Preparing Your Own Sports Drink

The hydration and energy needs of a sports drink are determined by the intensity and duration of the exercise session, in combination with the expected environmental and weather conditions. Unlike the messages we are given by the commercial sports drink media, there is no such thing as one ideal sports drink, and there is nothing "special" or "complicated" about the ingredients to a sports drink!!! Due to this, making your own drink is a logical option, and can also save you plenty of money!

What Should Be In A Sports Drink?

A sports drink is basically a mixture of simple carbohydrate – usually a fructose-glucose mix; flavoring; and some electrolytes – mostly sodium and a trace of potassium. As discussed in class, the carbohydrate needs of a drink increase with the duration of the exercise session, as do the electrolyte requirements. Conversely, the fluid replenishment functions of the drink need to be of priority when the weather conditions and exercise intensity combine to make dehydration a realistic occurrence.

Below are Tables 17.4 and 17.5 from my graduate level text. Basically, these tables provide you with all the information you need to tailor a sports drink recipe to suit your specific needs.

Carbohydrate and electrolyte contents of selected liquid carbohydrate beverages and solid foods that contain high amounts of carbohydrate

	CARBOHYDRATE		FAT	PROTEIN	ELECTROLYTE CONTENT (mEq/L)			OSMOLALITY*
	g/L	(MAIN SOURCE)	(g)	(g)	NA+	K+	OTHER	(mOsm/L)
BEVERAGE								
Gatorade	6	Sucrose, glucose powder	—	—	110	25	Cl, P	280-360
Exceed	7.2	Glucose polymers, fructose	—	—	50	45	Cl, Ca, Mg, P	250
10K	6.3	Sucrose, fructose, glucose	—	—	52	26	Vitamin C; Cl, P	350
Coca-Cola	10.7-111.3	High-fructose corn syrup	—	—	9.2	Trace	P	600-715
Sprite	10.2	High-fructose corn syrup, sucrose	—	—	28	Trace		695
Cranberry juice	15	High-fructose corn syrup, sucrose	—	—	10	61	Vitamin C	890
Orange juice	11.8	Fructose, sucrose, glucose	—	—	2.7	510	P, Ca; vitamins C, A, niacin, riboflavin, thiamine; Fe	690
Water	—	—			Low†	Low†	Low†	10-20
SOLID CARBOHYDRATE‡								
Power Bar (65 g)	42	High-fructose corn syrup, oat bran, maltodextrin	10	2	60	120	Niacin; Ca, P, Mg, Zn, Fe, Cu, Cr; vitamins D, E, B_6, B_{12}	—
Banana (medium)	26.7	Starch	0.6	1.2	1	11.5	Ca, Fe; vitamins B_1, B_2, B_6, A, C, Zn	—
Orange (medium)	17.4	Fructose	0.3	1.1	1	254	Ca, Fe; vitamins B_1, B_2, B_6, A, C, Zn	—

Volume of drink at given carbohydrate concentrations that must be ingested every 20 minutes to provide certain amounts of carbohydrate per hour

DRINK CARBOHYDRATE CONCENTRATION (g/L)	DRINK VOLUME (ml) HOURLY AMOUNT OF CARBOHYDRATE INGESTION (g)						
	30	35	40	45	50	55	60
20	500	583	667	750	833	917	1000
30	333	389	444	500	555	611	667
40	250	291	333	375	416	458	500
50	200	233	267	300	333	367	400
60	167	194	222	250	278	306	333
70	142	167	190	214	238	262	286
80	125	145	166	187	208	227	250
90	111	130	148	167	185	204	222
100	100	116	133	150	166	183	200
110	91	106	121	135	151	167	182
120	83	97	111	125	139	153	166
150	67	78	89	100	111	122	133
200	50	65	74	75	83	91	100

Given the above facts, a sports drink should contain little carbohydrate if the exercise session is less than 60 min, or if hydration is more important than carbohydrate provision. Conversely, for prolonged exercise in a cool environment, carbohydrate provision is of increased importance. Nevertheless, due to the risks and significant exercise performance implications of dehydration, adequate fluid intake is always a concern when exercising greater than 30 min. Finally, as the rate of fluid emptying from the stomach (gastric emptying) is decreased with increasing carbohydrate content, fluid delivery to the body increases as the carbohydrate content of the drink decreases. Gatorade, at 6 g CHO/100 mL (6% CHO = 60 g CHO/L), is a good compromise for providing carbohydrate at a relatively low concentration so that fluid delivery to the body is not overly impeded. The important fact to remember here is that research shows that at least 40 g CHO/hr need to be ingested to provide an ergogenic effect. Thus, the volume of a sports drink ingested should provide greater than 45 g CHO/hr – but only for exercise durations that warrant carbohydrate ingestion. When fluid intake is a priority, and thus larger volumes are needed to be ingested, you do not need as concentrated carbohydrate sports drink. The opposite is also true. Finally, remember that the stomach can only empty approximately 1.2 L/hr, and therefore this represents the maximal volume of fluid to be ingested each hr. Sucrose (table sugar) is a highly recommended form of CHO for sports drinks and actually provides more glucose than the corn syrup in commercially made drinks.

Based on these facts and explanations, you should be able to devise appropriate amounts of carbohydrate in a sports drink to suit specific exercise and weather conditions.

What About the Electrolyte Content of A Drink?

Research indicates that there is really no need for electrolytes in a sports drink unless you exercise for extended periods of time (> 3 hrs), and/or are exposed to hot and humid conditions for extended periods of time (days). Nevertheless, to be safe and improve palatability, about 20-25 mEq/L of Na^+ is required, with 2-5 mEq/L of K^+.

As the easiest source of Na^+ is table salt (NaCl), and the best source of K^+ is potassium chloride (KCl – a salt substitute available from any grocery store). The necessary amounts of each source would be as follows;

NaCl = 58.4424 g/M	KCl = 74.551 g/M
25 mEq/L = 0.025 M/L	5 mEq/L = 0.005 M/L
0.025 x 58.4424 = 1.461 g	0.005 x 74.551 = 0.3727 g

Note: 1 g = 0.04 oz

Thus, you need to add 1.461 g of table salt and 0.3727 g of salt substitute to 1 L of your drink to provide a suitable amount of electrolytes.

What About Glycerol?

Addition of glycerol to a sports drink will further improve the ability of the drink to hydrate the body. I recommend that you prepare a drink with 5g glycerol every 100 mL (5% glycerol), which equates to 50g/L. As glycerol is sweet to taste, you need to lower the carbohydrate content of your drink. Thus, a good compromise is to dilute Gatorade (or your customized version!) by half, and then add the glycerol.

Practice Formulating A Drink?

Make the following sports drinks and propose the volume needed to be ingested/hr:

1) A drink that is biased to provide mostly fluid, yet still provides at least 40 g CHO/hr.

2) A drink that is biased to providing CHO at 65 g/hr, yet still can provide 750 mL/hr of fluid.

3) How wold you make a half-diluted Gatorade solution that contains 5% glycerol?

4) How would you make a sweetened, but non-carbohydrate, glycerol and electrolyte drink of 5% glycerol, 20 mEq/L sodium, and 5 mEq/L potassium?