Beyond Corn Syrup

Other types of glucose syrups need to be used in place of corn syrups for products to fit into a particular clean-label category.

John K. Ashby
California Natural Products

John K. Ashby is general manager of the Ingredients Division of California Natural Products. Over the past 20 years he has held various executive positions in the food industry, with an emphasis on nutritional, performance, natural and organic foods.

Different markets require different ingredient selections in order to fit into a particular market niche. Natural, organic and other clean-label food trends have been gaining momentum over the past few years. Although in some ways this has been slower to move into the confectionery area, the various clean-label markets are now growing in different areas of confectionery.

Because of expectations in the marketplace, some clean-label strategies require using substitutions for corn syrup. However, syrups with similar functionalities, the kind of functionalities that glucose syrups of all types possess, are still required for many products. So other types of glucose syrups need to be used in place of the corn syrups. The most frequent substitutes are rice syrups and tapioca syrups.

Rice syrups have the highest acceptability in the clean-label categories, although they generally have a noticeable caramelly taste.

Tapioca syrups have a lesser halo of acceptability although they are quite taste-neutral relative to the corn syrups they might be replacing.

The most significant issue is that although different glucose syrups may have similar functionalities, on the whole they function differently, most often requiring at least slightly different formulations—even when the paperwork may appear to be showing similar specifications.

One brand of high fructose corn syrup (HFCS) 55 is usually a drop-in, one-to-one substitute for another brand of HFCS 55. This is not true for most other glucose syrups. One brand of rice syrup, for instance, is most likely not a one-to-one substitute for another brand of rice syrup even when the dextrose equivalence (DE) reported for both brands may be the same.

In order to understand this better we need to understand glucose syrups.

WHAT ARE GLUCOSE SYRUPS?

Some readers may think this is obvious, but my experience is that glucose syrups are not well understood.

Glucose syrups are a standard-of-identity food, defined in the Code of Federal Regulations (CFR) 21CFR168.120, which reads in part:

> Glucose sirup is the purified, concentrated, aqueous solution of nutritive saccharides obtained from edible starch.
>
> The food shall meet the following specifications:
>
> The total solids content is not less than 70%…
>
> …reducing sugar content is not less than 20%…

Basically, a syrup must have solids over 70 percent in order to have a low-enough ➤

The reducing sugar content has to be 20+ or the solubility of the larger carbohydrates would be so low that you can't get the water activity low enough without having the viscosity of a brick.

water activity to not grow microbes while under storage.

And the reducing sugar content has to be at least 20 percent or the solubility of the larger carbohydrates would be so low that you can't get the water activity low enough without having the viscosity of a brick.

This is really not a very limiting set of specs. And yet I have seen on the floor of the IFT show "syrups" not meeting these standards that within no time at all were off the market because of their tendency to ferment in warehouses with the resultant eruptions of gooey sugars (and some alcohol).

The CFR also defines the naming and spelling of these products:

> The name of the food is "Glucose sirup"….
>
> The name may alternately be "_____ sirup" filled in with the name of the starch.
>
> The word "sirup" may also be spelled "syrup."

Yes, the CFR has two legal ways to spell the product, *sirup* and *syrup*.

Corn syrups are glucose sirups. Rice syrups are glucose sirups. Sorghum syrups are glucose sirups when they are made from the grain of the sorghum. Technically they are not when they are made from the cane of the sorghum. Then they are often called *sorghum molasses* and/or *sweet sorghum*.

UNDERSTANDING GLUCOSE SYRUP SPECIFICATIONS

To understand glucose syrups we will take a look at dextrose equivalence, carbohydrate structure, matrix complexity, Brix and processing parameters.

Dextrose equivalence, or DE, has two words in it, *dextrose* and *equivalence*. Let's break down the meaning of each and why this is important.

Dextrose

Dextrose is the primary building block in nature for starch (food for plant seeds and people) and cellulose or wood (the primary structural element for plants), which is cow food but not human food. Both primarily use 1-4 glycosidic linkages (starch uses some 1-6 glycosidic linkages). They are both chemically very similar.

The main chemical difference is that starch uses alpha 1-4 glycosidic linkages and cellulose uses beta 1-4 glycosidic linkages. Just think of an alpha linkage as a right hand and a beta linkage as a left hand — the right hand can't fit into a left-hand glove and vice versa. So the enzymes that can break down alpha linkages can't really break down the beta linkages.

We tend to think of starch and cellulose as very different — starch is fairly easily hydrolyzed, cellulose not so easily hydrolyzed. The difference is not really because of the alpha-versus-beta linkages, but because the plant takes the beta-linkage carbohydrates and weaves them together. Think of ropes, where each filament is weak but very strong when they are all woven together. This weaving is why enzymes can't as easily access the cellulose and hydrolyzing (breaking down or digesting) is not as efficient. This is how the plant wants it: strength for the cellulose and ease of digestion for the starch.

Equivalence

The next word, *equivalence*, is a little trickier. A word definition for this might be *the percentage of reducing sugars calculated as dextrose.*

Each glucose molecule has one aldehyde sticking off the end of the molecule. Aldehydes are chemical structures that can chemically reduce other chemical compounds — hence the term *reducing sugar*.

So, if you have 100 percent glucose molecules, then you have 100 percent aldehydes available to chemically reduce other molecules (100% means 100% as many as you would have compared to an equivalent weight of glucose).

This aldehyde part of the molecule is ➤

what is used when one glucose is covalently bonded to another glucose, making a polymer. So when you have maltose that is a polymer of two glucoses stuck together, you have the weight (approximately) of two glucoses, but instead of having two aldehydes available for chemical reductions, you only have one because one of them was used up to connect the two glucoses together. This is half as many reducing units as the same weight of glucose would have, or 50 percent the reducing power or a dextrose equivalence of 50 percent, because a pound of maltose only has half as many reducing elements as a pound of glucose.

This is basically the algebraic or simple method of calculating dextrose equivalence:

Simple DE = 1*DP1(glucose) + 0.5*DP2(maltose) + 0.33*DP3(triose) + 0.25*DP4, etc.

This is probably the most common way to measure dextrose equivalence in the syrup industry; albeit very debatable as we will see. You use high-performance liquid chromatography (HPLC) or high-performance ion chromatography (HPIC) columns to run a sample of the syrup and get a readout of the proportions, the percentages of glucose in the sample, the percentage of maltose, the percentage of DP3, DP4, DP5 and DP7. Then plug those amounts into the equation and the result is the DE.

That is only one way to measure DE. The academic measurement is what is called the *Lane Eynon procedure*, which measures the reduction of copper sulfate in Fehling's solution, or the exact chemical reduction potential of the sample. The resulting DE number will not be the same as the simple DE above.

Nor will either be the same DE number if DE is calculated using the other two ways to calculate DE shown below:

Alternate DE = 1*DP1(glucose) + 0.6*DP2(maltose) + 0.39*DP3(triose) + 0.1*>DP3

Schenck DE = 1*DP1(glucose) + 0.58*DP2 (maltose) + 0.395*DP3(triose) + 0.298*DP4

If you were to have a syrup comprised of exactly 25 percent of DP1 and DP2 and DP3 and DP4, the DE values will be different depending upon which method you used to calculate the DE:

Simple DE = 52.1
Alternate DE = 52.3
Schenck DE = 56.8
Lane Eynon = none of the above

These different ways of calculating DE are aiming at different goals, such as algebraic purity, or to approximate perceived sweetness or to try to approximate what the Lane Eynon procedure result would be based upon the knowledge of the proportions of the various polymers. But there is no reason one is better than the other.

So by now hopefully you have lost some confidence in the uniqueness and sufficiency of DE specifications. All this matters because different carbohydrates react with water differently and this causes the different functionalities of different syrups in applications.

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So when you are making a glucose syrup, you need a way to measure that you have made a consistent product. You need a way to be able to know and measure the carbohydrate structure of the syrup.

CARBOHYDRATE STRUCTURE

Carbohydrate structure is the set of different carbohydrates that exist in the syrup (or in the overall matrix of the food itself, but a bit more about this later) that determines the functionality, not necessarily the DE.

Maltose is just two glucoses covalently glued together. One would initially think that since glucose and maltose are similar, their functionalities would be very similar. But even though the size (molecular weight or degree of polymerization, i.e., how many glucoses are glued together) of ➤

Glucose is quite hygroscopic; it attracts water. When glucose is dry, it wants to suck up moisture and get wet, and when it is wet, it wants to crystallize out of solution. Maltose when dry stays dry.

the carbohydrate in general tends to affect in a predictable trend how it interacts with water, the glucose and maltose are a bit of an anomaly.

Glucose is quite hygroscopic; it attracts water. When glucose is dry, it wants to suck up moisture and get wet, and when it is wet, it wants to crystallize out of solution.

Maltose when dry stays dry, and is not as precipitous in its tendency to precipitate (although it will).

This is why for a crunchy nut cluster type of application you need the maltose to keep it glued together and crunchy. And when you want a more gooey texture you generally want more glucose, and less maltose.

Especially in the example of different textures of nutrition bars and granola bars, the ratio of glucose to maltose can be as important as everything else that is in the matrix. Generally, you want a higher glucose/maltose ratio for a gooier texture, and a lower glucose/maltose ratio for a crunchier texture.

The maltose texture is different than that which long-chain carbohydrates give to an application. Longer carbohydrates tend to give a longer texture—think marshmallow treat. No analogy is perfect, and longer, bigger carbohydrates can make a bar really hard, especially over time. Longer carbohydrates can be a real trap towards the end of a shelf life and turn a product that is fine early on into a brick later.

There is no simple algebraic definitive answer of how to exactly formulate something. It takes some trial and error, and experience, but thinking specifically how each component is contributing to the finished texture—initial texture and end-of-shelf-life texture—can really speed up the formulation process.

Now that we have mentioned how differently various carbohydrates can act, we will look at another example that puts one more nail in the coffin of trusting a DE specification as a total explanation of a product. We are going to look at two fictional syrups that have the same DE but would obviously have very different functionalities (Figure 1).

Both syrups calculate to the same DE, yet most developers with experience know that syrup #1 is going to act very differently than syrup #2. Seeing that maltodextrin-like DP10 in fictional syrup #1 will clearly have a huge effect. Same DE, very different syrup. How differently they act also depends a lot on how different the degree of polymerization—size—of the other carbs is. Really large dextrins will make the syrup act differently than if the other carbs are much smaller molecules.

In the corn syrup arena, the various DEs are relatively standardized and this is why, for the most part, one DE43 corn syrup can be substituted for another DE43 corn syrup. Once you venture out of the corn syrup arena you cannot count on that fungibility.

The tools you have to figure out how close one glucose syrup might be to another glucose syrup follow:

- The reported dextrose equivalence.
- Data on the amounts of glucose and maltose. This can be very unreliable data but at least get what data is available.

And then, once you have the above, you can try to approximate what is going on in the higher-molecular-weight range by measuring viscosity. I dislike this as a specification because measurement of viscosity

Comparing Two Fictional Syrups

	Fictional Syrup #1	Fictional Syrup #2
Dextrose equivalence	32	32
Glucose (DP1)	26 g	0
Maltose (DP2)	0	42 g
Trisaccharide (DP3)	0	33 g
Decasaccharide (DP10)	49 g	0
Total sugars	26	42
Other carbs	49	33

Figure 1

can be so variable, so I generally ignore reported viscosities. However, you can do a simple benchtop measurement side by side to get hints. The more different the comparable viscosities are, the more likely you have more development work to do to switch from one syrup to another.

We have a real life example of two syrups that are very different yet are often reported with the same DE, 42 (or one is more often reported as a DE43 and one as a DE42) (Figure 2).

The DE43 medium conversion is the carbohydrate structure for a rice syrup that is similar to the basic so-called 43 42 corn syrup, with maltose and glucose at similar levels.

The DE42 high maltose is the so-called high-maltose rice syrup that is as little glucose as possible with as much maltose as you can get. This syrup is widely used in granola and nut cluster applications because the maltose helps to achieve a nice candy set to the product.

These two syrups are definitely not interchangeable, and are very different even though the DE can be similar numbers.

SYRUP MATRIX COMPLEXITY

To summarize, up to now we have three perspectives on glucose syrups that can help us to understand their functionalities in applications:

- The dextrose equivalence.
- The levels of glucose and maltose.

Same but Different Syrups

	High Maltose	Medium Conversion
Dextrose equivalence	42	43
Glucose (DP1)	4	19
Maltose (DP2)	34	13
Total sugars	38	32
Other carbs	38	44
Simple DE calculation	32	38
Alternate DE calculation	36	40
Schenk DE calculation	38	42

Figure 2

- The higher-molecular-weight carbohydrates that can sometimes be elucidated a bit by looking at viscosity.

Many, not all, non-corn-syrup glucose syrups also have a dramatically increased syrup matrix complexity.

In general, corn syrups have very narrow molecular-weight ranges, and nothing else in the syrup.

Many other glucose syrups have the added complexities of very wide ranges of molecular weights, and minor constituents —proteins, fats, fibers—not present in nutritionally significant quantities.

There are pluses and minuses to this. The wider range of molecular weights means there are many differently sized molecules, each size of which interacts with water differently. This can help a lot with humectancy and result in an increased tendency to keep the water where it is. Water movement is the major problem of nonmicrobial staling, so keeping the water where it is can be a huge advantage. This wider range of molecular weights is in part a result of using only enzymes to make the syrups, without acid or base treatment that tends to homogenize the molecular weights a bit more. Enzymatically produced tapioca and rice syrups tend to bring this advantage.

A disadvantage of this wider size distribution is that the targets for carbohydrates are therefore less tight. This generally means a wider range of mono- and disaccharides in the syrups, so this has to be managed to keep one's nutrition label copacetic.

The minor constituents can bring some significant changes in functionalities. Tapioca syrups do not have any of these because they are made from the tapioca starch, just as corn syrups are made from the corn starch.

The most significant minor constituent in rice syrup is the fat. This fat is rice bran oil and it is a very strong emulsifier. So this ➤

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is a big advantage where you want emulsification—water control, baking shelf life, mouthfeel, etc. This is a clean-label way to bring emulsification into the product without the chemically sounding emulsifiers like mono- and diglycerides, etc., that are not clean-label compatible.

This rice bran oil is one of the big advantages of rice syrup and is crucial in many applications, although this emulsification can be a disadvantage in some whipping applications. In that type of application, tapioca syrup would be more suited because it does not have the rice bran oil, or other emulsifier, in it. Rice syrup does not work the same as other glucose syrups. We are not dealing with fungible products when venturing into this clean-label wilderness.

MIXOLOGY

I want to touch on viscosity because this is vastly misunderstood by so many operators out there.

Viscosity is a dependent variable, not an independent variable. That is all you have to know. Understanding this may need a little input. The viscosity of a syrup is the result of all the variables that make it up: the concentration, the various sizes of the molecules, the minor constituents that are in the syrup, if any, and the temperature of the syrup. Viscosity being the result means that it is a dependent variable; the result is dependent upon those decisions.

You cannot change the viscosity by itself because it is not an independent variable. The temperature is an independent variable. You can change it directly. So you cannot change the viscosity response of the syrups without buying a different syrup.

These syrups have viscosities that are very temperature dependent. There are several factors that account for this.

To make a syrup in the first place, you have to concentrate it enough so that the water activity is low enough that microbes can't grow. This means it has to be concentrated enough so that there is very little free water. This means very little free water for microbes to use to grow, and very little free water to provide easy flow to the syrup. Hence, any change in the temperature, otherwise known as a change in the energy of the water molecules, causes a large change in the viscosity.

The overall DE of the syrup dramatically changes the viscosity response. The larger molecules bind up water and drive up viscosity faster for a given weight than is true for smaller molecules. Hence, lower-DE syrups with more, larger molecules have higher viscosities to begin with and respond more dramatically to changes in temperature than do higher-DE syrups.

Syrups with more of the minor constituents have still higher viscosities. If two syrups have exactly the same carbohydrate structures and one has more of the minor constituents, it will have a noticeably higher viscosity. You can see both of these effects in the viscosity graphs shown in Figures 3 and 4. The lowest-DE (26) syrup has the highest viscosity and the highest change in viscosity as temperature changes.

Viscosity versus Temperature

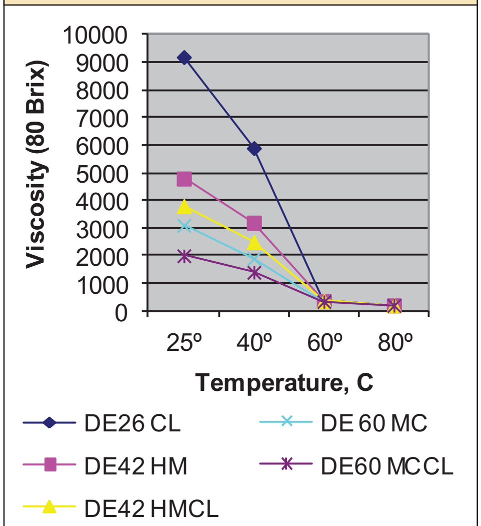

Figure 3

The syrups that have more of the micronutrients have higher viscosities than the syrups that are more filtered (not totally filtered but more filtered). You can see this because the syrup labeled DE42 HMCL (more filtered as identified by the "CL," which means this syrup went through a higher filtration clarifying process) has a lower viscosity than the syrup labeled DE42 HM, which does not have the letters CL and did not have the finer filtration. The DE42 syrup does have more of these micronutrients in them and hence does have a higher viscosity.

This high response to viscosity is something I encounter many times every winter. I will get a call saying, "Your syrup is made wrong and won't work, I can't even pump it, and it worked so well last summer!"

It has always turned out to be that the syrup is too cold because the plant is so much colder than in the summer, and the physics of the system then means it will have a higher viscosity. Buying the syrup in totes with heaters or prewarming the syrups in a warm (not hot) room is the answer here. It is not the syrup's fault that the plant is so cold.

Viscosity versus Brix

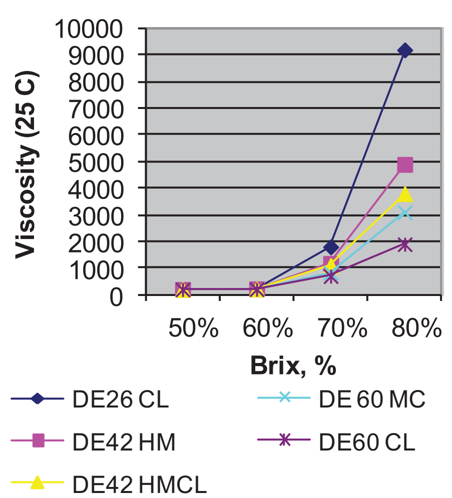

Figure 4

PRODUCT LINE SIMPLIFICATION

Figure 5 shows a simple set of syrups to consider when looking at glucose syrups (non-fructose-containing glucose syrups —yes, high-fructose corn syrup is a glucose syrup). Do not try this at home. Call an expert to help you choose. Some general points follow:

The DE26 will give the fewest sugars and so is of interest to marketing, which always wants to minimize the sugar line on the Nutrition Facts panel, but this is sometimes tricky and for some applications just can't be done.

The DE42 syrup is great in nut clusters and granolas, and for balancing formulas when you have a lot of fructose that needs balancing, for example, when a product has a lot of fruit juice or honey in it.

Blending DE26 and DE60 might very well be an answer for a particular application. But it does not substitute for DE43. It does not average out this way, not least of all since the DE26 will have way more really large molecules and the DE60 almost none, so the balance of large molecules will not be the same in the mixture as it will be in the DE43. This mixture may be exactly what works in your application, but it does not work as a substitute for not having any DE43 on hand.

TEMPERATURE AND WATER

Especially in candy technology, we have a tendency to think that temperature equals Brix, when in fact the truth is that temperature is only approximately equal to Brix.

Simple Glucose Syrups

	Low Conversion	High Maltose	Medium Conversion	
DE	26	42	43	60
Glucose	5	4	19	29
Maltose	11	34	13	25
Sugars	16	38	32	54

Figure 5

The DE42 syrup is great in nut clusters and granolas, and for balancing formulas when you have a lot of fructose that needs balancing, for example, when a product has a lot of fruit juice or honey in it.

Dextrose equivalence is absolutely not a sufficient determinant of the syrup. Glucose and maltose numbers are probably more important than the reported DE.

And this relationship is not exactly the same as you go from one type of glucose syrup to another—the physics of each syrup is different because the makeup of the different syrups is different.

Another important point is that you might be able to cook a carbohydrate-only corn syrup for a long time, but when you have a syrup that has ingredients other than carbohydrates you will not be able to hold it at a high temperature for as long a time because it will burn much faster. There most likely also will be different heating parameters. That is a nice way of saying you might have to heat it up more slowly than you might heat up a corn syrup.

It can be helpful to think about the way different carbohydrates in your application interact with water (whether from the glucose syrups or other ingredients). One tool is to look at the ingredients' solubility in water. Figure 6 shows relative solubilities of different carbohydrates.

Relative Solubility of Some Carbohydrates

Fiber insoluble	0
Fiber soluble	?
Gum	?
Starch	?
Lactose	18
Maltose	78
Glucose	100
Sucrose	204
Fructose	375

Grams dissolved per 100 grams of water

Figure 6

Some ways to think about this follow:

- Less soluble on the top of the chart, more soluble as you go to the bottom.
- Drier food on the top, gooier food on the bottom. This is a great example of how no "rule" is perfect; we know there are some anomalies in the ways that maltose works so differently than glucose.
- More likely for the food to get harder with time during shelf life on the top of the chart.
- More likely to get gooier on the bottom of the chart, hence risking microbiological growth with time while on the shelf.

BRIEF SUMMARY

Dextrose equivalence is absolutely not a sufficient determinant of the syrup. Glucose and maltose numbers are probably more important than the reported DE.

The viscosity of the syrup might give you some information in addition to the above but can be very tricky. It may tell you something of the distribution of the larger, less-measurable carbohydrates in glucose syrups.

Heating parameters can be very different with a glucose syrup not made from corn than they would be for a similar corn syrup.

When selecting among brands of glucose syrups, you simply have to try them, and not rely on specifications.

SOME HELPFUL RULES

Now let's close with these inviolate rules:

JKA Rule #1 **The marketing goal never equals the optimal formula**

Corollary: increasing/decreasing an ingredient for a marketing claim always takes you farther from the desirable consumer taste/mouthfeel, shelf life.

JKA Rule #2 **The product with more sugars will win in a consumer taste test**

Corollary: targeting a lower sugar number on the Nutrition Facts panel means reducing consumer acceptability in some way.

Contrapositive corollary: winning the consumer taste test does not necessarily mean the consumers will like the product.

JKA Rule #3 **A simpler, cleaner label never equals the optimal formula**

Corollary: it is no wonder that the ingredients declaration on *Wonder Bread* is huge. □

Questions and Answers

Q: Why is calculated DE less than measured/theoretical? Why does maltose set to a hard coating?

A: There are many, many different ways that DE can be calculated and the different formulas lead to different numerical results. As far as why maltose sets to a hard coating, you are asking a theological question. This is just the physical chemistry of the molecule. Not even marketing can change this!

Q: Is ion exchange limited to corn syrup or is it done to other glucose syrups?

A: One can do this with any syrup. In general, ion exchange is not compatible with organic and is often not looked upon warmly in the "natural" category.

Q: How long can tapioca syrups be held in a heated tank?

A: 130° to 140°F—42/43 medium maltose.

Q: What is the effect on degradation? What is the effect on moisture loss?

A: The syrup breaks down into smaller carbohydrates; you get oxidations and Maillard reactions and an increase in Brix. One has to establish for their own operation how much of this can be tolerated.

Q: What is the difference between α and β linkage?

A: Like a right hand and left hand, the linkage between the glucose molecules has a different shape. Google alpha and beta linkages in carbohydrates and you can see as much detail as you wish.

Q: Would the addition of an emulsifier aid in the prevention of fructose "pockets" or inverted sucrose in an aged sample of taffy? How do we prevent this?

A: Really this is a mixing issue.

Q: In your demo it appears that the yield is different, but how different is the viscosity?

A: I don't understand the yield question, but the presentation showed how drastically different the viscosities can be depending on the DE.

Q: What is the difference between tapioca dextrin, tapioca starch and tapioca syrup?

A: **Tapioca dextrin:** when you start breaking down the big starch molecules (mostly amylose and amylopectin) the slightly broken down carbohydrates are called dextrins. The size ranges from pretty big (many, many dextroses covalently bonded together) to pretty small. Technically, three dextroses could be thought of as a dextrin.

Tapioca starch: These are the large molecules that are in the seed before they break down into any smaller molecules.

Tapioca syrup: a syrup will have virtually zero of the starch molecules because they will all be broken down a bit into dextrins and smaller, and may be a mix of dextrins and sugars, but doesn't have to have any dextrins in it. For example, HFCS has zero dextrins in it, only gluscose and maltose.

Q: How does agave juice fit in this picture?

A: Agave is a lot of fructose, even more so than HFCS, honey and fruit juice. So it will really function similar to if you were using straight fructose. You have to balance the use with other carbohydrates to get the final consistency you want.

Q: How does high maltose CS balance carbohydrates where fruit juice concentrate is used. Why?

A: Most fruit juices are very close to HFCS and sucrose and honey in their concentrations of fructose and glucose (roughly 50%/50%). This means when using fruit juices the effects are similar to how HFCS will act in the application—with a tendency to make the product gooey. Maltose sets more firmly (think nut clusters that you can't really make with only fructose but can make with maltose). So if marketing wants fruit juices used for the juice claim, then you may have to balance it by adding some high-maltose syrup to get the right consistency.

Q: Why are glucose and maltose concentrations crucial?

A: Glucose tends to make products gooey (fructose even more so); maltose tends to make products more firm. ***Could you use a practical example in confection making to explain it?*** This is such a massive question I would suggest reading the article just published in the May 2016 issue of *Manufacturing Confectioner*.

Q: How do calorific values vary with carbohydrate content for various syrups?

A: Four calories per gram for all standard carbohydrates in the syrups. However, some of the nonstandard syrups will have different calorie counts where they include some of the lower-calorie carbohydrates—allulose, for example. Go to vendors of various syrups to get calorie counts for their products.

Q: What is the scope of problems with brown rice syrup and heavy metals?

Rice syrups received some negative press a few years ago. What was the issue and was it a valid issue, or something overstated or taken out of context?

A: Google "rice fda arsenic" and you can immediately come up with the FDA's page Arsenic in Rice and Rice Products. You can learn as much as you want (maybe 500 pages or so just at this site) and you can also see the result of the FDA's 6-year study of this issue where they did issue a guidance for infant rice cereals but found the risk so negligible for adults that they set no guidance for adults other than their standard of eat a balanced diet.

Q: Could a manufacturer label corn syrup, glucose syrup; or high fructose corn syrup, high fructose glucose syrup? Would this meet FDA's definition?

A: Ask your lawyer. But you would also have to ask your marketer because if you did label it this way, the set of consumers that is specifically trying to avoid corn syrup might think you were trying to deceive them when they found out it was corn syrup and they might be mad, even if your lawyer does say you can legally call it that.