

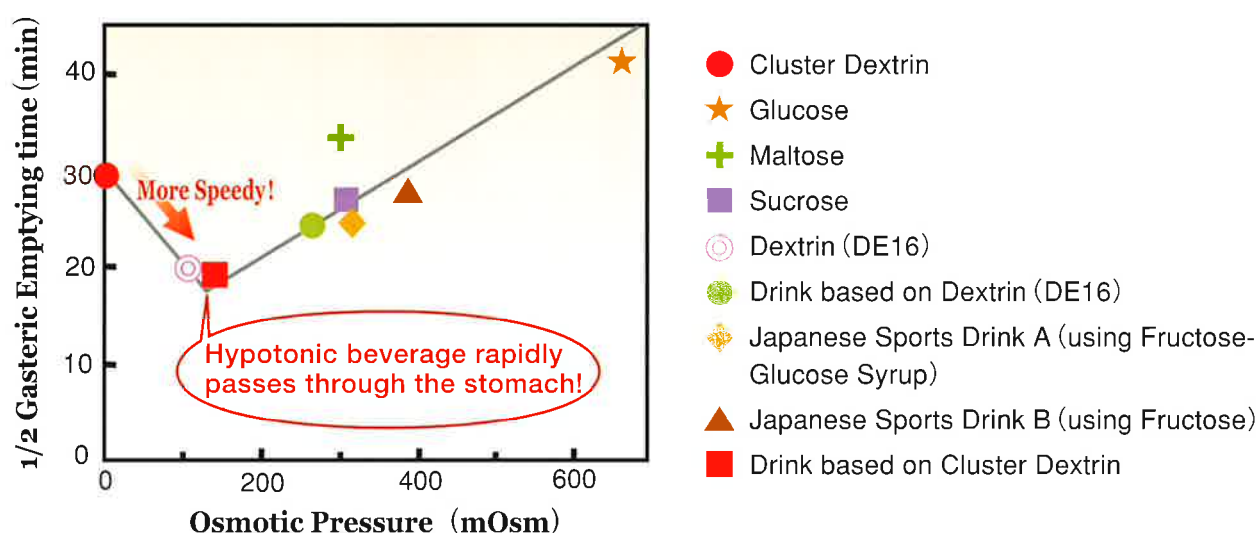
An excellent energy material

# Cluster Dextrin<sup>®</sup> (CCD<sup>®</sup>)

## Highly Branched Cyclic Dextrin

Shorter residence time in the stomach allows design of a sports drink that is quickly absorbed in the body.

### -GET (Gastric Emptying Time) of Various Carbohydrates- (Intake 300mL 10% carbohydrate solution)



Usually, in the case of beverages with electrolytes only, 280 mOsm (same osmotic pressure as bodily fluid) is absorbed quickest. However, our research revealed that gastric emptying when the beverages contain carbohydrates, with a low osmotic pressure beverage of approximately 150 mOsm, is the shortest in proportion to the osmotic pressure of the beverage and gastric emptying (transfer time from stomach to intestine) \*1).

That is, if low molecular weight carbohydrates such as glucose are used, osmotic pressure becomes higher even if the concentration is the same (620 mOsm in 10% solution), and only leads to preparation of slow gastric emptying beverages.

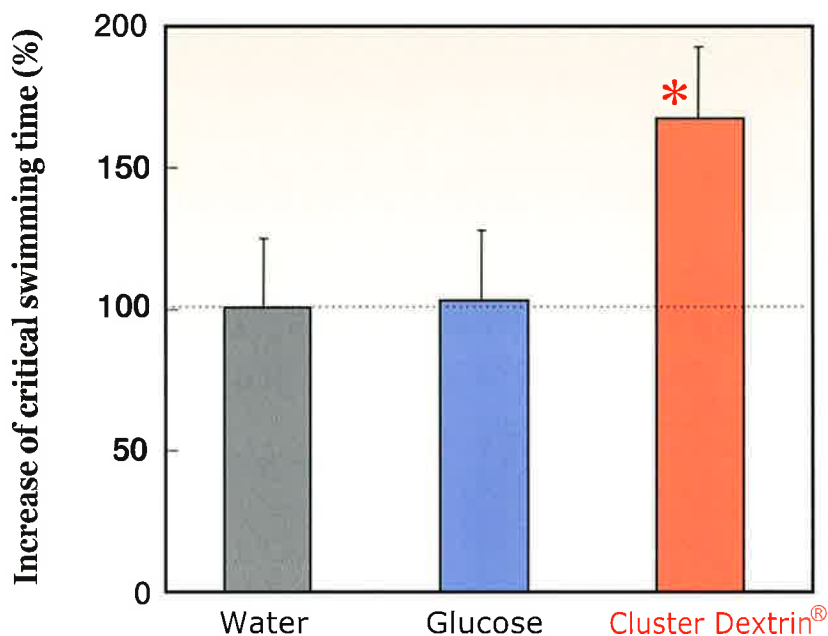
On the other hand, if approximately 2500-fold higher average molecular weight Cluster Dextrin<sup>®</sup> compared to glucose is used, osmotic pressure is hardly affected and hypotonic sports drinks can be readily designed, even though electrolytes, vitamins, and amino acids, which are essential for sports drinks, are combined (■ in the Figure).



\*1) *Int J Sports Med*, 26: 314-319, 2005

We confirmed that the endurance increasing effect can be obtained by consuming a beverage containing Cluster Dextrin® !

### -Effect on Swimming Endurance in Human-



This figure shows the results for seven top swimmers.

\* ; Significantly different ( $p < 0.05$ )



Beverages combining Cluster Dextrin® are characterized to contain highly concentrated carbohydrate and fast gastric emptying. Therefore, the carbohydrate energy, moisture, and electrolytes consumed during exercise can be re-supplied promptly. We confirmed that administration of Cluster Dextrin® to mice significantly increased the swimming time (=endurance) in endurance swimming compared to administration of water and glucose solution\*<sup>2</sup>).

Moreover, we investigated the critical swimming time of top swimmers swimming in a flowing water pool after taking each beverage shown in Figure. As a result, it was revealed that swimming time is significantly extended when Cluster Dextrin® containing beverage is consumed compared to the cases with other beverages.

\*<sup>2</sup>) Biosci Biotechnol Biochem, 63: 2045-2052, 1999



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