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Analysis of Beer

BY LESTER HANKIN

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Beer is a generic name for beverages made by fermentation of extracts of cereal grain, particularly barley, or other starchy material (1,8). Beer is a beverage known since antiquity and next to wine is probably the oldest of prepared food drinks. In modern times the countries of northern Europe set the style of beer as it appears today. In fact, the words "beer", "brewing", and "lager" are all of German origin (1,8).

Beer is defined in Connecticut Statutes (2) as any beverage obtained by the alcoholic fermentation of an infusion or decoction of barley, malt and hops in drinking water and containing more than one-half of one percent of absolute alcohol. Taxes on beer sold in Connecticut are collected by the Excise Tax Division of the Department of Revenue Services at the rate of \$3 per barrel (not less than 28 nor more than 31 gallons per barrel).

Consumption of beer in the United States is about 33 gallons per person per year based on persons over 18 years of age (6). In all, over six billion gallons of beer are produced each year in the United States (6,7).

Generally three types of beer are sold: regular, light, and non-alcoholic. The term light intends to signify a product with less alcohol and fewer calories than regular beer. About 23 percent of beer sales are now of the light type (4). Non-alcoholic beer usually claims less than a half percent of alcohol and is intended for people who desire a product with little or no alcohol.

In this Bulletin I report the alcohol and calorie content of domestic and foreign beer sold in Connecticut.

METHODS

Samples were collected at wholesale beer distributors in Connecticut by inspectors of the Excise Tax Division of the Department of Revenue Services during April and May, 1987. Analysis for alcohol content was by AOAC methods (5) using gas chromatography (3). Proteins, ash, and solids were analyzed by AOAC methods (5). Carbohydrate content was calculated as percent total solids - (% protein + % ash). Calories were calculated as (% alcohol X 6.93) + ((% carbohydrate + % protein) X 4) (3). Duplicate analyses for alcohol in the same container of beer showed an average deviation of 0.057 percent and duplicates for protein 0.05 percent.

RESULTS AND DISCUSSION

Of the 202 samples tested, 163 were regular beer (Table 1), 26 were light beer (Table 2), and 13 were non-alcoholic beer (Table 3). These represented 81, 19 and 9 different brands of regular, light, and non-alcoholic beer, respectively. Each Table lists the brand name of the beer, the name of the brewer, the country of origin, alcohol content, and the calories per 100 ml (milliliters) (3.5 ounces).

Alcohol in regular, light, and non-alcoholic beer averaged 5.0, 4.1, and 0.3 percent, respectively (Table 4). Calories in regular, light, and non-alcoholic beer averaged 43, 32, and 17 per 100 ml, respectively. The range in values for alcohol and calories was wide. Alcohol in regular beer ranged from 2.0 to 9.5

percent, while light beer ranged from 2.4 to 5.4 percent and non-alcoholic beer from 0.1 to 0.7 percent. Similarly, calories varied among all types of beer. Some variation was noted in alcohol content among different containers of the same type of beer. A difference of 1.5 percent was found in one type of regular beer and 1.6 percent in another. Although the labels showed no code numbers, each container of beer is likely from a different manufacturing batch.

A comparison of alcohol and calorie content between regular and light beer from the same manufacturer can be made by examining Tables 1 and 2. For example, eight regular beers made by Anheuser Busch (does not include beer claiming half the amount of alcohol as regular beer) averaged 5.11 percent alcohol. Four light beers from the same manufacturer averaged 4.17 percent, 15 percent less than found in the regular beer. Calories in the same Anheuser Busch regular beer averaged 44 per 100 ml and 35 in light beer, or 20 percent fewer calories. Similar comparisons may be made for other manufacturers.

SUMMARY

In all, 202 samples of beer were tested. The alcohol and calorie content for each sample are reported. In comparison to regular beer which averaged 5 percent alcohol and 43 calories per 100 ml, light and non-alcoholic beer averaged 16 and 94 percent less alcohol and 27 and 60 percent fewer calories, respectively.

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REFERENCES

1. Encyclopaedia Britannica. Vol. I, 15th edition, 1974, Chicago, IL.
2. General Statutes of the State of Connecticut, revised to January 1, 1987, sections 12-433 and 435.
3. Hankin, L. 1986. Analysis of wine and beer coolers. Bulletin 840, CT Agricultural Experiment Station.
4. Messenger, B. 1988. Coors Target: Beer across America. Prepared Foods 157:58-61.
5. Official Methods of Analysis. 1984. 14th edition, S. Williams (ed.). Assoc. Official Analytical Chemists, Arlington, VA.
6. Statistical Abstracts of the United States. 1985. 105th edition, Washington, DC.
7. Statistical release Dept. of the Treasury, Bureau of Alcohol, Tobacco, and Firearms. ATF R A:I 5130-2.
8. The Chemistry and Technology of Food and Food Products. 2nd edition. M.B. Jacobs (ed.). 1951. Interscience Publishers, NY.

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Anchor Porter			
Anchor (USA)		5.66	59
Anchor Steam Beer			
Anchor (USA)		4.63	43
Asahi Draft Beer			
Asahi (Japan)		5.21	41
Ballantine Private Stock Malt Liquor			
Narragansett (USA)		6.01	47
Ballantine India Pale Ale			
Falstaff (USA)		6.17	53
		6.61	55
Ballantine Premium Lager Beer			
Falstaff (USA)		4.82	43
Ballantine XXX Ale			
Falstaff (USA)		5.68	49
		5.08	46
Bass & Co's Pale Ale			
Bass (England)		4.02	37
		5.51	45
		4.95	41
Beamish Irish Cream Stout			
Beamish & Crawford (Ireland)		3.73	37
Beck's Beer			
Brauerei Beck (Germany)		5.13	43
		5.13	42
Big Barrel Australian Lager			
Cooper & Sons (Australia)		3.98	31
		4.66	39
Black Horse Premium Draft Beer			
Black Horse (USA)		4.74	45
Blatz Beer			
G. Heileman (USA)		4.86	43
Blatz Milwaukee 1851 Beer			
Blatz (USA)		4.48	38
Boulder Porter			
Boulder (USA)		6.07	53
Budweiser King of Beers			
Anheuser Busch (USA)		4.82	40
		4.47	39
Busch Beer			
Anheuser Busch (USA)		4.98	42
		5.19	43
Carling Black Label Canadian Style Beer			
G. Heileman (USA)		4.71	45
		4.38	39

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER (CONTINUED)

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Cerveza Carta Blanca			
	Cerveceria Cauhtemoc (Mexico)	4.02	36
Cerveza Tecate Beer		4.10	37
	Cerveceria Cauhtemoc (Mexico)	4.49	41
Chester Golden Ale			
	Greenall Whitley (England)	5.43	44
Colt 45 Malt Liquor		5.53	45
	G. Heileman (USA)	6.11	49
Coors Banquet Beer		4.81	39
	Adolph Coors (USA)	5.03	41
Corona Extra Beer			
	Cereveria Modela SA (Mexico)	4.84	45
Dos Equis XX Imported Beer			
	Cauhtemoc (Mexico)	4.79	42
Dos Equis XX Special Lager			
	Cerveceria Moctezuma (Mexico)	4.96	44
Dragon Stout			
	Desnoes & Geddes (Jamaica)	6.79	62
Foster's Lager		5.25	42
	Carlton & United (Australia)	5.06	44
Furstenberg German Beer			
	Fustlich Ferstenbergische (Germany)	4.43	39
Genesee 12 Horse Ale		4.76	46
	Genesee (USA)	4.98	44
Genesee Beer			
	Genesee (USA)	5.03	43
Genesee Cream Ale		4.98	44
	Genesee (USA)	4.70	42
George Killian's Irish Red Ale			
	Adolph Coors (USA)	5.79	50
George Killian's Irish Red Brand Beer			
	Adolph Coors (USA)	5.54	49
Great Wall Imported Chinese Beer			
	Green Bamboo (China)	4.63	45
Greenall's Cheshire English Pub Beer			
	Greenall Whitley P.L.C. (England)	5.00	40
Grizzly Canadian Lager		5.48	43
	Hamilton (Canada)	4.45	36
Grolsch Lager Beer		5.12	44
	Grolsch Bierbrouwerij (Holland)	5.27	44
		5.16	43
		5.37	44

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER (CONTINUED)

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Guinness Extra Stout			
Guinness (Ireland)		4.27	43
Haffenreffer Private Stock Malt Liquor		6.37	50
Narragansett (USA)		6.87	50
Hamm's Beer			
Pabst (USA)		4.53	40
Harp Imported Lager Beer		4.55	40
Harp (Ireland)		4.71	42
		4.96	43
Heineken Lager Beer		5.41	47
Heineken (Holland)		5.41	45
Heineken Special Dark Beer			
Heineken (Holland)		5.17	48
Hofenperle Special Feldschlosschen Bier			
Feldschlosschen Rheinfelden (Switzerland)		5.28	45
Kaiserdorn Rauchbier-Smoked Bavarian Dark Beer			
Bamberg Worner OHG (Germany)		5.88	49
Kirin Beer		6.85	53
Kirin (Japan)		5.27	43
Knickerbocker Natural Beer			
Ruppert (USA)		4.16	38
Kronenbourg Beer		5.11	43
Kronenbourg (France)		4.83	42
Kronenbourg Imported Dark Beer			
Kronenbourg (France)		5.08	46
Kuppers Kolsch			
Kuppers (Germany)		5.38	45
LA Anheuser Busch Premium Pilsner Beer		2.29 ^a	26
Anheuser Busch (USA)		2.00 ^a	29
Labatt's 50 Canadian Ale			
Labatt (Canada)		5.34	43
Liberty Ale			
Anchor (USA)		6.12	53
Lord Chesterfield Ale		5.40	30
D.G. Yuengling & Son (USA)		5.57	44
Lowenbrau Dark Special Beer			
Miller (USA)		5.00	45
Lowenbrau Special Beer		5.12	45
Miller (USA)		5.03	44

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER (CONTINUED)

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
McEwans Scotch Ale			
	Scottish & Newcastle (Scotland)	9.50	83
Michelob Beer		4.90	44
	Anheuser Busch (USA)	4.99	45
Michelob Classic Dark Beer			
	Anheuser Busch (USA)	4.76	45
Michelob Classic Dark Beer			
	Anheuser Busch (USA)	4.93	45
Mickeys Fine Malt Liquor			
	G. Heileman (USA)	5.70	45
Miller High Life Beer		4.78	44
	Miller (USA)	4.80	43
Miller High Life Genuine Draft Beer		4.68	42
	Miller (USA)	5.02	43
Molson Canadian Beer			
	Molson (Canada)	5.19	43
Molson Golden Beer		6.04	48
	Molson (Canada)	5.22	43
Moosehead Canadian Lager Beer		5.08	43
	Moosehead (Canada)	4.84	40
		4.92	40
O'Keefe Canadian Beer		4.96	40
	O'Keefe (Canada)	5.03	41
Olde English Brand "800" Malt Liquor		6.13	48
	Pabst (USA)	5.78	45
Old Milwaukee Beer		4.95	44
	Stroh (USA)	4.51	41
Olympia Premium Lager Beer			
	Pabst (USA)	4.78	41
Pabst Blue Ribbon Beer		4.50	39
	Pabst (USA)	5.01	43
		5.00	43
Piels Premium Draft Style Beer		4.84	43
	Stroh (USA)	4.23	39
Pilsener Urquell Beer			
	Pilsener Urquell Pilzen (Czechoslovakia)	4.25	45
Red Stripe Lager Beer		5.04	43
	Desnoes & Geddes (Jamaica)	4.82	42
Red White & Blue Special Lager Beer		4.43	40
	G. Heileman (USA)	5.15	43
Rheingold Premium Beer			
	Rheingold (USA)	4.78	42

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER (CONTINUED)

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Rolling Rock Extra Pale Premium Beer			
Latrobe (USA)		4.64	40
Rolling Rock Premium Beer		4.51	34
Latrobe (USA)		4.27	38
Samuel Adams Boston Lager		4.67	50
Boston Beer (USA)		4.88	48
		4.74	44
Schaefer Beer		4.66	40
Stroh (USA)		4.60	40
		4.48	40
Schlitz Beer		4.70	41
Stroh (USA)		4.41	40
		4.60	42
Schlitz Malt Liquor			
Stroh (USA)		6.29	52
Sheaf Stout			
Carlton & United (Australia)		5.28	49
Sierra Nevada Pale Ale			
Sierra Nevada (USA)		4.82	45
Sierra Nevada Porter			
Sierra Nevada (USA)		5.34	48
Sierra Nevada Stout			
Sierra Nevada (USA)		5.10	56
Signature Stroh Beer			
Stroh (USA)		4.84	43
Sol Cerveza Especial		3.94	36
Cerveceria Moctezuma (Mexico)		4.13	37
Spaten Munich Special Dark Beer			
Spaten-Brau (Germany)		6.63	52
St. Pauli Girl Beer		5.00	39
St. Pauli (Germany)		4.79	41
St. Pauli Girl Dark Beer		5.02	45
St. Pauli (Germany)		4.93	44
Stroh's Beer		4.64	41
Stroh (USA)		4.68	42
Suntory Draft Beer			
Suntory (Japan)		4.64	39
Superior Imported Beer			
Cerveceria Moctezuma (Mexico)		4.34	43
Thos Cooper & Sons Adelaide Lager			
Cooper & Sons (Australia)		4.27	36

TABLE 1--ALCOHOL AND CALORIE CONTENT OF REGULAR BEER (CONTINUED)

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Thos Cooper & Sons Naturally Brewed Real Ale	Cooper & Sons (Australia)	6.77	45
Thos Cooper & Sons Naturally Brewed Stout	Cooper & Sons (Australia)	7.10	58
Tolly Original Premium Ale	Tollemache & Cobbold (England)	4.85	41
Tsingtao Beer	Tsingtao (China)	4.79	43
Tuborg Deluxe Dark Export Quality Beer	G. Heileman (USA)	5.11	46
Tuborg Export Quality Beer	G. Heileman (USA)	5.02	45
		5.02	44
Tusker Malt Lager	Bia Ni Bora (Kenya)	5.24	42
Utica Club Pilsener Lager Beer	West End (USA)	4.82	27
Watney's Red Barrel Beer	Stag (England)	3.92	40
Wurzbürger Hofbrau Pilsner Beer	Wurtzburger Hofbrauag (Germany)	5.42	45
Yuengling Porter	D.G. Yuengling & Son (USA)	4.13	40
Yuengling Premium Beer	D.G. Yuengling & Son (USA)	4.65	39
		4.11	39

^a claims half the alcohol of regular beer

TABLE 2--ALCOHOL AND CALORIE CONTENT OF LIGHT BEER

Brand	Brewer (Country)	% Alcohol	Calories per 100 ml
Amstel Light Bier		3.74	29
Amstel Brouwerij B.V.	(Holland)	3.96	28
Anheuser Busch Natural Light Beer		4.40	33
Anheuser Busch	(USA)	4.12	31
Bud Light Beer		3.56	30
Anheuser Busch	(USA)	3.88	33
Coors Light Beer			
Adolph Coors	(USA)	4.36	30
Dribeck's Light Low Calorie Beer			
Brauerei Beck	(Germany)	3.39	28
Genesee Light Beer			
Genesee	(USA)	3.55	27
Michelob Light Beer		4.53	41
Anheuser Busch	(USA)	4.52	39
Miller Lite Pilsner Beer		4.61	31
Miller	(USA)	4.40	29
Molson Light Beer			
Molson	(Canada)	2.41	23
Nordik Wolf Light Imported Beer		4.81	32
A.B. Pripps Bryggerier	(Sweden)	4.70	31
Old Milwaukee Premium Light Beer			
Stroh	(USA)	3.82	32
Pabst Extra Light Low Alcohol Beer			
Pabst	(USA)	2.50 ^a	19
Piels Naturally Light Beer			
Stroh	(USA)	4.49	40
Rheingold Extra Light Beer			
Rheingold	(USA)	4.32	27
Schaefer Light Lager Beer			
Stroh	(USA)	4.07	34
Schlitz Light Pilsner Beer			
Stroh	(USA)	4.28	31
Stroh Light Beer		4.91	42
Stroh	(USA)	4.45	35
Watney's London Light Beer			
Whatney Combe Reid	(England)	3.56	29
Wurtzburger Hofbrau Pure Bavarian Light Beer			
Wurtzburger Hofbrau Ag	(Germany)	5.44	43

^a claims 50% less alcohol than regular beer

TABLE 3--ALCOHOL AND CALORIE CONTENT OF NON-ALCOHOLIC BEER

Brand	Brewer (Country)	% Alcohol	Calories per/100 ml
Bass Barbican Non-Alcoholic Malt Beverage			
Bass (England)		0.10	15
Clausthaler Non-Alcoholic Herbfrisches Schankbier			
Binding Brauerei (Germany)		0.44	13
Clausthaler Non-Alcoholic Herbfrisches Schankbier			
Binding Brauerei (Germany)		0.48	14
Elan Swiss Brew Non-Alcoholic Malt Beverage			
Feldschlosschen (Switzerland)		0.50	25
Kaliber All Natural Non-Alcoholic Brew Light Malt Beverage			
Guinness (England)		0.10	14
Kingsbury Non-Alcoholic Malt Beverage		0.20	15
G. Heileman (USA)		0.10	14
		0.10	13
Metbrau All Natural Draft Non-Alcoholic Malt Beverage			
Metropolis (USA)		0.50	21
Moussy Non-Alcoholic Malt Beverage		0.05	15
Cardinal Fribourg (Switzerland)		0.10	16
Saint Michael's Non-Alcoholic Malt Beverage			
St. Michael's (USA)		0.73	17
Wurtzburger Hofbrau Non-Alcoholic Light Malt Beverage			
Wurzberger Hofbrau Ag (Germany)		0.10	30

TABLE 4--AVERAGE ALCOHOL AND CALORIE CONTENT OF REGULAR, LIGHT, AND NON-ALCOHOLIC BEER

Product	No. samples	% Alcohol	Calories per 100 ml
Regular	163	5.0 [2.0-9.5]	43 [26-83]
Light	26	4.1 [2.4-5.4] (-16%)	32 [19-43] (-27%)
Non-alcoholic	13	0.3 [0.1-0.7] (-94%)	17 [13-30] (-60%)

The number in parenthesis () indicates average difference from regular beer and numbers in brackets [] is the range of % alcohol and calories per 100 ml, respectively.