

TOX TALK

Society of Forensic Toxicologists, Inc.

1013 THREE MILE DRIVE • GROSSE POINTE PARK • MICHIGAN 48230-1412

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MESSAGE FROM THE PRESIDENT . . . C. NICHOLAS HODNETT, PH.D.

Another annual meeting has come and gone. Mike Schaffer is to be congratulated for hosting SOFT's biggest and busiest meeting. Our Executive Coordinator, Patricia Mohn-Monforte, contributed greatly to the success of the meeting and even convinced her mother to assist with the registration desk.

As the year closes, SOFT finds itself in excellent shape. An exciting, financially successful meeting was held, membership continues to increase, our finances are in order, the committees continue to actively work toward improving the operation of the Society and provide us with professional guidance, and we have a group of very capable officers and board members eager to administrate in our twentieth year as an organization.

I wish to thank everyone who has made a contribution to the operation of SOFT this year - especially those who did the "little" jobs that don't get much recognition. We couldn't have done it without you!

MARK YOUR CALENDARS: SEPTEMBER 12-15, 1990
TENTATIVE DATES FOR THE LONG ISLAND S.O.F.T. MEETING

IN THIS ISSUE

REGULAR FEATURES: CAREER OPPORTUNITIES - DIRECTORY UPDATE
- PROFESSIONAL CALENDAR - FROM THE EDITOR'S DESK

OF SPECIAL INTEREST: ELECTION RESULTS - TREASURY NOTE\$

TECHNICAL HIGHLIGHTS: - "BREATH ALCOHOL CONCENTRATIONS
MEASURED IN A SOCIAL DRINKING STUDY - S.O.F.T. 1989
MEETING" BY WATTS AND SIMONICK (INSERT)
- 1989 S.O.F.T. ANNUAL MEETING ABSTRACTS (INSERT)

INSERTS: SALARY SURVEY RESULTS

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ToxTalk is mailed quarterly to members of the Society of Forensic Toxicologists, Inc. For membership information contact: Alphonse Poklis, Ph. D., 1990 SOFT Secretary, Director, MCV Tox Lab, Box 597 - MCV Station, Richmond, VA 23298. telephone: (804) 786-0272

All members and others are invited to contribute to ToxTalk. Submit all materials (original plus 3 copies, if possible) for publication consideration to: ToxTalk, 1013 Three Mile Drive, Grosse Pointe Park, Mi 48230-1412.
DEADLINES: February 1, May 1, August 1, and November 1.

All of the many people who have contributed to ToxTalk this past year are greatly appreciated. I personally want to acknowledge the assistance of Vicki Watts and Chip Walls to the issues published in recent years.

There is a lot of material in this December issue - meeting abstracts, the social drinking study, and a salary survey. Vicki Watts and Tom Simonick deserve a tremendous amount of credit for conducting the alcohol study, preparing the report, and making the text available to SOFT members. It required a lot of time and effort to produce this quality product.

My thanks to all who contributed to the salary survey. I hope the information is useful.

Remember, ToxTalk is your publication - short reports, interesting cases, and information you would like to share with your colleagues are encouraged.

CONGRATULATIONS TO THE 1990 SOFT OFFICERS AND NEW BOARD MEMBERS

- PRESIDENT: ROBERT O. BOST, PH.D.
- VICE PRESIDENT: WILLIAM H. ANDERSON, PH.D.
- SECRETARY: ALPHONSE POKLIS, PH.D.
- TREASURER: MARK B. LEWIS, B.S.
- DIRECTORS: ROBERT J. OSIEWICZ, PH.D.
- VINA SPIEHLER, PH.D.

1989 ANNUAL MEETING OUTSTANDING SUCCESS

Dr. Michael Schaffer, 1989 Meeting Host, reports the response to the SOFT Annual Meeting in Chicago was outstanding and thanks everyone for his/her participation and contribution to its success. As noted in the program, without the assistance of the abstract review committee, workshop organizers and faculties, scientific session presentors, exhibitors, corporate sponsors, and volunteer assistants, the intense program would not have been possible. Everyone involved, including registrants, displayed a typical SOFT cooperative spirit and all efforts are truly appreciated. Registration topped 275, with non-members representing more than half the participants. Copies of the abstracts for the meeting are enclosed with this copy of ToxTalk. A favorable financial report will be presented to the Board.

THIS DEFENSE IS FOR THE BIRDS

A probationer adamantly denied using cocaine despite positive cocaine/BE findings in his urine on three consecutive sampling occasions. He offered the following innovative tale in his defense:

It seems the probationer was regularly involved in the illegal practice of cock fighting. To increase the combativeness of the birds, it is common to do them with cocaine just prior to the contest. After the fight, the loser is plucked, fried, and enjoyed by all!

(contributed by Ed Briglia)

TREASURY NOTE\$

1989 DUES ARE NOW PAST DUE

If you have not paid your dues, send your payment of \$35 for Full and Associate or \$15 for Student Members to:

Mark Lewis, SOFT Treasurer
24 Rip Van Lane
Ballston Spa, NY 12020

Make your check payable to S.O.F.T., Inc. Non-payment will result in the loss of your membership status.

1990 DUES

During March, members will receive dues notices with a rate reflecting the fiscal year change. LATE FEES will be charged to any members who pay their dues after the May 31st deadline.

THE S.O.F.T. FISCAL YEAR HAS BEEN CHANGED from 7/01 - 6/30 to the calendar year beginning January 1, 1990. The new business year for the Society is currently January 1 to December 31, 1990. Treasurer Mark Lewis will make the necessary adjustments when he sends out the next dues notices.

Be sure to submit any receipts for 1989 S.O.F.T.-related expenses to Mark Lewis immediately.

DO YOU KNOW WHERE THESE PEOPLE ARE??

The following members have had SOFT correspondence returned by the U.S. Postal Service as undeliverable:

Wilmo Andollo	John F. Jemionek	Miftah Kemal
James Kosinski	Gregory N. Maisel	Asaad Masoud
Timothy Moriarity	James Ruger	Ausrine Valaitis.

Unless these members contact Treasurer Mark Lewis immediately (address above), they will be removed from the membership list as of January 1990. If you have personal knowledge of the whereabouts of any of the above individuals, please have them contact Treasurer Lewis if they desire to remain on the membership roster.

MEMBERSHIP HAS ITS PRIVILEGES

Besides the obvious professional advantages to being a member of S.O.F.T. as well as receiving ToxTalk, CURRENT S.O.F.T. members receive substantial meeting registration discounts.

SOFT BOARD OF DIRECTORS' MEETING

- Summary -

The Officers and Board of Directors of SOFT met on October 18, 1989 at the annual SOFT Meeting in Chicago, Ill. The meeting was called to order at 2:30pm, CDT, by President C. Nicholas Hodnett.

The first order of business was to extend a resounding vote of appreciation to Dr. Michael Schaffer, Pat Mohn-Monforte and the others who helped arrange the outstanding accommodations and scientific program for the Chicago meeting. There were 240 people preregistered for this meeting and new registrants were being accepted daily. Workshops 1, 2 and 3 were filled and there were 120 people registered for workshop four.

Plans for the 1990 SOFT Annual Meeting on Long Island, New York are being coordinated by Tom Manning, Mike McGee and Nick Hodnett. This meeting will commemorate SOFT's twentieth anniversary and promises to be a sterling occasion. Preliminary plans call for this mid-September meeting to be held at the luxurious Royce Carlyn Hotel.

The 1991 annual meeting is scheduled for Montreal, Canada and will be held in conjunction with the Canadian Society of Forensic Scientists. Bill Robinson is SOFT liaison to CSFS. By vote of the Board, Bill was given the full authority and responsibilities of a meeting host for the 1991 meeting.

Treasurer Mark Lewis reported that total income for the period Jan. 1 to June 30 was \$20,016.70. Included in this sum is \$13,714.89 received from the SOFT annual meeting in Philadelphia. Total expenses for the same period was \$9497.03. The SOFT checking account balance at the end of this period was \$17,771.75. In addition, the sum of \$20,386.27 is in an account allocated to the ERA fund.

The Nominating Committee, with the approval of the Board of Directors, offered a new slate of officers to the membership at the annual business meeting.

Robert O. Bost, PhD	President
William H. Anderson, PhD	Vice President
Alphonse Poklis, PhD	Secretary
Vina Spiehler, PhD	Director
Robert J. Osiewicz, PhD	Director

The Board voted to attach an administrative fee to the late payment of membership dues. The amount of the fee and the conditions under which it will be applied is to be set by the Treasurer with the approval of the Executive Committee. The Board also accepted the promotion of Charter Members, Thomas Rejent and Art McBay, to Retired Member status.

Results of the ballot on five amendments to the SOFT Bylaws was announced. The following four amendments (paraphrased) passed:

- Deletion of Chapter II, Section 3,C [The Board may revoke the membership of any member who has failed to attend 3 consecutive annual meetings.]

- Chapter III, Section 1,B to read: [The President and Vice President shall be elected for terms one calendar year beginning Jan. 1. The Secretary and Treasurer shall be elected in alternating years for two year terms. No officer shall serve more than two consecutive full terms in office.]

- Chapter III, Section 5,C,3 to read: [The Secretary shall keep a register of current addresses of each member and shall at intervals approved by the Board prepare a membership directory.]

- Chapter IV, Section 5 to read: [The fiscal year of the Society shall annually begin on January 1 and end on December 31.]

DIRECTORY UPDATE

NEW MEMBERS IN 1989

The following amendment did not pass: Chapter IV, Section 2. [There shall be at least two regular meetings of the Board of Directors annually.] Chapter IV, Section 2 remains as follows: [There shall be at least one meeting of the Board of Directors prior to the convening of the Annual Meeting.]

The Board of Directors of the American Board of Forensic Toxicology has extended to SOFT an invitation to submit the names of nominees for consideration as directors of ABFT. Present directors whose terms expire on 30 June 1990 are Robert Cravey, Jack Wallace, Irving Sunshine and Yale Caplan. The requirements for nominees are that they currently be certified as a Diplomat of the ABFT and be willing to serve if elected.

The final report of the Laboratory Guidelines Committee was offered to the membership at the annual business meeting.

The Board of Directors' meeting was adjourned at 5:38pm, CDt.

Richard D. Pinder, Ph.D., DABFT
Secretary

S.O.F.T. BOARD MEETING
TUESDAY - FEBRUARY 20TH
NOON

A.A.F.S. CINCINNATI
HYATT REGENCY HOTEL
ROOM: BUCKEYE B

FULL MEMBERS: Shirley Brinkley, Donnel Cash, Edward Cone, Robert Czarny, Robert DeLuca, William Dovensky, Bruce Goldberger, Nancy Haley, Marilyn Hall, Marilyn Huestis, Barbara Manno, Joseph Manno, Elizabeth Marker, Andrew Mason, Barbara Meixell, Kevin Merigian, David Moody, George Natho, Michael Slade, Thomas Simonick, Edward Stern, Katherine Sztendera, Carole Trojan, Donald Uges, and Robert Zettl.

ASSOCIATE MEMBERS: Christine Alt, Timothy Appel, Donald Cannon, Lisa Caughlin, Maureen Finn, Glenn Hardin, Randy Harris, Prentiss Jones, Maria Jovic, Diana Kras, Laura Kwart, Laura LeDonne-Drake, Michael Lehrer, Laurie Moore, Ann Porter, Jay Poupko, John Rorabeck, Gaspare Scaturro, Phyllis Soine, Sanjay Trivedi, Mark Uhrich, Guy Vallero, and David Wells

STUDENT MEMBERS: Thomas Aucoin, Kenneth Graham,

ADDRESS/TELEPHONE CHANGES

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4954

Thomas Rejent, 3956 Ridge Lea, Apt. C,
Tonawanda, NY 14150

Michael Schaffer (312) 997-4490

NOTE: All cities OUTSIDE the CHICAGO CITY LIMITS that had the 312 area code have been changed to area code 708.

A new S.O.F.T. MEMBERSHIP DIRECTORY is being considered but no decision has been made to date.

MOVED? Notify Dr. Poklis (address on page 1) if your directory listing is incorrect or if you have moved.

CAREER OPPORTUNITIES

CHIEF OF TOXICOLOGICAL SERVICES: Duties - supervise the activities of a tox lab conducting forensic and clinical analyses. Staff of seven. 1989 salary range \$44,215-61,520. Minimum requirements - 20 semester credits in chemistry, B and 6 years tox experience; or M.S. and 5 years related experience. Send letter and resume to C. Nicholas Hodnett, PH.D., Dept of Labs & Research, Hammond House Rd., Valhalla, NY 10595. Telephone 914-524-5610.

DIRECTORS: Responsible for daily technical operation of California and North Carolina labs. Requires Ph.D. in a biological science with experience in forensic urine drug testing and must meet D.H.H.S. guidelines for director; A.B.F.T. certification or qualification for certification preferred. Salary depends on qualifications and experience. Send resume, 3 references and salary history to: Marcia Ladd, V.P. of Administration, CompuChem Labs, Inc., P.O. Box 12652, 3308 Chapel Hill/Nelson Highway, Research Triangle Park, NC 27709.

PROFESSIONAL CALENDAR

CALIFORNIA ASSOCIATION OF TOXICOLOGISTS 1989 quarterly meetings and workshops: Feb. 3 - San Jose, CA; May 4 Drugs and Driving Workshop and May 5 meeting - Culver City, CA; Aug. 3 Steroids Workshop and Aug. 4 meeting - Sacramento, CA; Nov 2-3 Quarterly Meeting, Yosemite, CA. For further information contact Thomas Sneath, National Toxicology Labs, 3101 16th St., #107, Bakersfield, CA 93301; (805) 322-4250.

C.A.T. WORKSHOP May 4, 1990: Drugs & Driving Workshop will feature a morning panel presentation including discussion of the DRE program and toxicology findings in blood vs. urine. The afternoon will feature papers. Anyone interested in participating or attending should contact Susan Rasmussen, San Diego Sheriff's Crime Lab, 3520 Kurtz St., San Diego, CA 92110. Telephone 619-692-5630. The CAT quarterly meeting will follow on May 5th.

AMERICAN ACADEMY OF FORENSIC SCIENCES: Feb. 19-24, 1990, Cincinnati, OH. For information contact AAFS, P.O. Box 2520, Colorado Springs, CO 80901-2520. Telephone (719) 636-1100, FAX (719) 636-1993.

SOUTHWESTERN ASSOCIATION OF FORENSIC SCIENTISTS: April 24-28, Breckenridge, Co. Spring meeting includes workshops and guest speakers. Contact Laurel Farrell, Colorado Dept. of Health, 4210 E. 11th Ave., Denver, CO 80220 (telephone 303-331-4707)

S.O.F.T. 20th ANNUAL MEETING: September 12-15, 1990, Long Island, NY For information contact: Michael P. McGee, 1990 SOFT Meeting Committee Chairman, Office of the Chief Medical Examiner, 520 First Avenue, New York, NY 10016. Telephone 212-340-0120

CANADIAN SOCIETY OF FORENSIC SCIENCE: Oct. 1-5, 1990, Ottawa, Ontario. 1990 Annual Conference theme is "Forensics 90." Deadline for scientific papers is June 1st. For further information on scientific sessions and workshops, contact: C.S.F.S., Suite 215 - 2660 Southvale Crescent, Ottawa, Ontario, Canada K1B 4W5 (requires 30 cents U.S. postage). Telephone 613-731-2096.

Future SOFT meeting sites: 1990 - New York City area (Michael McGee); 1991 - Canada (joint meeting with CSFS); 1992 - Connecticut; 1993 - Joint meeting with CAT; 1994 - Atlanta, GA



Society of Forensic Toxicologists, Inc.

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DATE: DECEMBER 1989

TO: S.O.F.T. MEMBERS

FROM: JOSEPH R. MONFORTE, PH.D., ToxTALK Co-EDITOR

BELOW IS A SUMMARY OF RESPONSES TO MY REQUEST FOR CURRENT SALARY INFORMATION WHICH APPEARED IN THE SEPTEMBER ISSUE OF TOXTALK. A TOTAL OF 42 RESPONSES WERE RECEIVED; HOWEVER, KEEP IN MIND ALL POSITIONS WERE NOT ADDRESSED BY EVERY RESPONSE. I WANT TO THANK EVERYONE WHO SHARED THIS INFORMATION AND HOPE THE SURVEY IS OF USE TO THE MEMBERSHIP.

1989 SALARY SURVEY SUMMARY

GOVERNMENT POSITIONS

	DIRECTOR	TOXICOLOGIST	TOXICOLOGY SUPERVISOR	ANALYST
MEAN	59.0 (N=18)	49.9 (N=19)	44.0 (N=18)	33.0 (N=16)
LOWEST REPORTED	43.0	33.8	30.0	16.8
HIGHEST REPORTED	80.2	70.0	63.0	50.0
MAXIMUM ACHIEVABLE	90.0	75.7	64.5	60.0

NON-GOVERNMENT POSITIONS

	DIRECTOR	TOXICOLOGIST	TOXICOLOGY SUPERVISOR	ANALYST
MEAN	68.0 (N=7)	46.0 (N=7)	33.9 (N=9)	26.4 (N=6)
LOWEST REPORTED	42.0	30.0	40.5 (2)	39.5
HIGHEST REPORTED	93.0	65.0	24.9	17.9
MAXIMUM ACHIEVABLE	128.0	65.0	58.0	60.0

ALL RESPONDING LABORATORIES

	DIRECTOR	TOXICOLOGIST	TOXICOLOGY SUPERVISOR	ANALYST
MEAN	61.5 (N=25)	48.8 (N=26)	41.0 (N=27)	31.2 (N=22)



MEMORANDUM



DATE: FEBRUARY 7, 1990
 TO: EDITORS CAPLAN AND MONFORTE
 FROM: PATRICIA MOHN-MONFORTE, ToxTALK
 PUBLICATIONS EDITOR
 RE: DEC. 1989 TOXTALK - PRODUCTION REPORT

345 ISSUES OF THE SEPT ISSUE OF TOXTALK WERE MAILED 1/25/90

	BULK MAIL RATE (\$.167 EA.)*	FIRST CLASS MAIL
MEMBERS: 345 MEMBERS & APPLIC.	326	16 CANADA, 2 EUROPE A BERMUDA

EXTRA COPIES OF TOXTALK WITHOUT INSERTS MAILED TO CAPLAN AND BOST.

EXPENSES:

*\$55.32 ADDITIONAL POSTAGE: 1ST CLASS + ADDITIONAL BULK DUE TO OVER WEIGHT LIMIT
 20.00 COMPUTER FEE (ELIMINATES TYPESETTING)
 135.99 PRINTING (PAID DIRECTLY TO PRINTER)
 38.00 INSERT PRINTING (PAID DIRECTLY TO PRINTER)
 39.08 MISC.
 450.00 PUBLICATION EDITOR FEES
 \$738.39 TOTAL COST NOT INCLUDING PRE-PURCHASED ENVELOPES AND BULK STAMPS

COMMENTS: THIS WAS A 6-PAGE ISSUE THAT WAS LABOR INTENSIVE DUE TO THE SIZE AND NUMBER OF INSERTS (SALARY SURVEY, SOCIAL DRINKING STUDY, SOFT MEETING ABSTRACTS). UTILIZING BULK MAIL RATE SAVED \$322.74 POSTAGE AS OPPOSED TO FIRST CLASS MAIL. EACH PIECE WEIGHED NEARLY 4 OUNCES.

MARCH ISSUE: SHALL WE PURSUE THE ERA IDEA HERE? I NEED A DETERMINATION ON THIS SOON TO MAKE DEADLINE. ALSO, THIS ISSUE SHOULD HAVE THE MINUTES OF THE 1989 ANNUAL MEETING AS WELL AS A SYNOPSIS OF THE BOARD MEETING AT THE AAFS MEETING 2/20/90, LIST OF COMMITTEE APPOINTMENTS, AND ANY AVAILABLE INFO ON THE 1990 MEETING. HOPEFULLY, CHIP WILL SEND IN MATERIAL FOR THE JOURNAL CLUB. WHAT IS HAPPENING WITH A NEW DIRECTORY???? SHALL WE INCLUDE A GENERIC DUES NOTICE IN THIS ISSUE??

JUNE ISSUE: SHALL I SAVE CONSIDERABLE SPACE IN THE JUNE ISSUE FOR SOFT MEETING PROMOTION?

C: J. MONFORTE, Y. CAPLAN, B. BOST, M. LEWIS



Breath Alcohol Concentrations Measured in
a
Social Drinking Study
Society of Forensic Toxicology Meeting,
October '89, Chicago, Illinois

by

Vickie Watts and Thomas Simonick

Acknowledgements:

We sincerely thank the following individuals for their technical assistance in conducting this study.

Bruce Goldberger
Brian Joynt
Elizabeth Prociw

Everett Solomons, PhD
Irving Sunshine, PhD
Robert Zettl

Our special thanks to the following individuals who participated in this study for their commitment to be put under *CONTROL* in the name of Science.

William Anderson, PhD
Yale Caplan, PhD
Paula Childs, PhD
Dennis Crouch
Bryan Finkle, PhD
Nicholas, Hodnett, PhD
Barry Levine, PhD

Thomas Manning, PhD
J. Rod McCutcheon
Dave Moody, PhD
Michael Peat, PhD
Michael Schaffer, PhD
Richard Shaw
Vina Spiehler, PhD
Marina Stajic, PhD



INTRODUCTION

Interpretive expert testimony in alcohol (ethanol) related cases generally involves three types of calculations: retrograde extrapolation, where a known blood alcohol concentration (BAC) test result is used to predict the blood alcohol concentration at an earlier time period; the estimation of a minimum number of drinks to achieve the measured alcohol concentration; and the estimation of a theoretical maximum alcohol concentration obtained from a known drinking pattern. On a day-to-day basis, calculations on retrograde extrapolation and estimation of minimum number of drinks or theoretical maximum BAC are made in courtrooms across the country in answer to the demands of the medicolegal system.

These types of calculations involve multiple assumptions such as the subject's alcohol absorption time period, post-absorption elimination rate, and volume of distribution (Widmark ratio) for alcohol. The accuracy of the calculation depends upon the available data in the literature upon which these assumptions are based (1, 2, 3, 4, 5, 6). Most of the studies in the literature relating absorption and time to reach maximum BAC are based upon a bolus ingestion of alcohol over a short period of time with a limited number of variables such as empty or full stomach (7). However, there is very little published data on the time required to reach maximum BAC during consumption of alcoholic beverages in a social setting (8). Alcohol consumed in a relaxed social environment over an extended period of time is usually the situation encountered by the forensic toxicologist in providing interpretive expert testimony. A typical example would be a retrograde extrapolation for a subject arrested after an evening of drinking at a party or in a bar.

This study examines the consumption of alcohol under social drinking conditions. The resulting data was evaluated for the following:

- 1) Rate of drinking in a social setting when the drinks are administered at the subject's request
- 2) Time to reach maximum blood alcohol concentration after consumption of the last drink
- 3) Length of plateau periods at maximum BAC
- 4) Post-absorptive elimination rate of alcohol
- 5) Estimated Widmark ratios for men and women

MATERIALS AND METHODS

Experimental Design

Volunteer subjects (3 females and 12 males), 30 to 60 years of age, were interviewed for weight, type and time of recent food consumed, then pretested for initial breath alcohol concentration. Most subjects had consumed a moderately heavy dinner from 6:30 to 7:30 p.m. Drinking commenced at 8:00 p.m. after establishing a 0.00% breath alcohol concentration using the Intoxilyzer Model 5000.

The rate of drinking was not predetermined, but designed to reflect a normal social rate of alcohol consumption (9). Subjects consumed known quantities of alcohol as often as they requested, with each drink consisting of 50 or 100 mL of 40% alcohol, straight or combined with mixer, or 355 mL of 4% beer. The drinking time interval, time drinking stopped, total amount, and type of alcohol consumed were recorded for each subject. After completion of each drink, subjects underwent a ten minute deprivation period to allow for the dissipation of mouth alcohol (10). The breath alcohol concentration (BrAC) was then monitored by duplicate testing with the Intoxilyzer prior to administering the next drink. Subjects drank in small groups in the relaxed social environment of a hospitality suite. Limited quantities of peanuts and chips were provided.

Four volunteer non-drinking 'watchers' were each assigned 3-4 drinking subjects. The watchers observed and monitored alcohol consumption time, deprivation periods, stop drinking time, and post-absorption testing periods.

The alcohol consumption phase was completed in approximately 3-4 hours. Subject's were then monitored by duplicate breath testing at 10-15 minute intervals for the next 2-3 hours to record the post-absorptive phase for elimination rate.

Instrumentation

Two Intoxilyzer Model 5000 breath testing instruments (CMI-MPD, Owensboro, Kentucky) were utilized throughout the experiment to record blood alcohol concentrations. This instrument utilizes a 2100:1 blood:breath ratio, therefore results are reported in g/210 L (10). The calibration of the instruments was checked using a 0.100 g/210 L simulated breath alcohol solution with the results being 0.100 and .099 g/210 L.

RESULTS AND DISCUSSION

The fifteen subjects all consumed alcohol in a similar drinking pattern. The mean time interval between drink requests was found to be 32 minutes , with a range of 10 to 54 minutes. This time interval included the 10 minute deprivation period prior to each breath test. The subject was required to give a duplicate breath test before the next drink was administered. Table I shows the total number of drinks and range of time intervals between each requested drink for all 15 subjects.

Table I. Rate of Drinking in a Social Setting

Subject	# of Drinks	Mean Time Interval (min)	Time Interval Range (min)
#1	3	34.50	34-35
#2	5	41.25	33-49
#3	6	35.20	25-48
#4	4	43.00	35-54
#5	5	30.00	28-32
#6	7	25.50	23-32
#7	3	32.50	32-33
#8	9	24.86	16-38
#9	9	24.00	21-30
#10	6	31.00	25-40
#11	5	38.75	35-45
#12	5	32.25	25-46
#13	7	22.83	10-28
#14	5	43.00	26-56
#15	7	28.67	16-38
mean		32.48	10-54

Blood Alcohol Curve

As shown in Figure 1, a theoretical blood alcohol curve would have three phases: absorption-distribution, peak-plateau, and elimination. The time that each drink was administered is designated with a (d) and the time the last drink was completed with no more alcohol being ingested by (st).

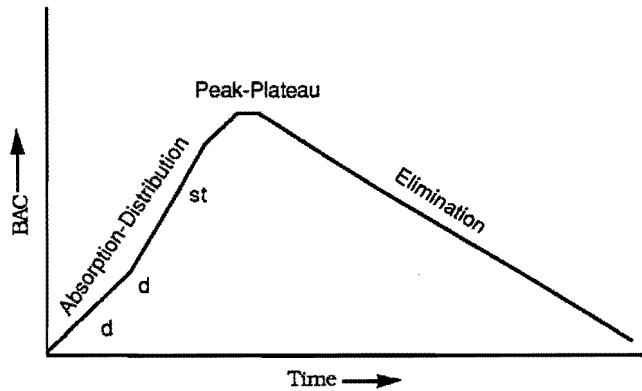


Figure 1. Phases of the Blood Alcohol Curve.

BrAC measurements were plotted versus time for each subject, with the higher value of each duplicate pair of breath tests used as the truer reflection of the BAC.

The resulting graphs demonstrate three types of alcohol distribution curves:

(1) Complete tri-phasic curves with a definite peak at the maximum BrAC were obtained for subjects #1 through 8. Regression line elimination rates were calculated from the BrAC curves along with the time to peak.

(2) Partial bi-phasic curves with an absorption phase and clearly defined maximum BrAC plateau marked by the beginning of an elimination phase were obtained for subjects #10, 11, and 12. The elimination data, though, was not complete enough to calculate elimination rates.

(3) Partial bi-phasic curves with an absorption phase and maximum BrAC were obtained for subjects #9, 13, and 14. The subjects still remained in the plateau phase at the completion of the study with no elimination data obtained.

The data presented on pages 11 through 26 shows the drinking history, BrAC curve, and regression line elimination data for each subject.

Absorption-Distribution phase

The BrAC shows a steady rise with time as the amount of alcohol absorbed into the bloodstream exceeds the amount that is being eliminated. In a social drinking pattern where alcohol is continually being ingested over many hours, this phase may actually consist of a series of progressive rises and plateaus. The time interval between the end of drinking and the maximum blood alcohol measurement is designated as the peak time (PT). Since the frequency of the breath testing influenced the calculated PT, this interval was considered to be a maximum. If the breath measurements were performed at shorter intervals, the PT would be more clearly de-

fined, and would be equal to or shorter than the time calculated. Also the choice of PT was based on the maximum BrAC, when analytical significance of measurements in the third decimal place between two time periods may have reflected the subject's ability to deliver the same volume of deep lung air on two different tests. As shown in Table II, the average PT was found to be 26 minutes, with a range of 12 to 61 minutes. Subject #10 remained in the plateau phase from the end of drinking to the beginning of the elimination phase.

Table II. Peak Time Interval Calculated From the Stop Drinking to the Time of Maximum Breath Alcohol Concentration

Subject	Peak Time
#1	12 min
#2	44 min
#3	15 min
#4	16 min
#5	21 min
#6	21 min
#7	14 min
#8	16 min
#9	61 min
#11	55 min
#12	22 min
#13	23 min
#14	26 min
#15	12 min
mean	26 min

Peak - Plateau phase

After the subject stops ingesting alcohol the BAC will eventually cease to rise. When this maximum blood alcohol concentration is reached, the subject has entered into the peak phase of the blood alcohol curve. The time period for this phase may range from a sharp peak to a broad plateau. If the peak BAC remains constant over time, this phase is designated as the plateau time for each subject.

Plateaus at maximum BrAC were observed in six subjects (Table III). The plateau time periods ranged from 47 to 89 minutes. Three of the six subjects (denot-

ed by *) had completed the plateau phase and were entering into the elimination phase showing a consistent decline in breath alcohol measurements. The remaining three subjects were still in the plateau phase at the completion of the study. The time periods for these subjects were considered to be minimum values. If more data points had been collected, the subjects may have continued on into the plateau period or entered into the elimination phase.

Table III. Plateau Interval Times

Subject	Plateau Intervals
#9	89 min
#13	55 min
#14	72 min
#10 *	52 min
#11 *	47 min
#12 *	50 min

Elimination Phase

When the BAC shows a steady decline over time, more alcohol is being eliminated from the bloodstream than is being absorbed. The resulting decline in the BAC measurements is the elimination phase of the blood alcohol curve (13,14). Linear regression lines were plotted from the elimination data using both results of the duplicated breath test measurements and the slopes used to determine elimination rates. Given the equation of the regression line ($y = mx + b$), the slope (m) represents the elimination rate in grams of alcohol per 210 liters ($g/210 L$) per minute. Recalculation ($\times 60$) of the data gives the elimination rate per hour.

Complete tri-phasic BrAC curves were obtained for eight subjects. As shown in Table IV, the mean elimination rate was found to be 0.020 g/hour with a range of 0.011 g to .033 g/hour. This data agreed with the published literature range of 0.07 to 0.29 %/hour (3,14).

Table IV. Elimination Rates Obtained From Regression Data

Subject	Elimination rate g/210 L/minute	Elimination rate g/210 L/hour
#1	0.00055	0.033
#2	0.00049	0.029
#3	0.00030	0.018
#4	0.00018	0.011
#5	0.00019	0.011
#6	0.00028	0.017
#7	0.00027	0.016
#8	0.00042	0.025
mean		0.020

Estimation of the Widmark Factor

Widmark (4) expressed the volume of distribution (Vd) of alcohol in the body as the quotient between the mean alcohol concentration of the whole body and that of the blood:

$$r = \frac{[\text{organism}]}{[\text{blood}]}$$

This quotient, known as the Widmark factor (r), can be estimated if one knows the total grams of alcohol administered to the body (A), and the grams of body mass (p) by using the value of the predicted theoretical maximum blood alcohol concentration (C₀), through the equation:

$$r = \frac{A}{(C_0)(p)} \quad \text{or} \quad A = (C_0)(p)(r)$$

This equation is valid if the total dose is absorbed instantaneously and the measured blood alcohol concentration (C_t) is equal to the predicted theoretical maximum blood alcohol concentration (C₀). In reality though, the process of absorption requires time during which a portion of the alcohol will be eliminated and the measured C_t will be lower the C₀ maximum. The point where the extended regression line intersects the y-axis represents the theoretical maximum BAC that would be

present if the entire amount of alcohol had been absorbed without any loss due to elimination (Fig. 2). By using the equation of the regression line established from the post-absorption data, the theoretical C_0 can be obtained by setting the time (x) to zero by which the concentration (y) will be equal to the y-intercept (1,15,16):

$$y = mx + b \qquad y = m(0) + b \qquad y = b$$

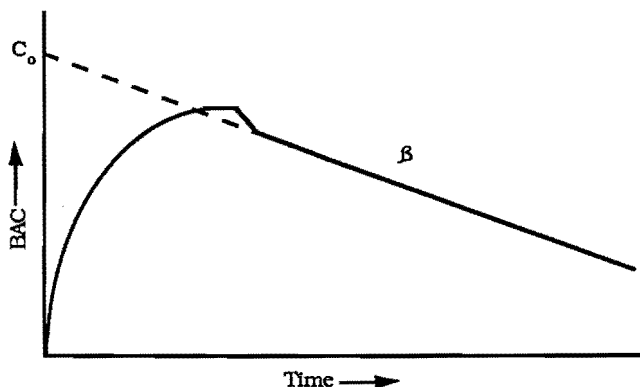


Figure 2. Theoretical Blood Alcohol Curve. After Widmark (4).

An alternative method to determine the theoretical maximum alcohol concentration for use in calculating the Widmark factor (r) is to add the amount of alcohol eliminated, calculated from the elimination rate (β), to the amount of alcohol still in the blood, measured by the BAC. The estimation of the Widmark ratio is represented by the same formula whether the curve is for single dose administration or a cumulative curve from intermittent ingestion of alcohol (4). The measured BAC at time (t) is represented by C_t and the amount of alcohol eliminated represented by $(\beta)(t)$:

$$A = p r (C_t + \beta t) \qquad r = \frac{A}{p (C_t + \beta t)}$$

Both methods were used to estimate Widmark factors for the eight subjects that exhibited regression line data in the post-absorption phase and the results compared in Table V. The theoretical maximum BACs showed good agreement between

the y-intercepts (C_0) of the regression line data, and the summation of measured BrAC and eliminated alcohol (C_s). The subsequent calculated Widmark factors (r_0 and r_s) also agreed well. The Widmark factors ranged from 0.55 to 0.99 for the six males and from 0.55 to 0.72 for the two female subjects. The above values were in agreement with the range of 0.5 to 0.9 as reported by Schwar (3). It should be noted that typically, the subjects used in determining Widmark factors are normally in a fasting state, have reached a higher BAC, and are in their early twenties. Age has an affect on Vd, since the total body water becomes lower with increasing years (17). Additionally, the weights used in the calculations were based on the subjects' estimates, and were not independently confirmed.

Table V. Theoretical Maximum Blood Alcohol Concentrations and Estimated Widmark Factors (r_1, r_2)

Subject	C_0	r_0	C_s	r_s
#1 F	0.123	0.57	0.127	0.55
#2	0.189	0.56	0.192	0.55
#3	0.130	0.62	0.133	0.61
#4	0.111	0.99	0.113	0.98
#5	0.090	0.96	0.092	0.93
#6	0.178	0.69	0.177	0.69
#7 F	0.083	0.72	0.086	0.69
#8	0.211	0.56	0.194	0.56

F = females

C_0 Theoretical maximum BAC obtained from the y-intercept of the elimination phase regression line.

C_s Theoretical maximum BAC obtained through summation of measured C_t and elimination βt alcohol.

Conclusion

This study has demonstrated that during social drinking the peak time interval was significantly shorter when compared to bolus ingestion data. The subjects in this experiment had consumed more food than those reported in Shajani (8), however, the peak time and the elimination rates were similar. In trying to represent a natural setting for drinking, the subjects chose to drink at 20 to 30 minute intervals, similar to that reported in the literature (9). There is a need for more social drinking experi-

ments to be conducted and reported in order to reproduce this data, since this is the real-world scenario usually faced by the forensic toxicologist as an expert witness.

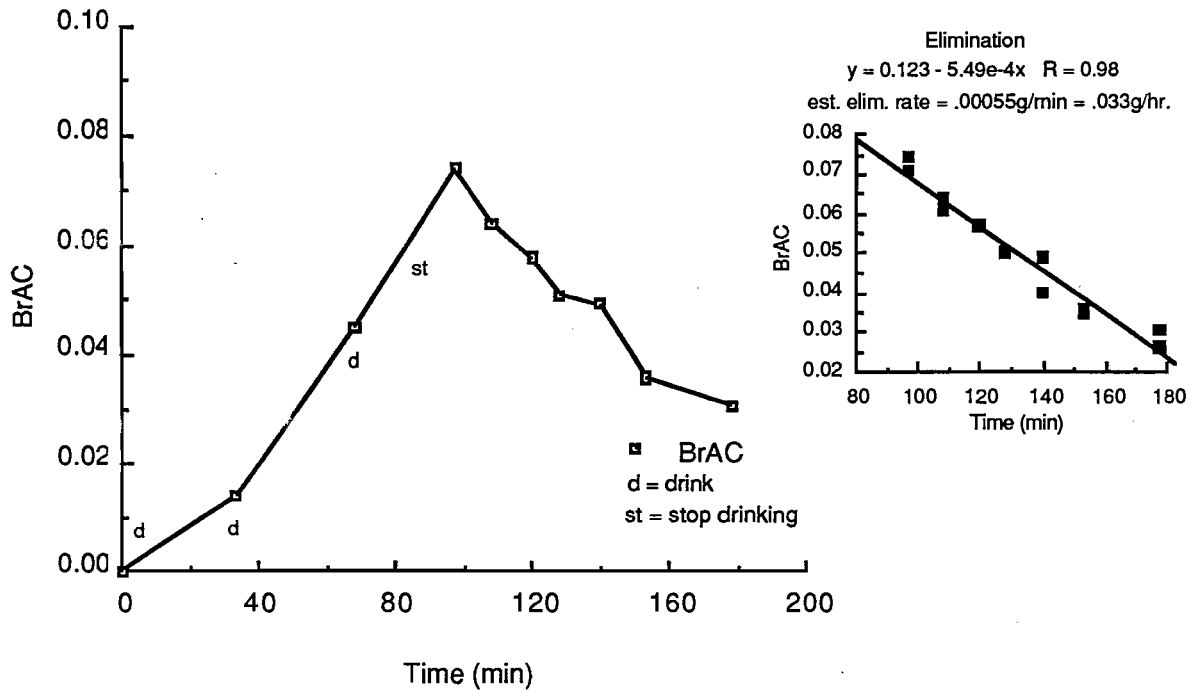
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Subject 1

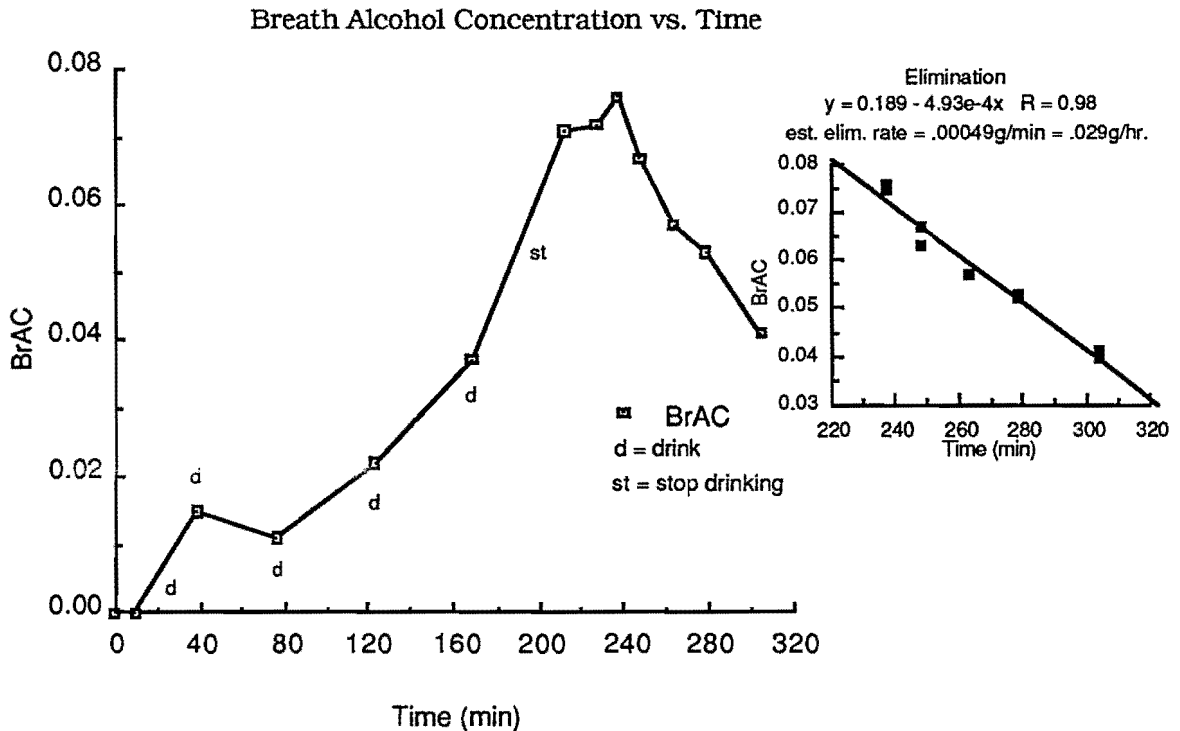
History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking: 2016 hrs.	0	.000	Sex:	Female
	33	.008	Weight:	150 lbs.
	33	.014		
	68	.044		
Stop Drinking: 2141 hrs.	68	.045	Ethanol:	Bourbon (40%) 150 ml
	97	.071	Food:	NIDA dinner 1830 to 1900
	97	.074		
	108	.061		
	108	.064	Stop Drinking:	85 min.
	120	.057		
	120	.058		
	128	.050		
	128	.051		
	140	.040		
140	.049			
153	.035			
153	.036			
Last Test: 2314 hrs.	178	.026		
	178	.031		

Breath Alcohol Concentration vs. Time



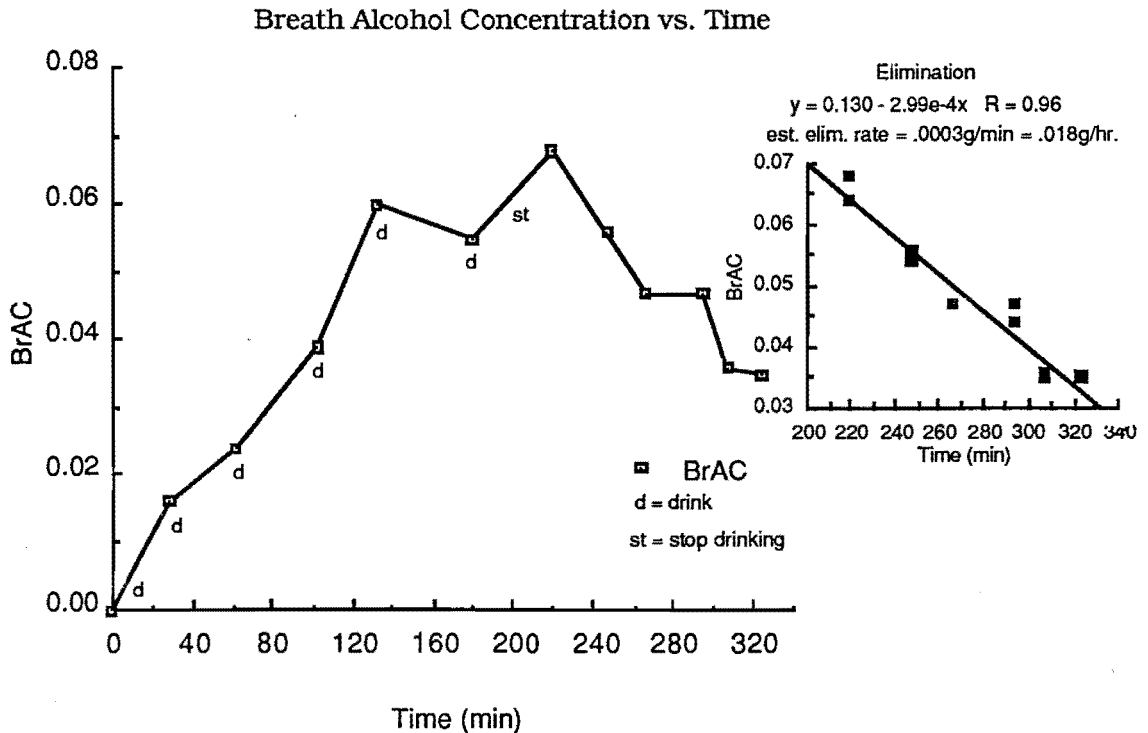
Subject 2

History	Time (min)	BrAC (g/210L)	Subject Information
Start Drinking: 2000 hrs.	0	.000	Sex: Male Weight: 165 lbs Ethanol: Bourbon (40%) 250 ml Food: NIDA dinner 1830 to 1930
	10	.000	
	38	.015	
	38	.010	
	76	.011	
	76	.010	
	123	.022	
	123	.022	
	168	.037	
	Stop Drinking: 2320 hrs.	168	
212		.070	
212		.071	
227		.071	
227		.072	
237		.075	
237		.076	
248		.063	
248		.067	
263		.057	
263	.057		
278	.052		
278	.053		
Last Test: 0130 hrs.	304	.040	
	304	.041	



Subject 3

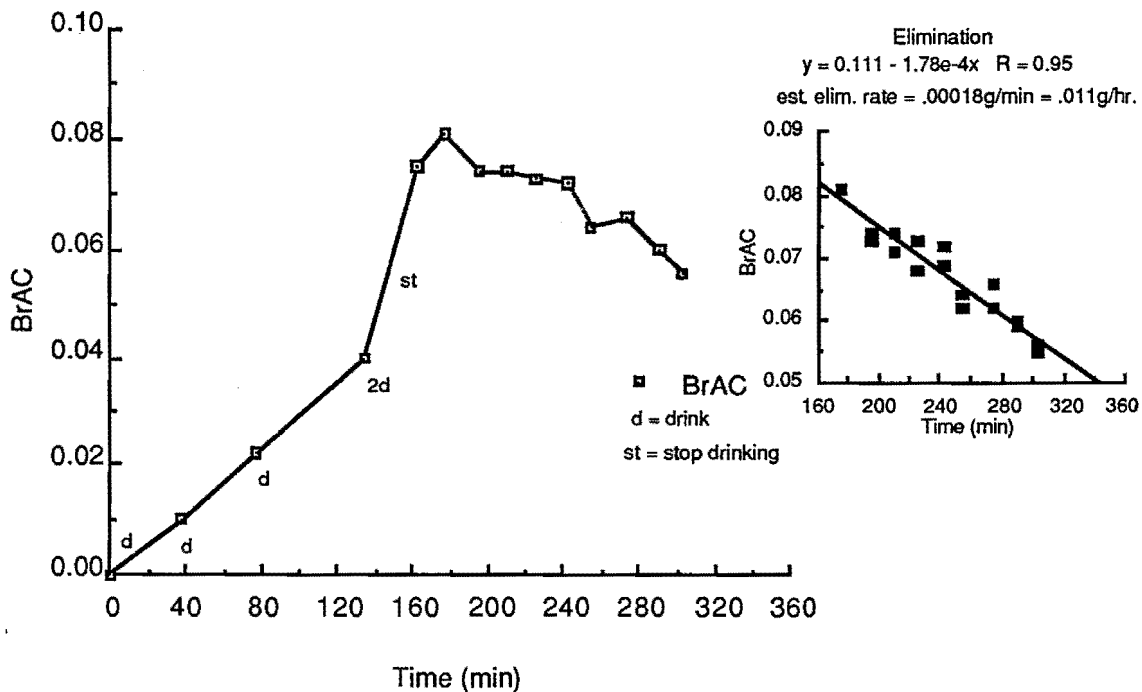
History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking: 2000 hrs.	0	.000	Sex: Male	
	28	.016		
	28	.018		
	Stop Drinking: 2330 hrs.	61	.024	Weight: 180 lbs.
		61	.023	
		102	.039	Ethanol: Beer (4%) 2059 ml
		102	.036	
		132	.060	Food: Chinese dinner 1830-1930
		132	.057	
		180	.053	Stop Drinking: 204 min.
		180	.055	
		219	.064	
		219	.068	
247	.054			
Last Test: 0130 hrs.	247	.056		
	266	.047		
	266	.047		
	294	.044		
	294	.047		
	307	.036		
	324	.035		



Subject 4

History	Time (min)	BrAC (g/210L)	Subject Information
Start Drinking:	0	.000	Sex: Male
2004 hrs.	37	.010	Weight: 160 lbs.
	77	.022	Ethanol: Gin (40%) 250 ml
Stop Drinking:	135	.040	Food: NIDA dinner 1830-1900
2235 hrs.	162	.075	Stop Drinking: 150 min.
	176	.081	
	176	.081	
	196	.073	
	196	.074	
	210	.071	
	210	.074	
	225	.068	
	225	.073	
	242	.069	
	242	.072	
	254	.062	
	254	.064	
	274	.062	
	274	.066	
	290	.059	
	290	.060	
Last Test:	303	.055	
0108 hrs.	303	.056	

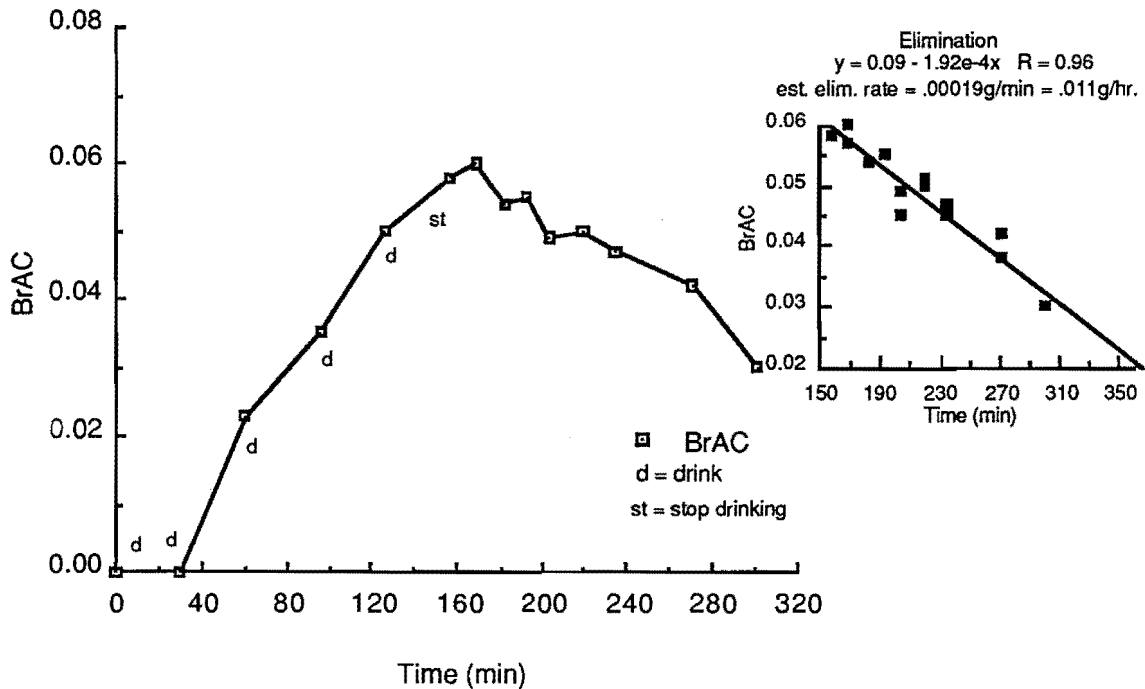
Breath Alcohol Concentration vs. Time



Subject 5

History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking: 1954 hrs.	0	.000	Sex:	Male
	30	.000	Weight:	205 lbs
	60	.023	Ethanol:	Whiskey (40%) 250 ml
	60	.023	Food: NIDA dinner 1830 to 1930	Stop Drinking: 147 min.
	96	.035		
	96	.035		
	126	.050		
	126	.050		
	157	.058		
	168	.057		
168	.060			
Stop Drinking: 2221 hrs.	182	.054		
	182	.054		
	193	.055		
	193	.055		
	204	.049		
	204	.045		
	220	.050		
	220	.051		
	235	.047		
	235	.045		
Last Test: 1255 hrs.	271	.042		
	271	.038		
	301	.030		
	301	.030		

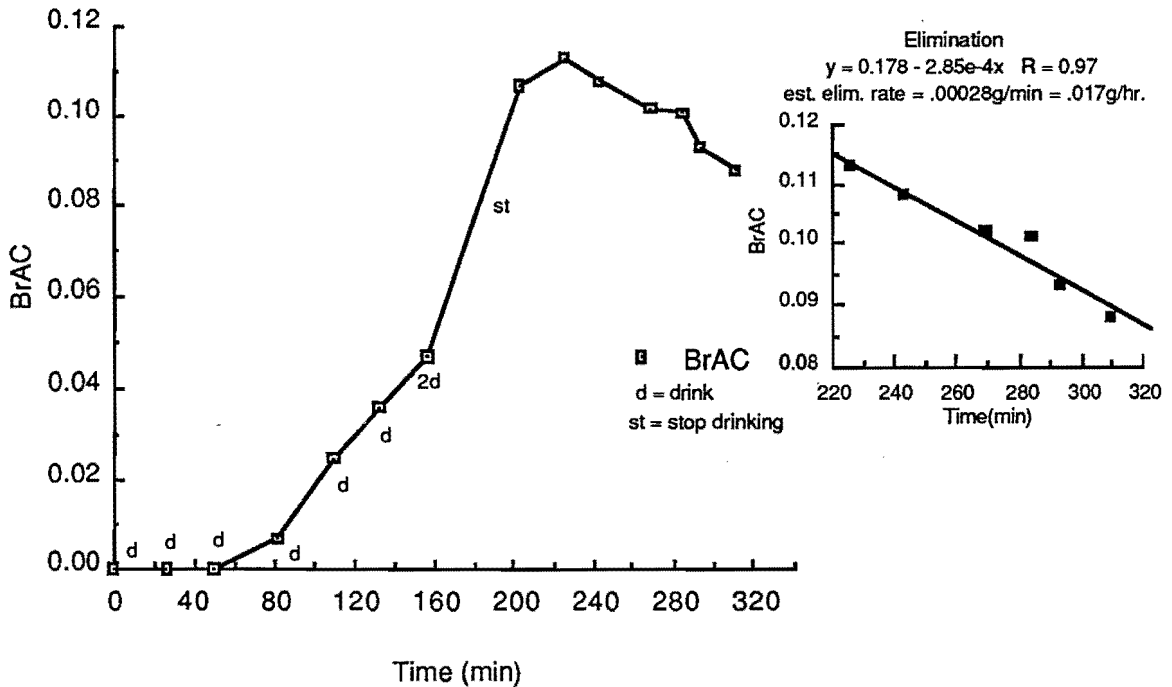
Breath Alcohol Concentration vs. Time



Subject 6

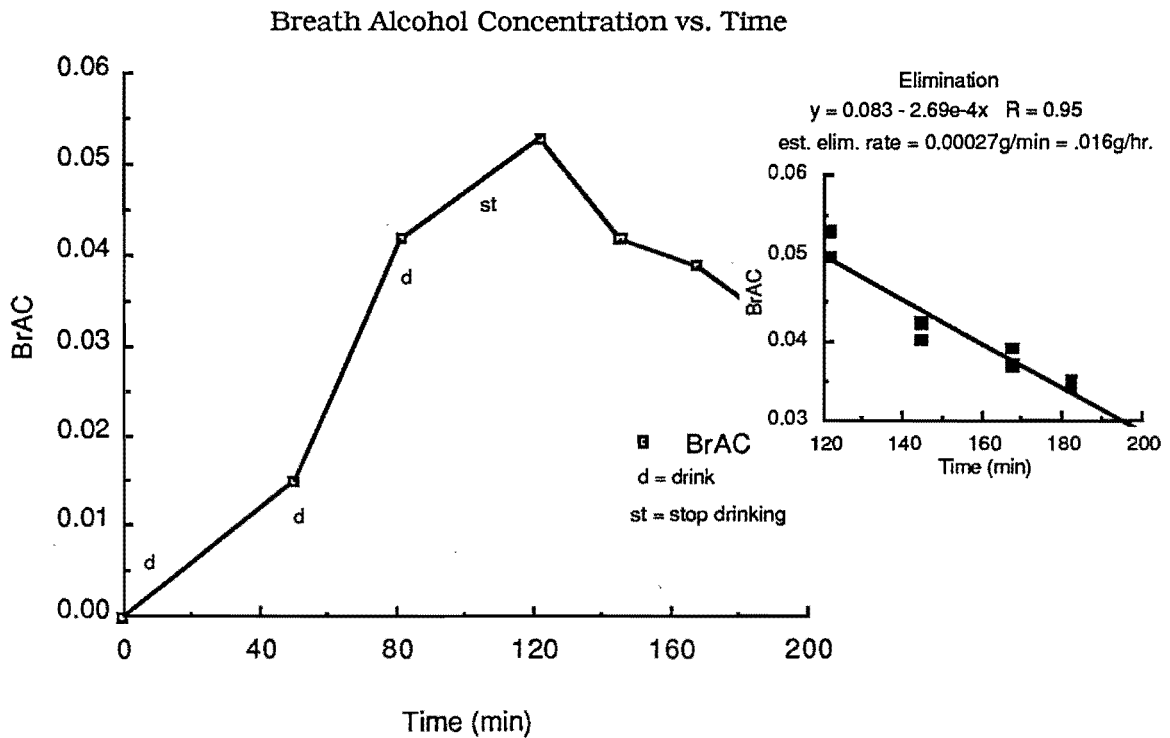
History	Time (min)	BrAC (g/210L)	Subject Information
Start Drinking:	0	.000	Sex: Male
2012 hrs.	26	.000	Weight: 235 lbs
	50	.000	Ethanol: Gin (40%) 400 ml
	82	.007	Food: large meal 1830 to 1930
	82	.007	Stop Drinking: 191 min.
	110	.022	
	110	.025	
	133	.035	
	133	.036	
	156	.038	
Stop Drinking:	156	.047	
2322 hrs.	203	.103	
	203	.107	
	226	.111	
	226	.113	
	243	.107	
	243	.108	
	269	.094	
	269	.102	
	284	.087	
	284	.101	
	293	.086	
	293	.093	
Last Test:	310	.088	
0122 hrs.	310	.088	

Breath Alcohol Concentration vs. Time



Subject 7

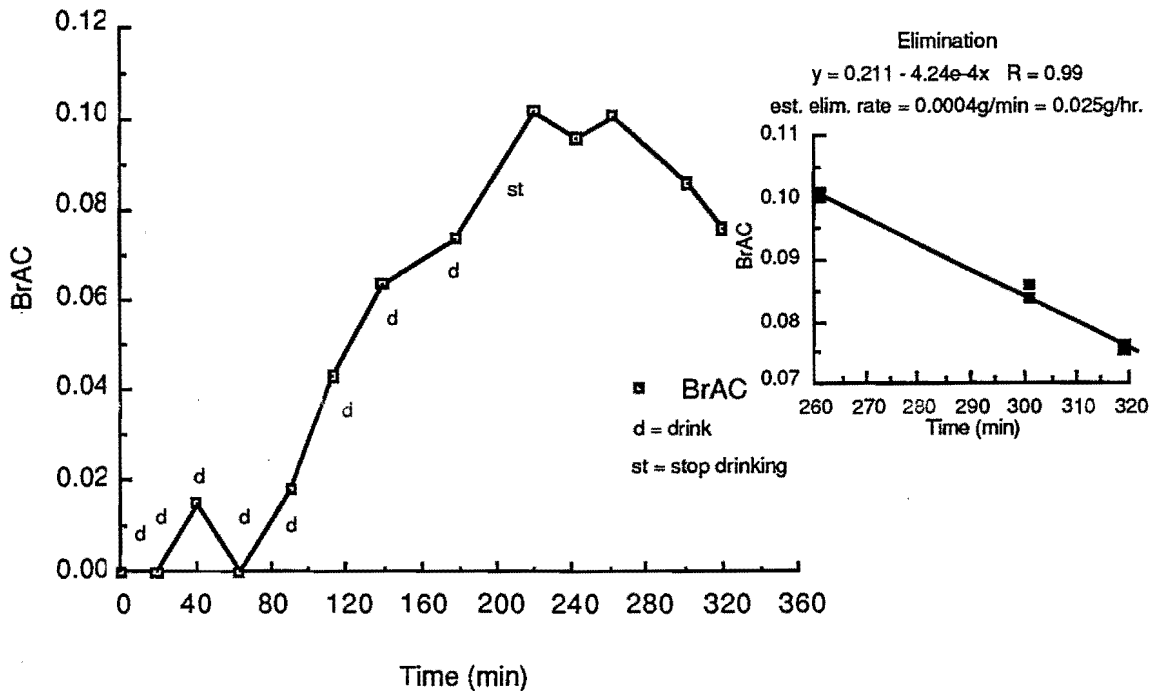
History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking:	0	.000	Sex:	Female
2227 hrs.	50	.015	Weight:	140 lbs.
	81	.042	Ethanol:	Cognac (40%) 120 ml
Stop Drinking:	81	.037	Food:	Lobster dinner 2100 to 2120
0015 hrs.	122	.053	Stop Drinking:	108 min.
	122	.050		
	145	.040		
	145	.042		
	168	.037		
	168	.039		
Last Test:	182	.034		
0129 hrs.	182	.035		



Subject 8

History	Time (min)	BrAC (g/210L)	Subject Information
Start Drinking: 2009 hrs.	0	.000	Sex: Male Weight: 240 lbs. Ethanol: Whiskey (40%) 400 ml Food: Cashews 1700 to 1800 Stop Drinking: 204 min.
	19	.000	
	19	.000	
	40	.015	
	40	.009	
	63	.000	
	63	.000	
	90	.018	
	90	.017	
	113	.043	
	113	.039	
	139	.064	
	139	.059	
	177	.074	
177	.074		
Stop Drinking: 2335 hrs.	220	.102	
	220	.100	
	242	.092	
	242	.096	
	261	.101	
	261	.100	
	301	.084	
Last Test: 0130 hrs.	301	.086	
	319	.076	
319	.075		

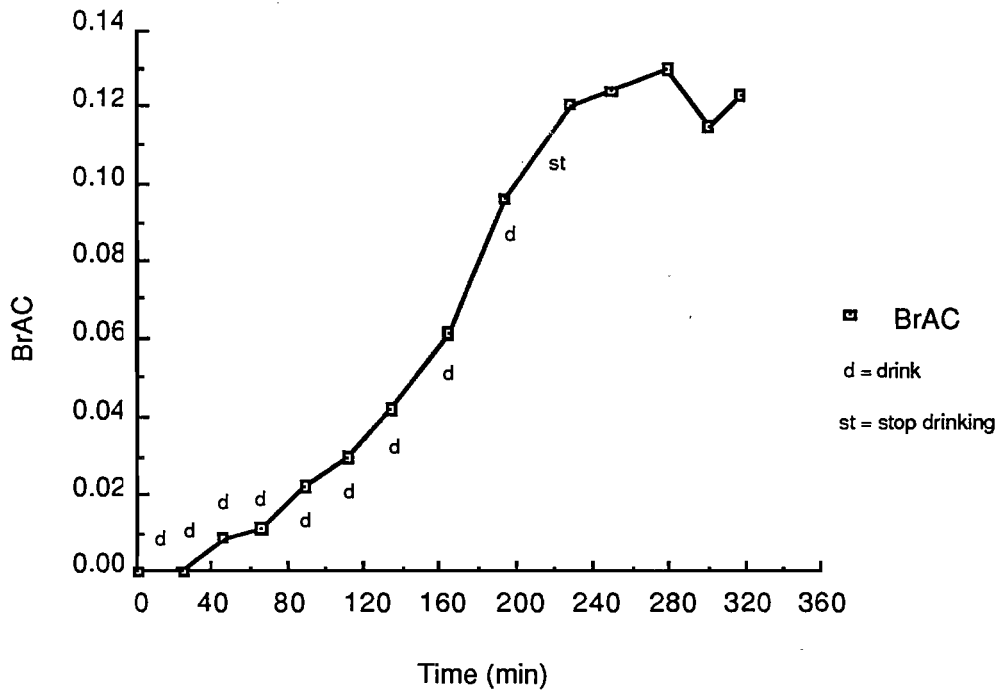
Breath Alcohol Concentration vs. Time



Subject 9

History	Time (min)	BrAC (g/210L)	Subject Information
Start Drinking: 2008 hrs.	0	.000	Sex: Male Weight: 168 lbs. Ethanol: Vodka (40%) 350 ml Beer (4%) 686 ml Food: NIDA dinner 1830-1900 Stop Drinking: 217 min.
	24	.000	
	24	.000	
	45	.000	
	45	.009	
	66	.009	
	66	.011	
	89	.022	
	89	.018	
	112	.030	
	112	.028	
	134	.041	
	134	.042	
	164	.060	
	164	.061	
Stop Drinking: 2345 hrs.	194	.096	
	194	.095	
	228	.121	
	228	.120	
	250	.124	
	250	.123	
	278	.130	
	278	.128	
	300	.115	
	300	.114	
Last Test: 0125 hrs.	317	.114	
	317	.123	

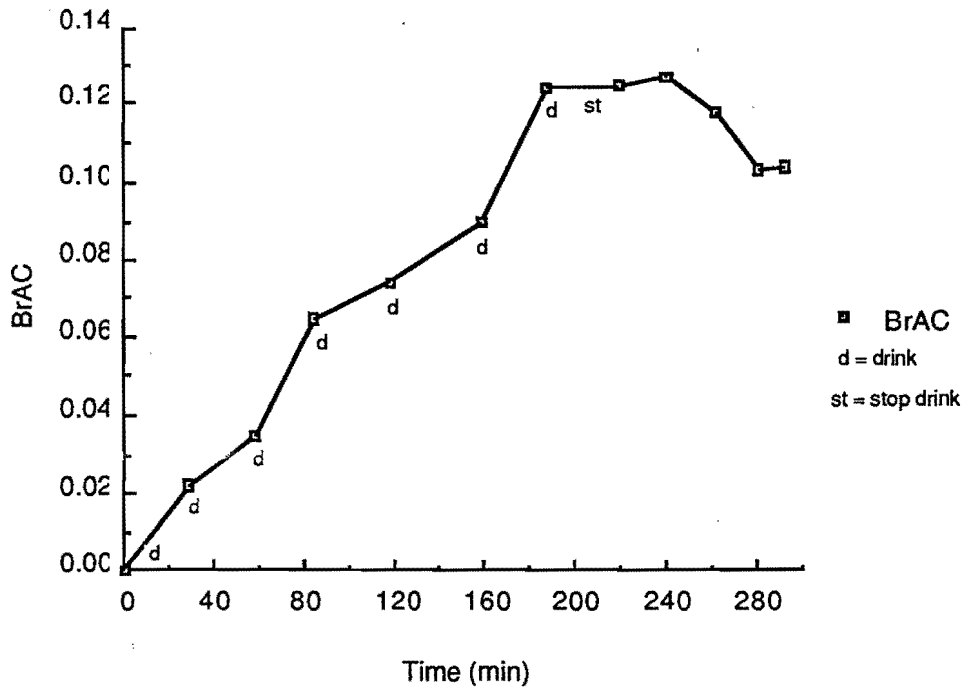
Breath Alcohol Concentration vs. Time



Subject 10

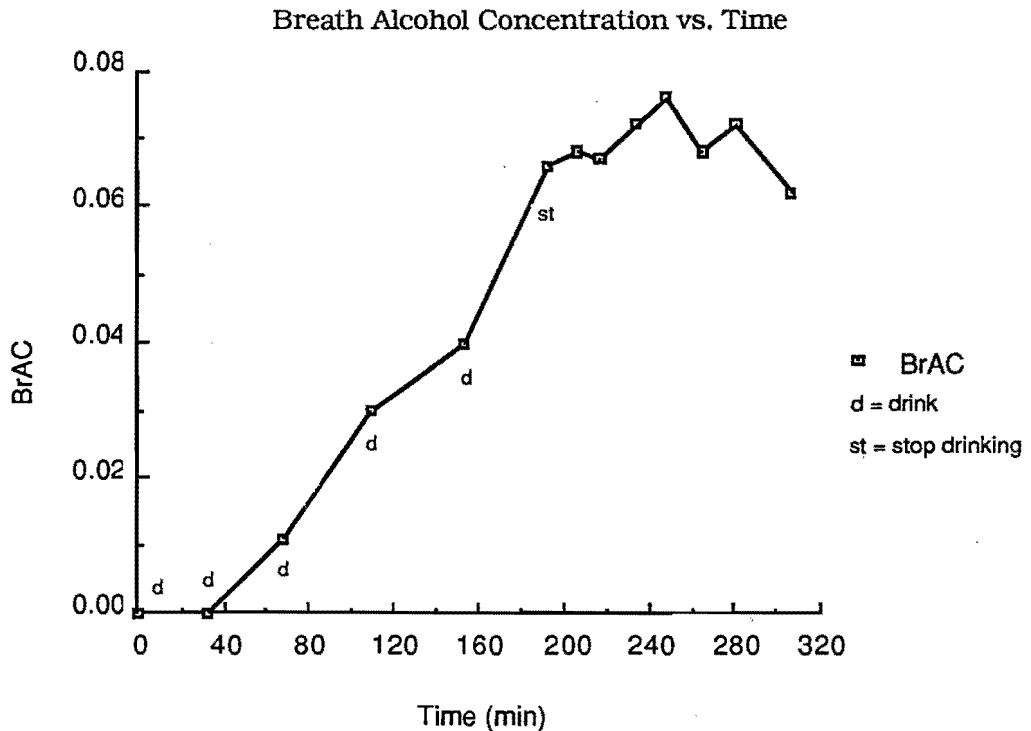
History	Time (min)	BrAC (g/210L)	Subject Information		
Start Drinking: 2001 hrs.	0	.000	Sex:	Male	
	29	.022	Weight:	145 lbs.	
	29	.022	Ethanol:	Vodka (40%) 350 ml	
	58	.035	Food:	NIDA dinner	
	58	.033			
	84	.065	Stop Drinking:	203 mins.	
	84	.053			
	118	.069			
	118	.074			
	159	.090			
	159	.086			
	188	.116			
	Stop Drinking: 2325 hrs.	188	.124		
		219	.124		
219		.125			
240		.127			
240		.112			
262		.118			
262		.109			
281		.098			
281		.103			
Last Test: 0053 hrs.		292	.100		
	292	.104			

Breath Alcohol Concentration vs. Time



Subject 11

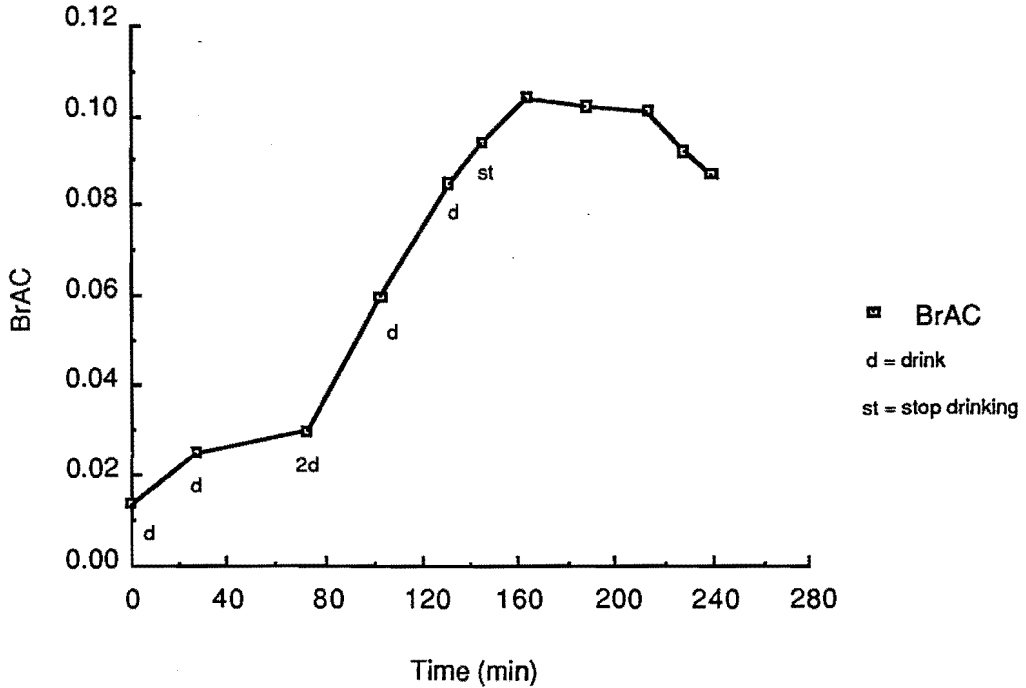
History	Time (min)	BrAC (g/210L)	Subject Information		
Start Drinking: 1959 hrs.	0	.000	Sex:	Male	
	33	.000	Weight:	150 lbs.	
	68	.008	Ethanol:	Gin (40%) 250 ml	
	68	.011	Food:	NIDA dinner	
	109	.027			
	109	.030	Stop Drinking:	179 mins.	
	154	.034			
	Stop Drinking: 2300 hrs.	154	.040		
		191	.065		
		191	.066		
206		.064			
206		.068			
217		.067			
217		.067			
234		.070			
234		.072			
247		.072			
247	.076				
265	.066				
265	.068				
281	.067				
281	.072				
Last Test: 0106 hrs.	306	.058			
	306	.062			



Subject 12

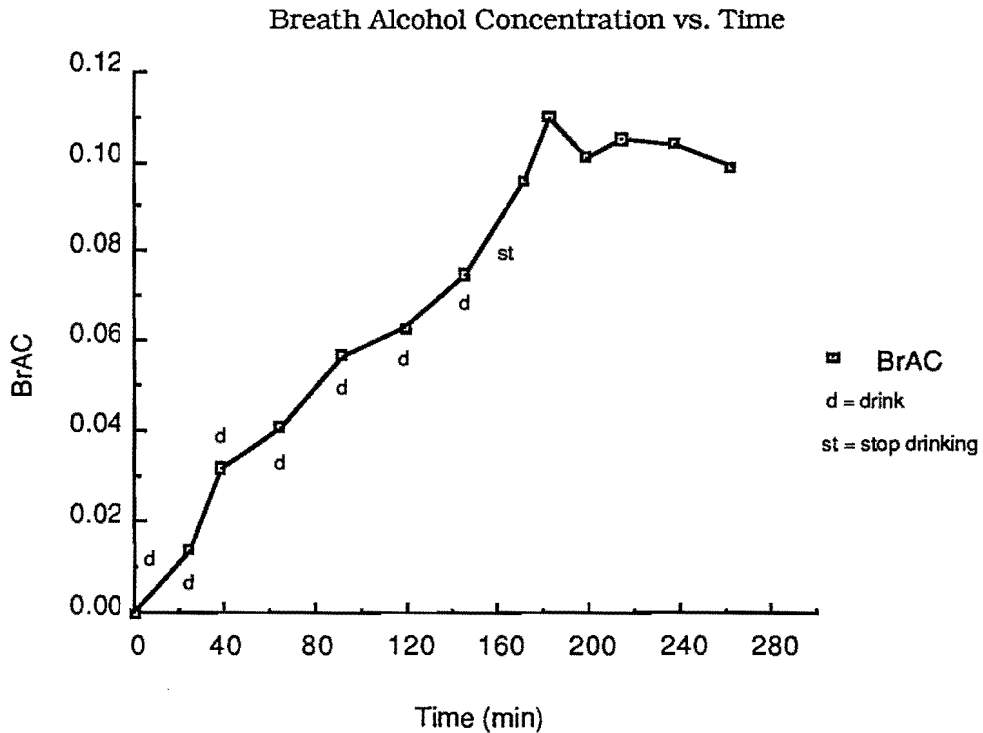
History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking: 2018 hrs.	0	.012	Sex:	Male
	0	.014	Weight:	175 lbs.
	27	.025	Ethanol:	Whiskey (40%) 300 ml
	27	.021	Food: Indian dinner, whiskey 1830-1930	Stop Drinking: 141 min.
	73	.030		
	73	.028		
	103	.060		
	103	.054		
	131	.085		
	Stop Drinking: 2340 hrs.	131		
145		.094		
145		.085		
163		.104		
163		.101		
188		.102		
188		.093		
213		.100		
213		.101		
228		.092		
Last Test: 0126 hrs.	228	.078		
	239	.087		
	239	.083		

Breath Alcohol Concentration vs. Time



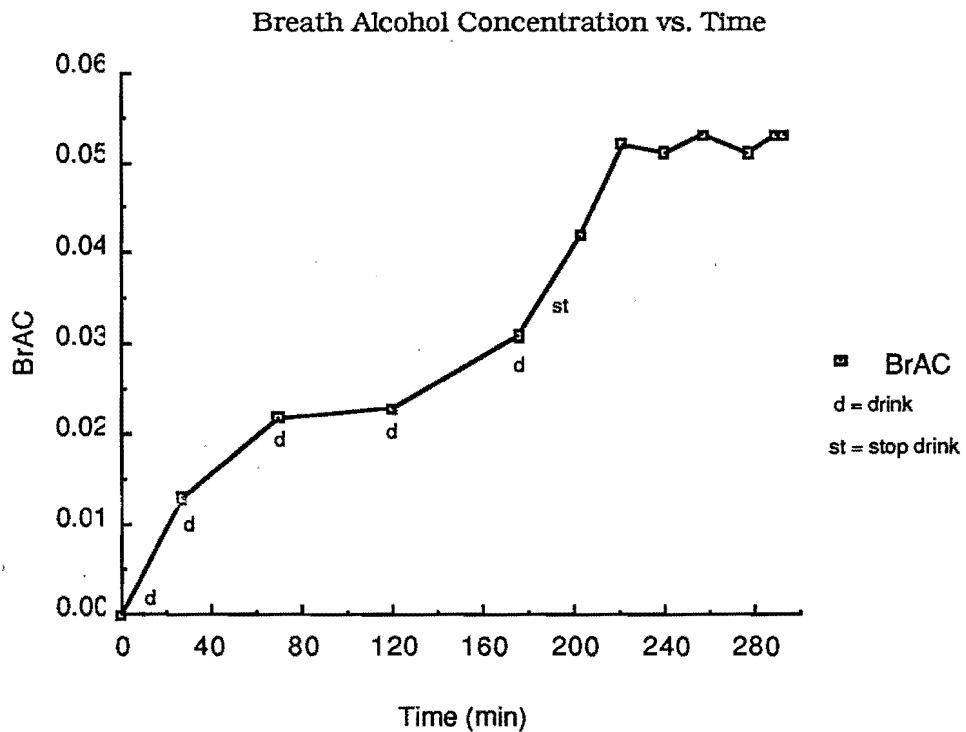
Subject 13

History	Time (min)	BrAC (g/210L)	Subject Information		
Start Drinking: 2002 hrs.	0	.000	Sex:	Male	
	24	.014	Weight:	205 lbs.	
	24	.013			
	38	.032	Ethanol:	Whiskey (40%) 350 ml	
	38	.030			
	64	.041	Food:	NIDA dinner 1830-1900	
	64	.039			
	91	.057	Stop Drinking:	159 min.	
	91	.047			
	Stop Drinking: 2251 hrs.	119	.063		
		119	.059		
		145	.074		
		145	.075		
		171	.095		
171		.096			
182		.110			
182		.104			
198		.095			
198		.101			
214		.105			
214		.105			
Last Test: 0034 hrs.	237	.104			
	237	.091			
	262	.095			
	262	.099			



Subject 14

History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking:	0	.000	Sex:	Male
2000 hrs.	27	.009	Weight:	140 lbs.
	27	.013	Ethanol:	Vodka (40%) 250 ml
	70	.022	Food:	NIDA dinner
	70	.019	Stop Drinking:	195 min.
	120	.023		
	120	.023		
	176	.031		
Stop Drinking:	176	.029		
2315 hrs.	203	.042		
	203	.034		
	221	.052		
	221	.049		
	240	.047		
	240	.051		
	257	.053		
	257	.052		
	277	.051		
	277	.051		
	289	.053		
Last Test:	289	.049		
0103 hrs.	293	.053		



Subject 15

History	Time (min)	BrAC (g/210L)	Subject Information	
Start Drinking: 2100 hrs.	0	.000	Sex:	Female
	16	.000	Weight:	150 lbs.
	16	.000		
	41	.010	Ethanol:	Cognac (40%) 350 ml
	41	.009		
	69	.024		
	69	.024	Food:	Steak dinner 1830-2030
	97	.048		
	97	.053		
	132	.088		
	132	.089	Stop Drinking:	187 min.
	169	.112		
	Stop Drinking: 0012 hrs.	169	.107	
199		.127		
199		.127		
Last Test: 0102 hrs.	234	.129		
	234	.111		

