
Soy			2.26	0.5-1.5
Egg	0.43			0.2-1.7
Corn	0.86			0.3-1.4
Rice	1.23			0.4-1.6
Potato	0.81			0.6-1.4

Next is chocolate milk. Really important note here, I think there's been some misunderstanding around this, this antigen is a combination of milk and chocolate, so when you see someone who's reacting to this, it does not mean they're reacting to pure dark chocolate, it means they're reacting to milk chocolate, chocolate with the addition of milk, and what you'll typically find as you can see here on this test result is that patients who have dairy intolerance are reacting to the milk chocolate, and it's probably the milk that they're reacting to, not the chocolate. Although when substances are combined, as we'll talk more about when we talk about Cyrex Array 10, they can

form new proteins, so it is technically possible that the patient could be fine with dairy and fine with chocolate, but not fine with milk chocolate, which makes it more confusing, definitely. Antibodies to milk chocolate are associated with allergy and celiac disease, and people who produce these antibodies, you often see cross-reaction with tobacco, ragweed leaves, and instant coffee.



**Used to make** milk, tofu, soy sauce, fermented bean paste, natto, tempeh and oil

**Extremely common** ingredient in processed foods

**Associated with** allergy

**Cross reacts** with birch pollen, cow's milk, casein

Studies suggest that soy **allergy** is becoming more common

Soy, we haven't talked about that yet. Soy is used to make milk, tofu, soy sauce, fermented bean paste, natto, tempeh, and of course soybean oil, which is ubiquitous in processed food. It's an extremely common ingredient in the food supply now in most places in the world, especially in the industrialized world. Antibodies to soy are associated with allergy. Soy cross-reacts to birch pollen, cow's milk, and casein, and recent studies have suggested that allergy to soy is becoming more common, and that's probably because it's consumed more regularly now.

# Corn

**Eaten whole**, also in vegetable mixes, breads, stews, soups, chili, salsa, supplement/ pharmaceutical fillers, and much more

**Processed** into syrup and used as a sweetener for beverages, treats, and pre-packaged foods

**Associated with** allergy/hypersensitivity, anaphylaxis, CD, crohn's disease, ulcerative colitis

**Cross reacts** with potato, rice, soy, gliadin

**Activates** mucosal neutrophils and eosinophils; can worsen GI inflammatory disorders and CD

TEST	RESULT			
	IN RANGE (Normal)	EQUIVOCAL*	OUT OF RANGE	REFERENCE (ELISA Index)
Array 4 - Gluten-Associated Cross-Reactive Foods and Foods Sensitivity **				
Rye, Barley, Spelt, Polish Wheat	0.70			0.4-1.4
Cow's Milk	0.89			0.1-1.3
Casein (Alpha & Beta)	0.71			0.1-1.7
Casomorphin	0.51			0.2-1.6
Milk Butyrophilin	0.58			0.2-1.8
Whey Protein	0.74			0.1-1.3
Chocolate (Milk)	0.81			0.1-1.4
Oats			1.11	0.2-1.0
Yeast	0.46			0.2-1.2
Coffee	0.67			0.3-1.9
Sesame	0.76			0.1-1.3
Buckwheat	0.71			0.4-1.3
Sorghum			1.75	0.3-1.2
Millet		1.24		0.3-1.5
Hemp	1.07			0.3-1.5
Amaranth		1.02		0.2-1.3
Quinoa	0.85			0.5-1.5
Tapioca	0.21			0.1-1.1
Teff		1.04		0.2-1.1
Soy		1.45		0.5-1.5
Egg	1.10			0.2-1.7
Corn		1.14		0.3-1.4
Rice	1.27			0.4-1.6
Potato			1.90	0.6-1.4

Corn, another product that's ubiquitous in our food supply. It's eaten whole, also in vegetable mixes, breads, stews, soups, chili, salsa, supplement in pharmaceutical fillers, and many, many more products. It's of course processed into syrup, high-fructose corn syrup, used as a sweetener for beverages, candy and pre-packaged foods. It's associated with allergy, hypersensitivity, anaphylaxis, celiac disease, Crohn's disease, and ulcerative colitis. It cross-reacts with potato, rice, soy, and gluten, and it activates mucosal neutrophils and eosinophils and can worsen GI inflammatory disorders and celiac disease.



## Foods known to **cross-react with gliadin**

Foods known to cross-react with **purified alpha-gliadin-33-mer**

Cow's milk	Gluten grains *
$\alpha + \beta$ Casein	Yeast
Casomorphin	Oats
Milk butyrophilin	Millet
Whey protein	Rice
Chocolate (milk)	Corn
* Polish wheat is also known as Camel's wheat, Egyptian wheat and Kamut®	

Adapted from: Cyrex Array 4 Clinical Applications Guide (<http://cyrexlabs.com>)

So before we finish up with Cyrex Array 4, I want to make a really important point. Not all of the antigens that are listed on Array 4 cross-react with gluten. Only the ones that are listed on this slide do, and this includes cow's milk, alpha- and beta-casein, casomorphin, milk butyrophilin, whey protein, chocolate milk, that whole group right there is basically dairy products, if you want to summarize. And then, yeast, oats, millet, rice, and corn, so these are the foods that patients with gluten intolerance will be most likely to also have an intolerance to, and patients who've gone on a gluten-free diet, if they're still having issues and they're consuming these foods, removing these foods will probably be the most likely to lead to further clinical improvement.

On the other hand, cross-reactivity doesn't happen in all cases, so not everyone with a gluten intolerance will react to these foods, but these are the biggest concerns. It's also important to know that other foods that are on this panel can still cause problems, but not via the mechanism of cross-reactivity. And I mentioned this I think earlier in the presentation, but with some of the foods like teff, that are newer to the Western diet, we don't really have enough data to know whether they're cross-reactants or not, so if you see that a patient has antibodies to a food that they've never eaten or they're not eating, that could be a cross-reaction. In fact, we've had a couple situations like that where a patient has produced antibodies to teff, and they're just almost completely certain that they've never eaten teff before. So one of the things that can explain that is if teff is actually a cross-reactant and that patient's gluten-intolerant, that they're also producing antibodies to teff when the test plate is run, even though they're not consuming it. Okay, that's it for Cyrex Array 4. Next time we're going to talk about Array 10.