Final Report

Contract A6-104-30

INDUCTION OF ARYL HYDROCARBON HYDROXYLASE IN CULTURED PERIPHERAL LYMPHOCYTES IN COLLEGE STUDENTS EXPOSED TO AIR POLLUTANTS

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ABSTRACT

Polycyclic aromatic hydrocarbons are known environmental contaminants and are metabolized to active carcinogenic forms by aryl hydrocarbon hydroxylase. In this study it was hypothesized that exposure to heavy air pollutants would result in higher levels of aryl hydrocarbon hydroxylase activity. To test this hypothesis buffy coat cells were isolated from peripheral blood obtained from students residing at two Seventh-day Adventist colleges. One college, Riverside Campus of Loma Linda University, represents a high air pollution exposure site and the other, Pacific Union College, Angwin, CA, represents a low air pollution exposure site. Blood samples were obtained from the same individuals on three different occasions. At each drawing white blood cells were cultured in the presence of mitogens for 48 hours. Cells were then harvested and frozen at -80°C until the enzyme assays were performed. The enzyme assay involved the spectrophotofluorometric detection of phenolic products when samples of cultured cells were incubated in the presence of benzo(a)pyrene. Data are expressed as units per mg cell protein.

Results obtained indicate wide interindividual variation irrespective of residence. Seasonal variations are also indicated. Significantly higher mean units of aryl hydrocarbon hydroxylase activity are associated with those students residing at the Riverside Campus of Loma Linda University. Differences are significant at a p value less than 0.0001. These results suggest that under the conditions employed in this study higher levels of aryl hydrocarbon hydroxylase activity are found in individuals living in geographical regions with high levels of air pollution.

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DISCLAIMER

The statements and conclusions in this report are those of the contractor and not necessarily those of the California Air Resources Board. The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such products.

CONCLUSIONS

Data obtained in this study suggest that metabolism of polycyclic aromatic hydrocarbons differs between human populations exposed to low air pollution levels and those exposed to high air pollution levels. Measurements of aryl hydrocarbon hydroxylase in cultured lymphocytes isolated from student blood samples show large interindividual variation within each population irrespective of the degree of air pollution exposure. When mean values of aryl hydrocarbon hydroxylase activity are compared significant differences exist between the low smog and high smog groups. The greatest difference between these two populations occurred in the 1977 fall assay following the summer season of high smog levels in the south coast basin. This assumes that levels of polycyclic aromatic hydrocarbons correlate directly with smog levels but since the air pollution monitoring stations employed did not register polycyclic aromatic hydrocarbons it is impossible to correlate seasonal values of aryl hydrocarbon hydroxylase activity with levels of polycyclic aromatic hydrocarbons to which the students in this study were exposed.

Although steps were taken to minimize as many variables as possible in this study it is still possible that some as yet undefined laboratory or environmental factor may be responsible for the differences observed and reported here.

RECOMMENDATIONS

As a result of this pilot study it is recommended that a follow-up study be implemented. This study should incorporate the following refinements.

1. The air pollution monitoring facilities on both college campuses should be modified to measure levels of polycyclic aromatic hydrocarbons (benzo(a)pyrene) in ambient air.

2. Students should be pre-screened to eliminate as many variables as possible and fewer numbers of students should be employed.

3. To minimize variability assays should be performed on cultured monocytes that are isolated from student blood samples.

4. A more sensitive spectrophotofluorometric instrument should be utilized during assays to determine aryl hydrocarbon hydroxylase activity.

5. Assays should be performed on monocytes isolated from student blood samples at four different times. At the beginning of the academic year as students arrive on campus, at the beginning of the winter quarter and spring quarter and finally at the beginning of the fall quarter of the following academic year. This will make it possible to follow each student through the course of one full year.

6. Using high pressure liquid chromatographic techniques the metabolic profile of randomly selected cultures should be analyzed to determine whether the metabolic products include active carcinogenic compounds.

INTRODUCTION

Polycyclic aromatic hydrocarbons are recognized environmental contaminants. They are released into the environment with the incomplete combustion of organic material. Polycyclic aromatic hydrocarbons (PAH) are present then in cigarette smoke, burning refuse, automobile exhaust emissions and in emissions from the making of coke or from oil refineries (1). Studies of exposure of humans to polycyclic aromatic hydrocarbons is limited primarily to smokers and to workers in selected occupations. PAH emissions from motor vehicles are substantially reduced by the statutory standards for lowering the content of carbon monoxide and hydrocarbons in exhaust emissions (2). In calculations of human exposure to benzo(a)pyrene (BP), a commonly monitored polycyclic aromatic hydrocarbon, values are highest for coke oven workers and coal tar pitch workers (2). Although BP emissions from motor vehicles represents a relatively small source compared to other sources they may be important in the total exposure to the nonsmoking commuter.

Carcinogenic effects of polycyclic aromatic hydrocarbons have been recognized for years and a voluminous amount of reference material is available which describes in vivo and in vitro studies of chemical carcinogenesis. Benzo(a)pyrene is a representative PAH whose chemical and biological action has been studied extensively. BP is a recognized air pollutant and it has been estimated that 2000 tons of BP are emitted into the atmosphere over the United States each year (1). BP is not the ultimate carcinogen but must be metabolized to form active intermediates which act as the ultimate carcinogen. Evidence suggests that the ultimate carcinogenic agent binds to cellular macromolecules (DNA, RNA, protein) to alter cellular function and induce the abnormal changes associated with cancer. The intermediates of BP metabolism that are suspect include arene oxides and diol epoxides (3).

Polycyclic aromatic hydrocarbons including BP are metabolized by a membrane associated mixed function oxygenase enzyme called aryl hydrocarbon hydroxylase (AHH) (4). The AHH enzyme system may play a key role in the metabolic activation of PAH substances and in the carcinogenic process. Exposure to polycyclic aromatic hydrocarbons induces AHH activity in most mammalian tissues (5) including cultured human lymphocytes (6), monocytes (7), and pulmonary macrophages (8).

Since benzo(a)pyrene is a recognized environmental pollutant and its presence is associated with heavily industrialized urban settings it was proposed that a study of the induction of aryl hydrocarbon hydroxylase in cultured human lymphocytes be undertaken. In this study a comparison is made between two groups. One represents exposure to low ambient air pollutants and the other exposure to high air pollution. An initial basic assumption in the design of this study was that the level of air pollution will also reflect differences in the exposure to polycyclic aromatic hydrocarbons and that this difference in exposure to PAH will be reflected in measured differences in the activity of the AHH enzyme system in cultured peripheral lymphocytes in the two populations. To minimize variables and to select as homogeneous a population as possible it was proposed that blood samples be

taken from freshman college students on two Seventh-day Adventist undergraduate campuses. Pacific Union College, Angwin, California represents the low smog environment and the Riverside Campus of Loma Linda University represents the high smog environment. Health standards adopted by Seventh-day Adventists includes abstinence from the use of tobacco, drugs and alcoholic beverages. Since AHH enzyme activity is affected by a variety of chemical agents including tobacco, drugs and alcohol the selection of subjects from these two college campuses should provide relatively homogeneous groups with the important variable being the air pollution level.

MATERIALS AND METHODS

Peripheral blood was obtained in heparinized vacutaners from individual students on each college campus. In 1976 individual samples were collected on the dates November 7-10 at Pacific Union College and November 14-17 at Loma Linda University, Riverside Campus. Two collections were made in 1977 at each campus, April 10-13 and September 23-29 at Pacific Union College and April 17-20 and September 30 - October 5 at Loma Linda University, Riverside Campus. Samples collected at Pacific Union College were flown by private plane to the Loma Linda Campus of Loma Linda University.

Upon arrival blood samples were centrifuged at 420Xg for 6 minutes and the serum was discarded. The buffy coat layer containing the lymphocytes was removed and placed in a sterile 5 ml disposable centrifuge tube. Contaminating red blood cells were lysed by adding 3 ml ACK lysing buffer (9) with gentle agitation at 4°C for 4 min. Cells were then centrifuged at 180Xg and the supernatant was discarded. The cell pellet was resuspended in 20 ml RPMI 1640 culture medium (Grand Island Biological Co.) containing 15 percent fetal calf serum (Grand Island Biological Co.), 1% phytohemagglutinin (PHA), 1% pokeweed mitogen (PWM), 70 µg/ml heparin and antibiotics. PHA, PWM and antibiotics were purchased from Grand Island Biological Co. Heparin was obtained from Sigma Chemical Co. Lymphocytes were cultured in 25 cm^2 tissue culture flasks (Corning) at 37°C for 48 hrs.

Lymphocyte cultures were harvested after 48 hrs by centrifugation at 250Xg. The supernatant was discarded and the cells were washed twice in chilled Moscona's saline (10). The cells were pelleted by centrifugation at 180Xg and frozen as a pellet in 1 ml of TMS buffer at -80°C. TMS buffer contains 50 m Moles Tris - HCl (pH 7.5), 3 m Moles $MgCl_2$ and 0.2 M sucrose (6).

Assays for aryl hydrocarbon hydroxylase activity were determined by a modified procedure (4, 6). Frozen samples were thawed and cells were resuspended in 1.75 ml TMS buffer. A 0.25 ml aliquot was removed for protein determination. Assays on whole cell samples (11) were run in duplicate. Each sample was incubated for 30 min at 37°C in a final volume of 1.1 ml containing 1.0 mg of reduced nicotinamide adenine dinucleotide (Sigma Chemical Co.) and 25 µg of benzo(a)pyrene. The reaction conducted in the dark was stopped by the addition of 4 ml of an acetone, hexane mixture (1:3) and shaking for 3 min. The phases were separated by centrifugation at 180Xg and 1 ml of the

organic phase was extracted with 3 ml of 1 N NaOH. The aqueous and organic phases were separated by centrifugation (180Xg) and fluorescence in the aqueous phase was determined spectrophotofluorometrically (4). Measurements were compared to those of a standard 3-hydroxybenzo(a)pyrene solution. Values were corrected by subtracting the fluorescence of a reaction mixture containing all the component chemicals but no cells. AHH enzyme activity was expressed as units per mg cell protein where a unit is defined as that catalyzing in 30 min the formation of phenolic products with fluorescence equal to 1 p mole of 3-hydroxybenzo(a)pyrene. Cellular protein was determined by a modification of the Wu-Herriott procedure (12).

Nontechnical Description of Culture and Analysis Procedures

The buffy coat layer containing the lymphocytes was carefully removed from each centrifuged blood sample. The cells in this layer were resuspended in culture medium containing 15 percent fetal calf serum, 1% phytohemagglutinin, 1% pokeweed mitogen, heparin and antibiotics. The chemicals phytohemagglutinin and pokeweed mitogens act to stimulate cell division in lymphocytes. The blood cells were kept in an incubator at 37°C for 48 hrs. After 48 hrs the culture medium from each flask was centrifuged and the cells growing in the medium were washed in a buffer solution and frozen at -80°C until the assay for aryl hydrocarbon hydroxylase was performed. Assays for the enzyme aryl hydrocarbon hydroxylase (AHH) were performed on thawed cell samples by incubating the cells in the presence of benzo(a)pyrene for 30 min. The metabolic products were extracted with NaOH and the fluorescence of these phenolic products was then measured and compared to a standard 3-hydroxybenzo(a)pyrene fluorescence curve. AHH activity was expressed as units per milligram of cell protein. Cell protein determinations were made by reacting small aliquots of cell samples with diphenylamine. The intensity of the color reaction was then measured and the results were read from a standard curve.

RESULTS

Table I illustrates aryl hydrocarbon hydroxylase activity in cultured lymphocytes obtained from peripheral blood from students residing at the campus of Pacific Union College, Angwin, California. This private parochial college is geographically located in a low air pollution setting. Mean values of AHH activity expressed as units per mg cell protein are shown for samples assayed in the spring and fall of 1977. Questionnaires obtained from each student at each blood drawing were analyzed. Students who were sick, on medication within 4 weeks of the blood drawing or who were frequent or occasional smokers of either tobacco or marijuana are classified as a separate group in each table. Group A includes all student samples assayed. Group B includes only data from students who were sick, on medication or smoking. Group C is composed of data from those students in Group A that are not included in Group B. In the fall data shown in Table I Group B also includes those students who were in a high air pollution environment during the last 4 weeks of the summer of 1977. Differences between mean ($\bar{x}$)

values of AHH activity of all samples and those of the other two categories in Table I are not significant at a p = 0.05 level. This is true for both the spring and fall assays. Differences in mean values between any comparable group assayed in the spring as compared with that in the fall are not significant at the p = 0.05 level.

Table I. AHH activity in cultured lymphocytes obtained from peripheral blood from students at Pacific Union College. Blood samples were drawn in April and September, 1977. Group A includes all student samples. Group B includes students who were sick, on medication or smoking. Group C represents those students in Group A that are not included in Group B.

	Spring			Fall		
GROUP	N[a]	$\bar{x}$[b]	S.E.M.[b]	N[a]	$\bar{x}$[b]	S.E.B.[b]
A	184	5.22	0.34	136	5.34	0.45
B	91	5.1	0.5	87	5.36	0.5
C	93	5.34	0.48	49	5.29	0.59

[a]N = number of samples used to compute the mean. Lymphocyte samples from each student were assayed in duplicate and averaged. Actual number of samples assayed is twice N.

[b]Mean($\bar{x}$) and standard error of the mean (S.E.M.) values are expressed as units per mg cell protein. A unit is defined as that catalyzing in 30 min the formation of phenolic products with fluorescence equal to 1 p mole 3-hydroxybenzo(a)pyrene. Culture and assay procedures are described in Materials and Methods.

Table II shows aryl hydrocarbon hydroxylase activity in cultured lymphocytes obtained from peripheral blood from students at the Loma Linda University, Riverside Campus, Riverside, CA. This college is geographically situated in the south coast basin in a high air pollution setting. Students who were sick, on medication, or smoking during the four weeks prior to the blood drawing are categorized separately in Group B. In the fall data shown in Table II Group B also includes those students who were in a low air pollution environment during the last 4 weeks of the summer of 1977. The statistical significance of differences between groups in the spring assay is equivocal and is not significant at the p = 0.05 level. A significant difference does exist when groups are compared between the spring and fall assays.

Table II. AHH activity in cultured lymphocytes obtained from peripheral blood from students at Loma Linda University, Riverside Campus. Blood samples were collected in April, late September and early October, 1977. Group A includes all student samples. Group B includes students who were sick, on medication or smoking. Group C includes those students in Group A that are not included in Group B.

GROUP	Spring			Fall		
	N[a]	$\bar{x}$[b]	S.E.M.[b]	N[a]	$\bar{x}$[b]	S.E.M.[b]
A	175	6.86	0.32	183	9.77	0.49
B	73	6.05	0.47	109	9.8	0.63
C	102	7.45	0.43	74	9.86	0.77

[a]N = number of samples used to compute the mean. Lymphocyte samples from each student were assayed in duplicate and averaged. Actual number of samples assayed is twice N.

[b]Mean ($\bar{x}$) and standard error of the mean (S.E.M.) values are expressed as units per mg cell protein. A unit is defined as that catalyzing in 30 min the formation of phenolic products with fluorescence equal to 1 p mole of 3-hydroxybenzo(a)pyrene. Culture and assay procedures are described in Materials and Methods.

In Table III mean values of AHH activity are compared between lymphocyte samples assayed from students representing the low air pollution environment at Pacific Union College and those from the high air pollution environment at Loma Linda University, Riverside Campus, for both the spring and fall blood drawings. Differences between values obtained at each campus for both the spring and fall assays are significant at p values less than 0.0001. The difference is particularly striking when comparisons of the fall assay are made.

Table III. A comparison of AHH activity of all lymphocyte samples assayed from students at Pacific Union College with those from Loma Linda University, Riverside Campus for both the 1977 spring and fall blood drawings.

College Represented	Spring		Fall	
	$\bar{x}$[a]	S.E.M.[a]	$\bar{x}$[a]	S.E.M.[a]
Pacific Union Angwin, CA	5.22	0.34	5.34	0.45
Loma Linda Riverside, CA	6.86	0.32	9.77	0.49

[a] Mean $\bar{x}$ and standard error of the mean (S.E.M.) values are expressed as units per mg cell protein. A unit is defined as that catalyzing in 30 minutes the formation of phenolic products with fluorescence equal to 1 p mole of 3-hydroxybenzo(a)pyrene. Culture and assay procedures are described in Materials and Methods.

AHH activity is not given for samples collected in November of 1976 since technical difficulties invalidates the data obtained.

DISCUSSION

Measurements of aryl hydrocarbon hydroxylase activity is an index of the capacity of cells and tissues to metabolize polycyclic aromatic hydrocarbons. PAH compounds are recognized environmental contaminants and members of this group are known carcinogens. Studies of carcinogen metabolism in humans have been accomplished using cultured lymphocytes isolated from blood (6,7). The significance of PAH metabolism is under investigation in a number of laboratories. Studies indicate that a number of metabolic intermediates have enhanced carcinogenicity over that of the parent compound (13). Since humans are exposed to these environmental contaminants studies of metabolic activation using human cells are necessary. Data suggest that AHH induction in humans is under genetic control (14) and that genetic rather than environmental factors are responsible for the inter-individual variability (15).

Individual data of AHH activity as reported in this study (Appendix) shows tremendous variability. This has been reported by others (15,16). Seasonal variations also occur with higher AHH activity occurring in the summer and fall (17). Seasonal variation is seen in comparing the AHH activity of samples assayed in the spring with those assayed in the fall for students at Loma Linda University, Riverside Campus (Table II) but not

for students at Pacific Union College (Table I). Although benzo(a)pyrene was not monitored by the air monitoring stations located on these two college campuses it is assumed that levels of PAH compounds in the atmosphere correlate with smog levels. Particularly in the south coast basin the summer season is marked by high air pollution levels. If PAH levels are higher at this time and humans are exposed this could account for the significantly higher levels of AHH activity seen in cultured lymphocytes from students on the Loma Linda University, Riverside Campus at the fall sampling. Since students residing at Pacific Union College are exposed to a low air pollution environment without seasonal fluctuations one might expect to see little or no variation in mean levels of AHH activity as shown in Table I. Students at Pacific Union College who were exposed to a high smog environment during the last 4 weeks of summer vacation and students at Loma Linda University, Riverside Campus, who were exposed to a low smog environment during the last 4 weeks of summer vacation are included in Group B of the fall data along with students who had been sick or were on medication. The number of students in the fall sampling at each campus that were placed in Group B solely on the basis of summer residence was too small to permit a valid comparison of AHH activity with all samples assayed (Group A). Most of these students were also sick and/or on medication. Fewer than 10 percent were smoking.

The values of AHH activity indicated in this report are several-fold higher than those given for cultured lymphocytes previously isolated by sedimentation on Ficoll-Hypaque gradients (17) but compare favorably with values obtained from induced monocytes (18). Different quantitation procedures make it difficult to make comparisons however. This report describes data obtained on AHH activity in cells in the buffy coat which would include lymphocytes and monocytes. This could account for the higher values obtained and for the greater variability. It seems unlikely that genetic factors would account for the differences in AHH activity observed in students from the two campuses since the sample size in each case was large.

A number of factors are known to affect AHH activity. These include cell density, storage of blood, exposure to mitogens, variations in culture medium, serum and culture conditions (19). It is possible that some of the conditions listed above could account for the variability in this study. This is particularly true for the starting cell density and blood storage conditions. Studies indicate a 50 percent reduction in AHH activity in lymphocytes isolated from whole blood stored for 24 hrs (19). Blood collected at Pacific Union College was in storage from 4 to 6 hrs longer because of the transit time and this may be a significant factor contributing to the lower mean values of AHH activity in student lymphocyte samples from this campus. The quantity of cells put in culture differed from sample to sample but the large number of samples employed should negate this as being a significant variable. The same lots of serum, culture medium, and mitogens were used in this study so that variations caused by different lots of these materials should be minimal.

Aryl hydrocarbon hydroxylase metabolizes polycyclic aromatic hydrocarbons and is a component of the mixed-function oxygenases which metabolize

steroid hormones, drugs and insecticides (17). Although cigarette smoke is known to contain benzo(a)pyrene attempts to measure differences in levels of AHH activity between smokers and nonsmokers has been inconclusive. Since AHH can be induced by a variety of chemical agents, information concerning the habits and background of each individual is critical to any evaluation of the effects of environmental factors on AHH activity.

The data reported here suggest that environmental exposure to air pollutants induces AHH activity in cultured lymphocytes. Other studies are essential to a determination of the validity of this conclusion. The most reliable and least variable approach would be to measure AHH activity in cultured monocytes (16,18) and correlate AHH activity with ambient levels of polycyclic aromatic hydrocarbons (i.e. benzo(a)pyrene). These kinds of studies could be useful for evaluating the role of air pollutants (PAH) in the carcinogenic process.

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APPENDIX

Individual Data - Pacific Union College
Spring 1977

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
6004[a]	.047	1	0.149	3.170	6165[a]	.090	3	0.596	6.622
6038	.167	2.5	0.485	2.904	6168[a]	.093	2	0.373	4.011
6072	.057	1	0.149	2.614	6173	.043	2	0.373	8.674
6086	.108	3	0.596	5.519	6185[a]	.195	2	0.373	1.913
6087	.060	3	0.596	9.933	6188[a]	.111	1	0.149	1.342
6096[a]	.210	1.5	0.261	1.243	6189	.087	1	0.149	1.713
6101	.066	3	0.596	9.030	6191	.145	0.5	0.37	0.255
6104[a]	.063	0.5	0.037	0.587	6196	.198	0	0	0
6110	.113	0.5	0.037	0.327	6199	.094	4	0.820	8.723
6112[a]	.104	1.5	0.261	2.510	6201[a]	.035	3	0.596	17.029
6114[a]	.074	1	0.149	2.014	6204	.097	4	0.820	8.454
6116[a]	.183	2	0.373	2.038	6209[a]	.128	0.5	0.037	0.289
6124[a]	.047	0	0	0	6212[a]	.084	3	0.596	7.095
6125[a]	.029	2.5	0.485	16.724	6215[a]	.067	0.5	0.037	0.552
6127[a]	.076	2.5	0.485	6.382	6216[a]	.045	2	0.373	8.289
6128[a]	.147	8.5	1.826	12.422	6217[a]	.149	7	1.491	10.007
6129	.148	1	0.149	1.007	6219[a]	.149	3.5	0.708	4.752
6130[a]	.090	1.5	0.261	2.900	6220[a]	.053	0	0	0
6131[a]	.136	1	0.149	1.096	6221	.164	17	3.727	22.726
6134[a]	.063	1.5	0.261	4.143	6222[a]	.155	6	1.267	8.174
6140[a]	.098	2.5	0.485	4.949	6223[a]	.103	4	0.820	7.961
6141[a]	.080	1.5	0.261	3.263	6228	.140	3.5	0.708	5.057
6142[a]	.150	3.5	0.708	4.720	6229[a]	.057	1.5	0.261	4.579
6143[a]	.117	3	0.596	5.094	6233[a]	.129	5	1.044	8.093
6147[a]	.136	2	0.373	2.743	6236[a]	.143	3.5	0.708	4.951
6149[a]	.059	0	0	0	6239	.054	1	0.149	2.759
6153	.077	2	0.373	4.844	6240	.115	4	0.820	7.130
6159[a]	.148	1	0.149	1.007	6242[a]	.170	1	0.149	0.876
6160[a]	.104	2.5	0.485	4.663	6244[a]	.182	1	0.149	0.819
6162[a]	.107	1.5	0.261	2.439	6245[a]	.062	3.5	0.708	11.419

Individual Data-Pacific Union College (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein
6247[a]	.131	3	0.596	4.550	6464	.076	4	0.820	10.789
6248[a]	.051	1	0.149	2.923	6467	.083	3	0.596	7.181
6249[a]	.090	0	0	0	6482	.107	3.5	0.708	6.617
6253	.045	0	0	0	6483[a]	.068	3	0.596	8.765
6254	.119	5.5	1.155	9.706	6493[a]	.216	4.5	0.932	4.315
6255[a]	.093	3	0.596	6.409	6505[a]	.123	2	0.373	3.033
6256[a]	.091	3.5	0.708	7.780	6506	.078	1.5	0.261	3.346
6261[a]	.131	7.5	1.677	12.802	6516[a]	.098	3.5	0.708	7.224
6274[a]	.1	3.5	0.708	7.080	6521[a]	.094	10	2.162	23.000
6275[a]	.15	3.5	0.708	4.720	6543[a]	.097	0	0	0
6277[a]	.097	3	0.596	6.144	6545	.08	3	0.596	7.450
6282[a]	.147	2	0.373	2.537	6547	.142	12	2.609	18.373
6297	.039	0.5	0.037	0.949	6549	.042	0	0	0
6324	.113	3.5	0.708	6.265	6550	.048	1	0.149	3.104
6338[a]	.099	3	0.596	6.020	6555	.095	4	0.820	8.632
6349	.041	0.5	0.037	0.902	6557	.107	1	0.149	1.393
6354[a]	.068	2.5	0.485	7.132	6558	.103	2	0.373	3.621
6372	.113	6.5	1.379	12.204	6568	.082	5	1.044	12.732
6373	.117	1	0.149	1.274	6578	.101	1.5	0.261	2.584
6381	.098	0	0	0	6583[a]	.047	2.5	0.485	10.319
6400[a]	.109	0.5	0.037	0.339	6587	.166	1.5	0.261	1.572
6409	.1	2.5	0.485	4.850	6588	.099	2	0.373	3.768
6416[a]	.069	2	0.373	5.406	6602[a]	.135	5.5	1.155	8.556
6427	.115	9	1.938	16.852	6604	.107	3	0.596	5.570
6429	.113	1.5	0.261	2.310	6607[a]	.072	3	0.596	8.278
6430	.115	3.5	0.708	6.157	6614	.118	2	0.373	3.161
6432	.092	2	0.373	4.054	6619	.078	2.5	0.485	6.218
6434	.185	4	0.820	4.505	6620	.053	1	0.149	2.811
6435	.159	3	0.596	3.748	6638	.118	0	0	0
6437	.113	2.5	0.485	4.292	6643	.178	2	0.373	2.096
6454	.125	4	0.820	6.560	6646	.031	0	0	0
6457[a]	.027	1	0.149	5.519	6650	.053	1.5	0.261	4.925

Individual Data-Pacific Union College (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein
6664	.059	3.5	0.708	12.000	6794	.127	4	0.820	6.457
6668[a]	.052	1	0.149	2.865	6798	.096	1	0.149	1.552
6671	.101	0	0	0	6814	.116	0	0	0
6679	.046	0.5	0.037	0.804	6840[a]	.053	1	0.149	2.811
6683	.030	0	0	0	6850	.071	2	0.373	5.254
6685[a]	.123	1.5	0.261	2.122	6852	.083	2	0.373	4.494
6688	.093	3	0.596	6.409	6856	.05	1	0.149	2.980
6691	.062	1.5	0.261	4.210	6858[a]	.092	3	0.596	6.478
6693	.083	0	0	0	6859[a]	.065	2.5	0.485	7.462
6705[a]	.111	2	0.373	3.360	6863[a]	.064	1	0.149	2.328
6707	.139	3	0.596	4.288	6868	.082	0	0	0
6713	.136	0	0	0	6897[a]	.108	8	1.714	15.870
6714[a]	.104	0	0	0	6899[a]	.113	6	1.267	11.212
6720	.085	2.5	0.485	5.706	6900[a]	.094	5.5	1.155	12.287
6721[a]	.112	2	0.373	3.330	6901[a]	.118	9	1.938	16.424
6724	.063	0	0	0	6902[a]	.122	3.5	0.708	5.802
6725[a]	.069	1	0.149	2.159	6903[a]	.084	2	0.373	4.440
6726[a]	.019	1	0.149	7.842	6905[a]	.06	2.5	0.485	8.083
6727	.060	1	0.149	2.483	6907[a]	.103	2	0.373	3.621
6730	.114	2	0.373	3.272	6908[a]	.152	4	0.820	5.395
6733	.097	4	0.820	8.454	6910[a]	.128	0	0	0
6734	.117	6.5	1.379	11.786	6913[a]	.084	3	0.596	7.095
6738[a]	.056	1	0.149	2.661	6914[a]	.07	2	0.373	5.329
6741	.092	0.5	0.037	0.402	6915[a]	.037	0	0	0
6744	.076	1.5	0.261	3.434	6916[a]	.069	0	0	0
6749	.153	0	0	0	6917	.114	3	0.596	5.228
6761	.157	2.5	0.485	3.089	6935[a]	.081	6.5	1.379	17.025
6775[a]	.161	2	0.373	2.317	6950	.093	4	0.820	8.817
6777	.077	7	1.491	19.364	6951	.149	4.5	0.932	6.255
6779	.077	4.5	0.932	12.104					
6790	.065	5	1.044	16.062					
6792	.07	2	0.373	5.329					

[a] Student was sick or had been on medication sometime during the four weeks prior to the blood drawing.

Individual Data - Loma Linda University, Riverside Campus
Spring 1977

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
5005	.063	4	0.820	13.016	5073[a]	.138	6	1.267	9.181
5006	.098	2	0.373	3.806	5074[a]	.110	2	0.373	3.391
5007[a]	.087	2	0.373	4.287	5076[a]	.138	4.5	0.932	6.754
5008[a]	.079	2	0.373	4.722	5077[a]	.127	6	1.267	9.976
5011	.101	3	0.596	5.901	5079[a]	.087	3.5	0.708	8.138
5014[a]	.055	2.5	0.485	8.818	5080[a]	.083	3.5	0.708	8.530
5016	.092	1	0.149	1.620	5084[a]	.117	2.5	0.485	4.145
5018	.103	2	0.373	3.621	5087	.059	3.5	0.708	12.000
5019[a]	.104	7	1.491	14.337	5088	.17	5.5	1.155	6.794
5024	.1	4	0.820	8.200	5090[a]	.086	5	1.044	12.140
5026	.095	2	0.373	3.926	5091[a]	.059	1.5	0.261	4.424
5027[a]	.047	1.5	0.261	5.553	5093[a]	.135	4.5	0.932	6.904
5028[a]	.075	2.5	0.485	6.467	5094	.08	3	0.596	7.450
5029[a]	.130	4.5	0.932	7.169	5104[a]	.046	2.5	0.485	10.543
5030	.110	4	0.820	7.455	5105	.060	2.5	0.485	8.083
5032[a]	.085	3.5	0.708	8.329	5114	.143	2	0.373	2.608
5038[a]	.075	3.5	0.708	9.440	5117[a]	.051	2	0.373	7.314
5039[a]	.143	5.5	1.155	8.077	5130[a]	.064	4	0.820	12.813
5041	.101	4	0.820	8.119	5135[a]	.142	2	0.373	2.627
5046[a]	.066	4.5	0.932	14.121	5138	.081	3	0.596	7.095
5048	.123	3	0.596	4.846	5139[a]	.07	2.5	0.485	6.929
5053[a]	.142	5	1.044	7.352	5140	.086	0	0	0
5056[a]	.122	4	0.820	6.721	5142	.074	1	0.149	2.014
5057[a]	.105	3.5	0.708	6.743	5153[a]	.076	3	0.556	7.842
5059[a]	.042	2	0.373	8.881	5157	.181	2	0.373	2.061
5060[a]	.161	3	0.596	3.702	5164[a]	.051	2	0.373	7.314
5066[a]	.078	2	0.373	4.782	5167	.073	5	1.044	14.301
5068[a]	.074	3	0.596	8.054	5168[a]	.066	0.5	0.037	0.561
5069	.092	3	0.596	6.478	5172	.12	5.5	1.155	9.625
5070	.118	6	1.267	10.737	5174[a]	.095	2	0.373	3.926
5071[a]	.108	7	1.491	13.806	5176[a]	.068	2.5	0.485	7.132
5072	.080	3	0.596	7.450	5182[a]	.121	1.5	0.261	2.157

Individual Data-LLU, Riverside Campus (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	AHH Activity Units/mg Protein
5184	.095	1.5	0.261	2.747	5276[a]	.114	1.5	0.261	2.289
5185[a]	.144	3	0.596	4.139	5283	.054	2.5	0.485	8.981
5186	.108	6.5	1.379	12.769	5285[a]	.125	1.5	0.261	2.088
5187[a]	.113	6	1.267	11.212	5287	.106	3	0.596	5.623
5196[a]	.084	2	0.373	4.440	5290	.122	3.5	0.708	5.803
5199[a]	.075	4	0.820	10.933	5291	.056	2	0.373	6.661
5204	.159	9	1.938	12.189	5296[a]	.095	1.5	0.261	2.747
5206[a]	.094	3.5	0.708	7.532	5299[a]	.121	1	0.149	1.231
5207[a]	.108	1	0.149	1.380	5301[a]	.079	1	0.149	1.886
5219[a]	.211	2	0.373	1.768	5304[a]	.098	3.5	0.708	7.224
5220	.104	7	1.491	14.337	5307	.112	4	0.820	7.321
5221[a]	.104	2	0.373	3.587	5310[a]	.066	5.5	1.155	17.500
5223	.047	1.5	0.261	5.553	5311	.126	2.5	0.485	3.849
5231[a]	.057	2.5	0.485	8.509	5317	.052	2	0.373	7.173
5234	.085	2.5	0.485	5.706	5319	.138	2	0.373	2.703
5236[a]	.036	2	0.373	10.361	5320[a]	.095	3	0.596	6.274
5240[a]	.105	6.5	1.379	13.133	5321	.128	1	0.149	1.164
5242	.047	3	0.596	12.681	5328[a]	.052	2	0.373	7.173
5246[a]	.065	3	0.596	9.169	5329	.084	2.5	0.485	5.774
5248[a]	.121	2	0.373	3.083	5333[a]	.129	2	0.373	2.891
5249	.120	5	1.044	8.700	5336[a]	.132	1	0.149	1.129
5250[a]	.091	4.5	0.932	10.242	5337	.059	1.5	0.261	4.424
5253[a]	.073	6	1.267	17.356	5340	.063	2.5	0.485	7.698
5256[a]	.050	2	0.373	7.460	5345[a]	.045	2	0.373	8.289
5258	.138	2.5	0.485	3.514	5346[a]	.075	1.5	0.261	3.480
5259	.098	4	0.820	8.367	5350[a]	.08	3	0.596	7.450
5260	.108	3.5	0.708	6.556	5355	.049	0.5	0.037	0.755
5263[a]	.133	4	0.820	6.165	5373[a]	.056	5	1.044	18.643
5264[a]	.055	2.5	0.485	8.818	5379	.061	0.5	0.037	0.607
5265[a]	.116	4	0.820	7.069	5409	.091	3	0.596	6.549
5270[a]	.110	1	0.149	1.355	5410[a]	.03	2	0.373	12.433
5273[a]	.022	2	0.373	16.955	5422[a]	.03	2	0.373	13.433

Individual Data-LLU, Riverside Campus (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
5426[a]	.09	2.5	0.485	5.389
5427[a]	.037	2	0.373	10.081
5430	.080	1.5	0.261	3.263
5431	.058	1.5	0.261	4.500
5433[a]	.144	7.5	1.603	11.132
5434	.051	2	0.373	7.314
5445[a]	.089	3.5	0.708	7.955
5463	.077	2.5	0.485	6.299
5484	.098	0	0	0
5486	.110	1.5	0.261	2.373
5491	.077	2.5	0.485	6.299
5492[a]	.035	3	0.596	17.029
5506[a]	.120	2.5	0.485	4.042
5509	.1	0	0	0
5512	.066	1	0.149	2.258
5513	.119	4	0.820	6.891
5516	.172	4	0.820	4.767
5517	.086	8	1.714	19.930
5519	.057	1.5	0.261	4.579
5520	.073	3.5	0.708	9.699
5522[a]	.084	2	0.373	4.440
5524[a]	.107	6	1.267	11.841
5525	.06	2	0.373	6.217
5526[a]	.071	4.5	0.932	13.127
5528	.052	2.5	0.485	9.327
5529[a]	.089	1	0.149	1.674
5531[a]	.046	2	0.373	8.109
5532	.035	1	0.149	4.257
5534[a]	.079	1.5	0.261	3.304
5536[a]	.088	6	1.267	14.398
5537[a]	.145	4.5	0.932	6.428
5538[a]	.135	6	1.267	9.385
5539[a]	.077	0.5	0.037	0.481
5540	.103	4.5	0.932	9.049
5541	.034	0.5	0.037	1.088
5542[a]	.06	1	0.149	2.483
5543[a]	.083	3	0.596	7.181
5544[a]	.123	2.5	0.485	3.943
5545[a]	.052	2.5	0.485	9.327
5547[a]	.099	4	0.820	16.735
5548[a]	.059	2.5	0.485	8.220
5550	.089	3.5	0.708	7.955
5551	.083	1	0.149	1.795
5553	.120	1.5	0.261	2.175
5556	.056	3	0.596	10.643
6206	.131	0	0	0
6238	.057	0	0	0

[a] Student was sick or had been on medication sometime during the four weeks prior to the blood drawing.

Individual Data - Pacific Union College
Fall 1977

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
7004	.075	3	0.596	7.95	7236	.062	1.5	0.26	4.210
7086	.070	4	0.820	11.714	7239	.087	2	0.373	4.287
7087	.055	3	0.596	11.245	7240	.065	1	0.15	2.292
7096	.071	3	0.596	8.394	7244	.095	3	0.596	6.274
7101	.055	4	0.820	14.909	7245[a]	.081	2	0.373	4.605
7104	.052	2.5	0.485	9.327	7247[a]	.093	2	0.373	4.011
7110	.054	1	0.149	2.759	7253	.098	3	0.596	6.082
7112[a]	.072	6	1.379	19.153	7254[a]	.029	0	0	0
7116[a]	.130	4	0.820	6.308	7255[a]	.096	3	0.596	6.208
7124[a]	.078	1.5	0.261	3.346	7274[a]	.051	0	0	0
7128[a]	.069	3	0.596	8.638	7275[a]	.066	0.5	0.037	0.561
7130[a]	.056	1	0.15	2.661	7277	.080	2	0.373	4.663
7131	.065	3	0.596	9.169	7324	.063	2	0.373	5.921
7141	.072	1	0.15	2.069	7338	.042	1	0.15	3.548
7142[a]	.062	0.5	0.037	0.597	7372	.096	3	0.596	6.208
7143[a]	.066	2	0.373	5.652	7373	.074	1.5	0.261	3.527
7147[a]	.061	1	0.149	2.443	7381	.084	1.5	0.261	3.107
7153[a]	.060	4.5	0.932	15.533	7387	.091	1.5	0.261	2.868
7160[a]	.051	2	0.373	7.314	7400	.104	3.5	0.708	6.808
7165[a]	.071	3	0.596	8.394	7409	.049	3.5	0.708	14.449
7168	.048	0	0	0	7427	.116	2	0.373	3.216
7185	.079	4	0.820	10.380	7429	.091	1.5	0.261	2.868
7188	.066	3	0.596	9.030	7430	.041	0	0	0
7191	.096	2.5	0.485	5.052	7432	.060	0	0	0
7196	.042	1.5	0.261	6.214	7434	.083	2	0.15	1.795
7201	.037	1	0.149	4.027	7435	.134	3	0.596	4.50
7204[a]	.057	0.5	0.037	0.649	7437	.115	1	0.149	1.296
7209[a]	.072	2	0.373	5.181	7454	.084	1.5	0.485	5.774
7212	.099	2	0.373	3.768	7457[a]	.1	0.5	0.037	0.370
7217	.085	4.5	0.932	10.965	7464[a]	.118	1.5	0.485	4.110
7219[a]	.073	1.5	0.261	3.575	7482	.071	0.5	0.037	0.521
7233	.082	0.5	0.037	0.425	7483	.07	0	0	0

Individual Data-Pacific Union College (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
7493[a]	.075	1	0.199	1.987	7693[a]	.079	0.5	0.037	0.468
7506	.042	1	0.149	3.548	7705[a]	.038	2	0.373	9.816
7516	.051	6.5	1.379	27.039	7707	.091	2	0.373	4.099
7519	.053	2.5	0.485	9.151	7714[a]	.054	2	0.373	6.907
7521[a]	.047	1.5	0.261	5.553	7721[a]	.054	1	0.149	2.759
7543[a]	.096	6	1.267	13.198	7724	.027	2	0.373	13.815
7545	.091	2.5	0.485	5.330	7726	.022	0	0	0
7547	.095	1	0.149	1.568	7727	.033	0	0	0
7549	.078	4	0.820	10.513	7730	.087	4	0.820	9.425
7550	.052	1.5	0.261	5.02	7734	.039	2	0.373	9.564
7557	.059	1	0.149	2.525	7738	.049	3	0.596	12.163
7558	.032	1	0.149	4.656	7741	.045	2	0.373	8.289
7568[a]	.061	2.5	0.485	7.951	7744	.048	1	0.149	3.104
7578	.054	1.5	0.261	4.833	7750[a]	.069	3.5	0.708	10.261
7587	.078	2	0.373	4.782	7761	.062	0	0	0
7588	.040	2.5	0.485	12.125	7775	.117	2.5	0.485	4.145
7602[a]	.115	2	0.373	3.243	7777	.074	0.5	0.037	0.500
7604	.080	3	0.596	7.450	7790	.027	1	0.149	5.519
7607[a]	.040	1.5	0.261	6.525	7792	.040	1	0.149	3.725
7614	.059	0.5	0.037	0.627	7794	.071	1	0.149	2.099
7619[a]	.057	2	0.373	6.540	7798[a]	.064	2	0.373	5.828
7620	.077	0.5	0.037	0.481	7840[a]	.067	2	0.373	5.567
7638	.099	7	1.491	15.061	7856[a]	.093	2.5	0.485	11.279
7643[a]	.069	2	0.373	5.406	7858[a]	.056	1.5	0.261	4.661
7650	.036	2	0.373	10.361	7863	.039	0	0	0
7664	.038	0	0	0	7868	.101	1.5	0.261	2.584
7668[a]	.041	0	0	0	7899[a]	.051	1	0.149	2.922
7671	.053	0.5	0.037	0.698	7900[a]	.142	1	0.149	1.049
7679[a]	.054	3	0.596	11.037	7902[a]	.077	3	0.373	7.740
7683[a]	.110	1	0.149	1.355	7903[a]	.031	1	0.149	4.806
7685	.053	1.5	0.261	4.925	7905	.113	3	0.596	5.274
7691[a]	.052	1	0.149	2.865	7908[a]	.026	1	0.149	5.731

Individual Data-Pacific Union College (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity Units	Units/mg Protein
7910	.113	2.5	0.485	4.292					
7914[a]	.080	2	0.373	4.663					
7915	.060	0.5	0	0					
7917	.018	0.5	0.037	2.056					
8184	.071	2	0.373	5.254					
8519	.044	0.5	0.037	0.841					
8506	.040	0	0	0					
8219	.071	2	0.373	4.722					
8072	.038	2.5	0.485	12.763					

[a] Student was sick, had been on medication sometime during the four weeks prior to the blood drawing, or had spent the last four weeks of the summer vacation in a high smog environment.

Individual Data - Loma Linda University, Riverside Campus
Fall 1977

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity		Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Activity	
			Units	Units/mg Protein				Units	Units/mg Protein
8005[a]	.075	3.5	0.708	9.440	8082	.045	2	0.373	8.289
8006	.042	3	0.596	14.190	8084	.047	3	0.596	12.681
8007	.048	2	0.373	7.771	8087[a]	.058	5.5	1.155	19.914
8008	.067	2.75	0.559	8.343	8088[a]	.097	2.5	0.485	5.000
8011	.050	2	0.373	7.460	8091	.045	1.5	0.261	5.800
8014[a]	.040	0	0	0	8093[a]	.042	2.5	0.485	11.548
8016	.062	2	0.373	6.016	8094	.036	5	1.044	29.000
8018	.044	1	0.149	3.386	8108	.047	1.25	0.224	4.766
8019[a]	.088	4.5	0.932	10.591	8114	.063	1.5	0.261	4.143
8026	.062	2	0.373	6.016	8117[a]	.011	0	0	0
7028[a]	.037	0.5	0.037	1.000	8130[a]	.049	4	0.820	16.735
8029	.075	5	1.044	13.920	8135[a]	.028	3	0.596	21.286
8030[a]	.126	2	0.373	2.960	8138	.074	3.75	0.783	10.581
8032[a]	.037	0.5	0.037	1.000	8139[a]	.036	3	0.596	16.556
8038	.084	3	0.596	7.095	8140	.088	6.5	1.379	15.670
8039[a]	.044	2	0.373	8.477	8142[a]	.053	1.75	0.335	6.321
8041	.057	1	0	0	8144	.094	2.75	0.559	5.947
8046	.035	3	0.596	17.029	8157[a]	.062	2	0.373	6.016
8056[a]	.080	5	1.044	13.050	8160[a]	.102	3	0.596	5.843
8057[a]	.073	2.5	0.485	6.644	8164[a]	.040	2.5	0.485	12.125
8059	.091	4.5	0.932	10.242	8167	.032	1	0.149	4.656
8060	.074	4	0820	11.081	8168[a]	.077	5	1.044	13.558
8066[a]	.062	2.5	0.485	7.823	8172	.033	2	0.373	11.303
8068[a]	.060	4.5	0.932	15.533	8182[a]	.041	1	0.149	3.634
8069[a]	.056	5	1.044	18.643	8185[a]	.075	8.5	1.826	24.347
8070[a]	.046	4.5	0.932	20.261	8186	.055	4	0.820	14.909
8073[a]	.030	1	0.149	4.967	8187[a]	.057	3	0.596	10.456
8074[a]	.033	2.25	0.447	13.545	8196	.029	0.75	0.112	3.862
8076[a]	.040	2.5	0.485	12.125	8199	.060	3.5	0.708	11.800
8077[a]	.069	5	1.044	15.130	8201	.045	3	0.596	13.244
8079	.042	1	0.149	3.548	8206[a]	.054	6	1.267	23.463
8080[a]	.032	2	0.373	11.656	8207[a]	.050	1	0.149	2.980

Individual Data-LLU, Riverside Campus (Continued)

Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein	Sample No.	Total Protein (mg)	Corrected Fluorescence Reading	AHH Units	Activity Units/mg Protein
8210[a]	.048	2	0.373	7.771	8299	.078	2	0.373	4.782
8214[a]	.092	2.25	0.447	4.859	8301[a]	.116	4	0.820	11.095
8220	.048	2	0.373	7.771	8304[a]	.116	4	0.820	7.069
8221	.061	2.5	0.485	7.951	8307	.021	2.5	0.485	23.095
8231	.047	1	0.149	3.170	8310[a]	.119	3	0.596	5.008
8234	.039	3.25	0.671	17.205	8311[a]	.048	1	0.149	3.104
8235[a]	.089	5	1.044	11.730	8317	.132	3.5	0.708	5.364
8236	.041	1	0.149	3.632	8319[a]	.07,	7	1.491	21.300
8240	.057	4	0.820	14.386	8320[a]	.095	1	0.149	1.568
8246[a]	.076	5	1.044	13.737	8321	.132	6	1.267	9.598
8248	.049	3	0.596	12.163	8328	.059	2.5	0.485	8.220
8249	.031	2.5	0.485	15.645	8329	.094	1.75	0.335	3.564
8250[a]	.054	1	0.149	2.759	8333	.095	2	0.373	3.926
8253[a]	.061	1.5	0.261	4.279	8337	.09	4.5	0.932	10.356
8256	.059	5	1.044	17.695	8340	.04	1.5	0.261	6.525
8258	.093	1.5	0.261	2.806	8345	.036	2.5	0.485	13.472
8259	.042	2.75	0.559	13.310	8346	.085	5	1.044	12.282
8260	.060	1	0.149	2.483	8350	.026	2	0.373	14.346
8262	.053	0.5	0.037	0.698	8364[a]	.055	1	0.149	2.709
8264	.057	0	0	0	8373[a]	.066	5	1.044	15.818
8265	.116	7	1.491	12.853	8407	.049	1.5	0.261	5.327
8270[a]	.060	2	0.373	6.217	8409	.039	5	1.044	26.769
8272[a]	.106	4.5	0.932	8.792	8410[a]	.020	1.5	0.261	13.050
8273	.040	1.75	0.335	8.375	8419	.062	6.5	1.379	22.242
8276[a]	.051	2	0.373	7.314	8426	.077	1	0.149	1.935
8283	.042	0.5	0.037	0.881	8427[a]	.049	2	0.373	7.612
8285[a]	.088	2.5	0.485	5.511	8430	.037	3	0.596	16.108
8287	.106	3	0.596	5.623	8431[a]	.102	5	1.044	10.235
8290	.071	1.5	0.261	3.676	8433	.073	6	1.261	17.356
8291[a]	.015	1.5	0.261	17.400	8434[a]	.177	2.5	0.485	2.740
8296[a]	.077	2	0.373	4.844	8445	.044	2.5	0.485	11.023

AIR POLLUTION QUALITY CONTROL DATA

The pertinent APA data is being processed at Research Triangle Park and will be made available after February 28. It is therefore not possible to include the air quality control data from each college campus at this time. It will be added when it is made available.