Juice Consumption:
Potential Impact on Bodyweight?

The research highlights below are excerpted from current scientific studies that examined possible connections between consumption of 100 percent juices and bodyweight in children.

The preponderance of this research demonstrates that there is no connection between consumption of 100 percent fruit juices and overweight status in children.

Alexy U, Sichert-Hellert W, Kersting M, Manz F, Schoch G. Fruit juice consumption and the prevalence of obesity and short stature in German preschool children: results of the DONALD Study. Dortmund Nutritional and Anthropometrical Longitudinally Designed. *J Pediatr Gastroenterol. Nutr.* 1999:29:343–349.

This is a longitudinal study designed to look at a possible association between excessive consumption of 100 percent fruit juice (more than 12 ounces per day) and short stature and obesity. Data were collected and evaluated on 205 German children examined at each of 3, 4 and 5 years of age from the DONALD study. Dietary intake data were collected between 1990 – 1997 from 3-day weighted diet records. Neither BMI, Height Standard Deviation Score [HSDS = deviation of a child's body height from the median of the reference as a multiple of the standard deviation] nor growth velocity correlated positively with the consumption of fruit juice. In all age groups, consumption of 100 percent fruit juice was inversely correlated with the consumption of all other beverages and the total consumption of all other food. The researchers stated, **"In the study sample, even repeatedly excessive fruit juice consumption had no influence on anthropometric indices."** They added that **"intake of protein, fat and carbohydrates of children consuming excessive fruit juice was closer to the international dietary preventive guidelines than the intake of children consuming low amounts of juice."**

Dennison BA, Rockwell H, Baker S. Excess Fruit Juice Consumption by Pre-school-aged Children is Associated with Short Stature and Obesity. *Pediatrics.* January 1997. 99:15-22.

In this cross-sectional study of 168 children, 100 percent fruit juice consumption among children (two year to five year olds) was evaluated over seven days with mean consumption being 5.9 ounces (2 year olds) and 5.0 ounces (5 year olds). Intake data reflect the years 1992 to 1993. The researchers stated that 10 of the 19 children who drank 12 ounces or more daily had BMIs greater than the 75th percentile [considered obese at the time this study was conducted]. They similarly found that 47 out of 149 children who drank less than 12 ounces per day had similarly high BMIs. The researchers concluded "consumption of 12 ounces or more per day of fruit juice by young children was associated with short stature and obesity." **The researchers state that until more definitive research is done, it seems prudent for parents and caregivers to limit fruit juice consumption to less than 12 ounces daily. [Note: BMI > 75th percentile is no longer used as an index for obesity; newer CDC guidelines define overweight as BMI 95th percentile or greater and at risk of overweight BMI 85th to < 95th percentile.]**

Faith M, Dennison BA, Edmunds L, Stratton H. Fruit Juice Intake Predicts Adiposity Gain In Children From Low-Income Families: Weight Status-by-Environment Interaction. *Pediatrics*. November 2006. 118:5:2066-2075.

The researchers evaluated dietary intake of 2,081 preschool children who were participants in New York's Special Supplemental Nutrition Program for Women, Infants and Children (WIC). **The researchers found that fruit juice intake was not associated with increased adiposity among normal weight children. Also, the researchers did not find increased adiposity among overweight children who were consuming juice in amounts recommended by the American Academy of Pediatrics (AAP).** Only excessive consumption of fruit juice (24-30 ounces per day) was found to promote increased adiposity and was seen exclusively in children who were already overweight or at risk of overweight (whose BMI's were high, in the 85th percentile or greater as defined by the Centers for Disease Control and Prevention). The researchers state they did not account for total calorie intake and physical activity, but they have suggested that when excess juice consumption was seen, it may be an indicator of passive over-consumption of all caloric sources. The research paper also did not clarify that only 100 percent fruit juices (which are not sugar-sweetened) were included in the juice category. The researchers noted, "These findings are suggestive of a gene-by-environment interaction for excess weight gain, as the effects of juice intake on adiposity gain are strongest among children who were already the heaviest and most vulnerable to weight gain."

Field A, Gillman MW, Rosner B, Rockett HR, Colditz GA. Association between fruit and vegetable intake and change in body mass index among a large sample of children and adolescents in the US. *International Journal of Obesity.* 2003;27:821-826.

The purpose of this study was to determine if intake of fruits, juices and vegetables is associated with change in body mass index (BMI) among children. The subjects were 8203 girls and 6715 boys, between the ages of 9-14 years when the study began in 1996. All were participants in the Growing Up Today Study (GUTS). Intake of fruits, 100 percent juices and vegetables was measured using a validated food frequency questionnaire designed specifically for children and adolescents. The outcome measure were changes in BMI and BMI z-scores (scores that are used to gauge growth parameters in children). Growth and weight data were collected over a three-year follow-up period along with evaluation of the food questionnaires. **For both the boys and girls, the researchers concluded that there was no association between intake of 100 percent juices, fruits or vegetables (alone or combined) and changes in BMI. The researchers suggest that recommendations for fruit and vegetable consumption are well founded but "should not be based on a beneficial effect on weight regulation."**

Kloeben-Tarver AS. Fruit juice consumption not related to growth among preschool-aged children enrolled in the WIC program. *J Am Diet Assoc.* September 2001. 101:9:996.

This letter-to-the-editor provides details of a study that evaluated 100 percent fruit juice consumption and growth indicators using 77 subjects in an Atlanta (GA) Women, Infants and Children's (WIC) program. All of the study participants were low-income and predominantly minority children ages 1 to 5 years. Method of dietary intake collection was not specified for the years represented by the study. Obesity was defined as BMI > 75th percentile. Mean juice intake was 24 ounces per day; 30 percent (23/77) were of short stature and 34 percent (26/77) were obese; 79 percent (61/77) reportedly consumed > 12 ounces fruit juice per day. **No statistically significant relationships were found between excessive fruit juice intake and obesity or short stature.**

Newby PK, Peterson KE, Berkey CS, Leppert J, Willett WC, Colditz GA. Beverage consumption is not associated with changes in weight and body mass index among low-income preschool children in North Dakota. *J Am Diet Assoc.* July 2004. 104:7:1086-1094.

This study analyzed beverage consumption and obesity parameters among children from 1995 to 1998. Data on dietary and growth parameters for 1,345 children ages 2-5 years old were provided by the North Dakota Women, Infants and Children's (WIC) Program. The key outcome variables were changes in weight and height between visits no more than 6 to 12 months apart. A Food Frequency Questionnaire was used to assess intake. Overweight was defined as BMI > 95th percentile and risk of overweight BMI 85th to 95th percentile. In this population, mean consumption of 100 percent fruit juice (10.8 ounces per day for girls and 10.6 ounces per day for boys) was more than double that reported for children age 2 to 18 years from the 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals [4.6 oz/day]. In this WIC population, about 50 percent of the children consumed 12 ounces or more fruit juice per day. Results of the regression analysis found no association between 100 percent fruit juice intake and weight changes. The researchers were not able to control for other major risk factors for obesity, such as parental BMI, physical activity, and television viewing. Researchers concluded, **"Our results are consistent with other prospective studies that have found that fruit juice is not related to childhood obesity but are inconsistent with some reports that have found that sweetened beverages such as soda and fruit drinks are related to obesity among older children."**

Rampersaud GC, Bailey LB, Kauwell GP. National survey beverage consumption data for children and adolescents indicate the need to encourage a shift toward more nutritive beverages. *J Am Diet Assoc.* January 2003. 103:97-100.

The researchers used national survey data (1994-96, 1998 Continuing Survey of Food Intakes by Individuals) in this cross-sectional survey to evaluate 100 percent fruit juice intakes to compare with the American Academy of Pediatrics' (AAP) recommendations on fruit juice consumption. Children were < 6 months, 6 months to 6 years and 7 to 18 years of age. A 24-hour dietary recall was used for 1 or 2 non-consecutive days. A total of 5,559 children were included in the analysis. The researchers reported the majority of children fell within the AAP guidelines: < 6 months 78%; 6 months to 6 years 73%; and 7 to 18 years 94% were compliant with guidelines. The researchers stated, **"There is no conclusive evidence to suggest that in most cases, intake of 100% fruit juice should be restricted in children and adolescents; however, practitioners should discourage consumption of beverages other than breast milk, infant formula and water in children less than 6 months old."**

O'Connor M, Yang S, and Nicklas T. Beverage Intake Among Preschool Children and Its Effect on Weight Status. *Pediatrics.* October 2006. 11:4:1010-1018.

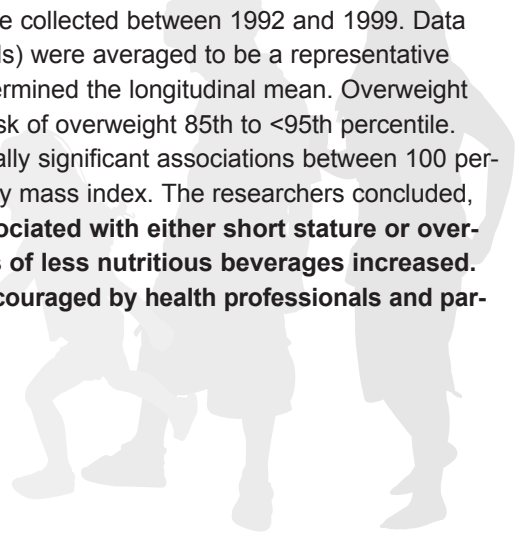
Baylor College of Medicine researchers evaluated dietary patterns of all beverage intakes by children aged 2-5 from the NHANES 1999-2002 database. Data for this analysis included consumption of total calories and 100 percent juices using 24-hour recall obtained by trained interviewers; other data were collected, including results from a physical examination. Statistical relationships between total calories consumed, amounts of juice consumed and body mass index were then analyzed. Of the 1160 children who had complete data appropriate for the analysis, the researchers determined that only 48 percent of the children were even consuming 100 percent juice. Mean consumption of 100 percent juice was 4.7 ounces daily which the authors state is in keeping with recommended juice intake from the American Academy of Pediatrics. (95th percentile confidence interval: 4.04-5.36 ounces). **The researchers then determined there was no relationship between increased total calorie intake, increased juice consumption and body mass index among those who consumed 100 percent juice. The researchers stated that although more prospective research is needed to evaluate all beverage consumption as children age, "the findings of this research support previous studies by Skinner et al and Newby et al that 100 percent fruit juice consumption is not associated with overweight status in preschool-aged children."**

O'Neil C, Nicklas T, Kleinman R. The Relationship Among 100% Juice Consumption, Nutrient Intake and Weight of Children 2-11 Years. Pediatric Academic Societies Meeting. May 8, 2007. Poster Presentation (unpublished research).

Data on food and beverage intake of 3,618 children ages 2 to 11 years were identified by a secondary analysis of the National Health and Nutrition Examination Survey (NHANES) 1999-2002 database. The mean daily consumption of 100 percent juice among juice consumers was 4.1 ounces. Fifty-seven percent of the entire population studies did not consume any juice. The data showed that the few children (13 percent) who consumed larger amounts of juice (12 ounces or more) did not have an association with overweight or at risk for being overweight. Compared to non-juice consumers, intakes of energy, carbohydrate, fiber, vitamins C and B6, potassium, riboflavin, magnesium, iron and folate by juice consumers were significantly higher, whereas intakes of sodium, fat, saturated fat, added fat and added sugar were lower. For all of the physiologic weight measures studied, no significant differences were found in the mean levels and the amounts of 100 percent juice. Overall, there was no difference in the likelihood of being overweight among the group that consumed 100 percent juice compared to non-juice consumers. On average, children drank less than 6 ounces of juice daily. 100 percent juice consumption was associated with higher intakes of several vitamins and minerals and lower intakes of less desirable nutrients by consumers than by children who did not consume 100 percent juice. Juice consumers also were found to eat more total fruit (including whole fruit) servings than non-juice consumers, and there was no negative effect on milk consumption. **These data show that 100 percent juice intake is not associated with overweight in children 2-11 years of age, confirming that intake of 100 percent juice is not excessive; is a valuable contributor of nutrients children's diets; and does not have an adverse effect on weight.**

Skinner JD, Carruth BR. A longitudinal study of children's juice intake and growth: the juice controversy revisited. *J Am Diet Assoc.* April 2001. 101:432–437.

This longitudinal study of 72 children evaluated beverage intake (including 100 percent juice) and growth parameters from ages 2 to 6 years. Data were collected between 1992 and 1999. Data from 3–day intakes (24-hour recall and 2 food records) were averaged to be a representative day and the mean of seven representative days determined the longitudinal mean. Overweight was defined as BMI 95th percentile or greater and risk of overweight 85th to <95th percentile. Analysis of the data consistently showed no statistically significant associations between 100 percent juice intake and children's height, weight or body mass index. The researchers concluded, **"Children's longitudinal juice intake was not associated with either short stature or overweight. As juice consumption decreased, intakes of less nutritious beverages increased. Consumption of 100 percent juices should be encouraged by health professionals and parents/caregivers."**



Skinner JD, Carruth BR, Moran J, Houck K, and Coletta F. Fruit Juice Intake Is Not Related to Children's Growth. *Pediatrics.* January 1999. 103:1:58-64.

Data for this research was derived in part from an ongoing longitudinal study of 62 children and an additional 43 that were added in year 3 [total of 105 children ages 2 to 6 years]. Intake data reflected consumption between 1994 and 1995 and were derived from three days of intake data (one 24 hour recall and a two day food record). The purpose of the data analysis was to evaluate if excess 100 percent fruit juice intake (12 ounces or greater) was associated with short stature and obesity in preschool children. The researchers assessed growth parameters and 100 percent fruit juice intake in children between 24 to 36 months. A comparison was made between children consuming >12 ounces or more per day of fruit juice and those consuming < 12 ounces per day. At that time, obesity was defined as being > 75th percentile. **The researchers found, "Results consistently indicated no statistically significant differences in children's height, body mass index or ponderal index related to fruit juice intake."** They added, "The consistent lack of relationship between children's fruit juice intake and growth parameters in our study does not support previous recommendations to limit the intake of 100% fruit juice to less than 12 ounces/day."

USDA. Is Fruit Juice Dangerous for Children? *Nutrition Insights*. USDA Center for Nutrition Policy and Promotion. March 1997.

Using statistics from the 1994-96, 1998 Continuing Survey of Food Intakes by Individuals, USDA staff evaluated the appropriate data sets and found that there was no relationship between 100 percent fruit juice consumption and body mass index (BMI). This analysis of the diets of 830 children (2-5 years) was done in response to a study by Dennison et al that suggested excessive juice consumption was linked with obesity and short stature. **This USDA analysis found that children who drank the most 100 percent juice (12 ounces or more) were actually taller, with lower BMIs than those who drank less juice.** This USDA document concluded, "Fruit juice consumption in quantities recommended in the *Dietary Guidelines for Americans* is advantageous for healthy children."

Welsh JA, Cogswell ME, Rogers S, Rockett H, Mei Z, Grummer-Strawn LM. Overweight among low-income preschool children associated with the consumption of sweet drinks: Missouri, 1999-2002. *Pediatrics.* 2005:115(2):e223-9.

This retrospective study was designed to examine the association between sweet drink consumption and overweight among preschool children using dietary records from 10,904 children who were 2-3 years of age, reflecting intakes between 1999 and 2001. The source of the data was the Missouri Pediatric Nutrition Surveillance System and Missouri Demonstration Project. Dietary intake data were collected by Food Frequency Questionnaires. Researchers recorded only the number of occasions the children consumed sweet beverages [including 100 percent juice, juice drinks, lemonade and soda]. Amounts consumed were not detailed in this study. Overweight was defined as BMI 95th percentile or greater and at risk of overweight as BMI 85th to < 95th percentile. When the entire population's consumption of all sweet beverages was evaluated collectively, increased consumption of sweet beverages was associated with varying degrees of becoming or remaining overweight. **However, when data was analyzed for 100 percent juice consumers only, there were no significant weight changes associated with juice consumption among children who were normal weight, underweight or at risk for overweight at the beginning of the study. For those children who were already overweight at baseline, there was a diminished association between juice intake with increased weight, but the researchers state that was of borderline significance.**

Information compiled by Juice Products Association September 2007 www.fruitjuicefacts.org

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