Polychlorinated biphenyl (PCB) residues and chlorinated hydrocarbon pesticide residues were assayed in 723 plasma samples collected from healthy volunteers, who resided in a single southeastern county and were not occupationally exposed to pesticides. As expected, pp'DDT and DDE residues were almost universal. Residues of DDD (84%), and dieldrin (63%) were also common. PCB residues were found in 43%, ranging up to 29 ppb. Significant age effects, not always linear, were observed for all residues except dieldrin and PCB. Ethnic differences were marked for every residue and ethnic-residence interactions were significant for all except dieldrin. Independent residential effects were observed for all except DDE and dieldrin. Sex differences were noted only for pp'DDT and DDE. PCB residues were more frequent and higher in whites and urban residents. Residues were rare (4.1%) in rural blacks. Likely urban exposure routes of PCB include polluted air and contaminated water. Other similar occult pollution problems are discussed.

Polychlorinated Biphenyl Residues in Human Plasma Expose a Major Urban Pollution Problem

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Introduction

The physical and chemical properties that make polychlorinated biphenyl (PCB) compounds valuable industrially assure their ability to become serious, persistent, environmental pollution hazards. These properties include high boiling points, low water solubility, high dielectric constants, miscibility with organic solvents and polymers, remarkable thermal stability and resistance to chemical degradation. Industrial uses may be conveniently classified as "closed" or consumptive. Closed systems include electrical capacitors and transformers, heat transfer systems and hydraulic fluids. Consumptive uses involve synthetic rubber, paints, plastics, wire insulation, caulking material, flame retardants, cutting oils, pesticide synergists, adhesives, sealants, paper, printing inks and protective coatings for wood, metal, and concrete. Inadvertent environmental contamination can occur accidentally from closed systems, as has been reported recently, but environmental infiltration is inherent in the consumptive uses. Industrial production has rapidly increased during the last four decades with U.S. production in 1968 estimated at over 5,000 tons. Production involves a halogenation process in which viscosity determines the synthesis endpoint. Each marketed PCB is a really complex mixture which can contain many of the 210 theoretically possible halogenated biphenyls plus other contaminating compounds.[1,2]

Beginning with the Swedish investigator Jensen in 1966, ecologists identified PCB residues in fish, birds and animal specimens from widely dispersed locations.[3] Residues were also reported from human hair, milk and adipose tissue.[4,5] A 1968 outbreak of chloracne in Japan, Yusho disease, was traced to the ingestion of rice oil contaminated by PCB.[6] Occupational exposures had previously been linked to chloracne and hepatic dysfunction.[7]

The investigation now reported was designed to answer five questions. First, how prevalent were PCB residues among the population of an east coast urban area? Second, would the demographic variables of age, sex, race and residence account for a significant portion of residue variability? Third, what links might exist between PCB residue patterns and those of the persistent chlorinated hydrocarbon pesticides? Fourth, what could these associations suggest about possible routes of PCB exposure? Fifth, would the DDT to PCB residue ratios be higher in rural residents and low in cities as had been previously reported in other species?[8]

Materials and Methods

Study population—Volunteers were recruited from Charleston County, South Carolina churches and neighborhood social groups in late summer 1968. Urban residents lived in the central city or an immediately adjacent suburban area while rural residents lived on an easily accessible island several miles away. Specimens from the few volunteers who reported occupational exposure to pesticides were excluded from this study. The age, race, residence and sex distribution of the 723 volunteers is shown in Table 1. Blood was collected using the Vacutainer system with a heparin anticoagulant. Plasma were separated and stored at 4° C in hexane washed glass tubes.

Residue analyses—Chlorinated hydrocarbon pesticide residues were assayed by gas chromatography with an electron capture detector using the Modified Dale-Cueto method.[9] PCB residues were assayed by gas chromatography with a Ni^{63} detector after basic dehydrochlorination. Rough PCB quantitation was achieved by integrating the area under a five peak "fingerprint" associated with Arochlors 1254 and 1260.

Statistical analyses—Ranges, means and cumulative frequency distribution for each residue and each race-residence group were compiled arithmetically as shown in Table 2. Further statistical analysis was complicated by the extreme skewness of the residue distributions necessitating a percentile transformation. Correlations between variables were then computed. An analysis of variance using a linear model was carried out on the transformed variables.

Table 1—A Demographic Profile of the Study Population

Age	Urban				Rural				All Groups
	Black		White		Black		White		
	Male	Female	Male	Female	Male	Female	Male	Female	
0-4	7	11	15	8	20	15	3	5	84
5-9	13	7	17	11	11	8	12	16	95
10-19	27	20	21	18	18	23	35	22	184
20-39	27	24	31	33	7	11	17	27	177
40-59	17	13	20	19	7	10	23	28	137
60 +	7	2	5	1	4	5	9	13	46
All Ages	98	77	109	90	67	72	99	111	
	175		199		139		210		
	374				349				723

Table 2—Plasma Residues of Selected Chlorinated Hydrocarbons Among Charleston County, South Carolina Residents in 1968 Distributed by Race and Residence

Residue and group	No. of obs.	Min.	Plasma residues (ppb) Frequency distributions - Per cent 10	30	50	70	90	95	98	99	Max.	Arith. mean
pp'DDT												
Rural black	139	0.6	2.4	4.9	7.8	10.4	17.8	21.4	22.1	26.5	28.2	8.8
Urban black	175	0.1	1.5	2.8	4.3	6.0	9.4	11.7	16.2	19.4	62.7	5.4
Urban white	199	0.1	0.5	1.0	1.4	2.0	3.6	4.3	4.9	6.0	6.6	1.7
Rural white	210	0.0	0.7	1.0	1.4	1.9	3.3	3.8	4.9	5.0	6.0	1.6
DDE												
Rural black	139	0.8	2.6	6.1	9.1	12.6	19.2	23.4	31.7	35.2	43.5	10.5
Urban black	175	0.1	2.2	3.3	5.6	7.8	11.2	12.2	16.2	16.8	18.5	6.2
Urban white	199	0.5	1.2	1.9	2.3	3.0	4.5	5.1	5.7	5.9	7.4	2.6
Rural white	210	0.3	1.5	2.6	3.3	4.1	5.4	6.1	7.8	8.5	9.7	3.4
op'DDT												
Rural black	139	0.0	0.0	0.0	0.1	0.1	0.7	1.5	2.4	2.6	2.7	0.2
Urban black	175	0.0	0.1	0.1	0.1	0.5	1.1	1.3	2.0	3.2	3.9	0.4
Urban white	199	0.0	0.1	0.1	0.1	0.3	0.5	0.7	1.0	1.4	2.7	0.2
Rural white	210	0.0	0.0	0.1	0.1	0.1	0.3	0.5	1.0	1.2	1.6	0.1
DDD												
Rural black	139	0.0	0.0	0.0	0.0	0.1	0.1	0.8	1.2	1.3	1.3	0.1
Urban black	175	0.0	0.1	0.1	0.1	0.5	1.1	1.6	3.1	3.8	4.5	0.4
Urban white	199	0.0	0.0	0.1	0.3	0.4	0.7	1.0	1.6	1.9	5.0	0.3
Rural white	210	0.0	0.1	0.1	0.1	0.4	0.9	1.3	1.6	3.0	4.2	0.3
DIELDRIN												
Rural black	139	0.0	0.0	0.0	0.0	0.1	1.1	1.5	2.0	2.1	2.4	0.2
Urban black	175	0.0	0.0	0.0	0.0	0.1	0.7	1.1	1.3	1.8	6.9	0.2
Urban white	199	0.0	0.1	0.2	0.3	0.5	0.7	0.8	1.0	1.2	1.4	0.3
Rural white	210	0.0	0.0	0.1	0.3	0.5	1.0	1.2	1.6	1.7	2.4	0.4
PCB												
Rural black	107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	5.6	20.6	0.3
Urban black	151	0.0	0.0	0.0	0.0	1.5	4.7	7.3	21.0	22.5	29.0	1.9
Urban white	166	0.0	0.0	0.0	1.5	3.0	7.0	9.0	13.5	13.5	22.0	2.3
Rural white	192	0.0	0.0	0.0	2.4	4.8	7.8	9.6	12.0	13.8	16.6	3.1

Results

Residue prevalence—As shown in Table 2, residues from several of the chlorinated hydrocarbon pesticides were commonly found at parts per billion concentrations as were PCB residues which were present in 43% of these tested. DDE and pp'DDT were ubiquitous residues whose mean and median concentrations exceeded those of op DDT, DDD and dieldrin by a factor of 15. PCB residues were intermediate in concentration, that is somewhat less than half those of pp'DDT and DDE but six or seven times these of op DDT, DDD and dieldrin. Maximum levels of PCB, pp'DDT and DDE were similar, exceeding such values for the other tested residues. Striking differences were noted between various race-residence groupings in residue prevalence and concentration. Blacks, especially rural blacks, had pp'DDT and DDE levels substantially higher than whites. Conversely, PCB and dieldrin residues were more frequent and somewhat higher in whites. The confounding effects of age, sex and race-residence interactions were then assessed by a linear analyses of variance model with the associated probabilities presented in Table 3.

Age effect—All pesticide residues, except dieldrin and PCB, varied significantly with age but the trend was not always linear, as shown in Table 3. A quadratic age function better described the distribution of pp'DDT residues. PCB, pp'DDT and DDE residue prevalence rates together with the means of measurable residues are distributed by age in Table 4. Both the prevalence and the mean level of PCB seem to increase with age, but this was because of confounding variables. On the other hand, pp'DDT and DDE residues were present at every age with measurable pp'DDT residues having a "U" shaped age distribution. DDE exhibited evidence of increases at ages 5 to 9 and in the seventh decade. DDE, op'DDT and dieldrin prevalence, but not concentration, increased somewhat with age.

Sex effect—Only pp'DDT and DDE varied significantly between the sexes (Table 3). This effect is illustrated in Table 5 where sex and age are simultaneously considered. Male excesses in mean measurable pp'DDT and DDE are present at every age. DDE excesses were greater than those of pp'DDT. The most striking differences occur during the first five years and seventh decades of life. On the other hand, neither the prevalence nor the mean measurable PCB residue levels showed any consistent sex pattern.

Race residence effects—Significant race, residence and race-residence interaction effects were common as shown in Table 3. Strong racial effects were noted for every chlorinated hydrocarbon residue and residence affected all except DDE and dieldrin. Race-residence interaction proved significant for all except dieldrin. Age-race-residence specific PCB prevalence rates and concentrations are presented in Table 6. PCB residues are very infrequent in rural blacks but when present may be quite impressive. Urban blacks also had a lower prevalence of PCB residues than either urban or rural whites. Mean measurable PCB residues were, however, somewhat higher among urban

Table 3—Testing Hypotheses about the Effects of Demographic Variables on Selected Plasma Chlorinated Hydrocarbon Residues Using Analyses of Variance After Percentile Transformation

	Residues					
	pp'DDT N=723	DDE N=723	op'DDT N=723	DDD N=723	Dieldrin N=723	PCB N=616
Total age	<.025	<.0001	<.01	<.025	NS*	NS
Age (1)†	NS	<.0001	<.0001	<.001	NS	NS
Age (q)†	<.025	<.005	<.001	.01	NS	NS
Sex	<.0001	<.0001	NS	NS	NS	NS
Groups	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Race	<.0001	<.0001	<.025	<.0001	<.0001	<.0001
Residence	<.0001	NS	<.001	<.0001	NS	<.0001
Race-res. Int.	<.0001	<.0001	<.0001	<.0001	NS	NS

*NS signifies "Not significant."

†Let age (1) denote a linear age function and age (q) denote a quadratic age function.

Table 4—Proportion of Volunteers Having Plasma Chlorinated Hydrocarbon Residues and Mean Value of Measurable Residues Distributed by Age

Age	Plasma residues								
	PCB			pp'DDT			DDE		
	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)
0-4	10	30.0	4.23	84	95.2	5.34	84	97.6	4.59
5-9	87	39.1	4.33	95	98.9	4.55	95	100.0	5.64
10-19	178	37.1	4.60	184	97.8	4.11	184	100.0	5.22
20-39	169	50.3	4.96	177	97.7	3.54	177	100.0	5.13
40-59	130	48.5	5.56	137	97.1	3.32	137	100.0	5.25
60 +	42	42.9	5.47	46	100.0	5.07	46	100.0	6.36

Table 5—Proportion of Volunteers Having Plasma Chlorinated Hydrocarbon Residues and Mean Values of Measurable Residues Distributed by Age and Sex

	Plasma residues								
	PCB			pp'DDT			DDE		
Age	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)
Female									
0-4	6	33.3	4.25	39	94.9	5.01	39	94.9	3.58
5-9	39	43.6	5.31	42	97.6	4.48	42	100.0	5.24
10-19	82	32.9	4.64	83	98.8	3.73	83	100.0	4.98
20-39	91	46.2	4.48	95	97.9	3.39	95	100.0	4.45
40-59	67	55.2	5.89	70	95.7	3.12	70	100.0	4.51
60 +	20	40.0	5.09	21	100.0	3.31	21	100.0	5.00
Male									
0.4	4	25.0	4.20	45	95.6	5.63	45	100.0	5.42
5-9	48	35.4	3.35	53	100.0	4.60	53	100.0	5.95
10-19	96	40.6	4.58	101	97.0	4.43	101	100.0	5.41
20-39	78	55.1	5.43	82	97.6	3.72	82	100.0	5.92
40-59	63	41.3	5.10	67	98.5	3.52	67	100.0	6.02
60 +	22	45.5	5.77	25	100.0	6.55	25	100.0	7.50

Table 6—Proportion of Volunteers Having Plasma Chlorinated Hydrocarbon Residues and Mean Values of Measurable Residues Distributed by Age, Race and Residence

	Plasma PCB residues											
	Black rural			Black urban			White urban			White rural		
Age	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)
0-4	7	4.3	4.20	1	100.0	7.0	1	100.0	1.50	1	0.0	-
5-9	18	5.6	20.60	18	55.6	2.91	25	48.0	3.17	26	42.3	5.42
10-19	39	5.1	3.70	45	24.4	5.21	38	52.6	3.98	56	58.9	4.84
20-39	17	5.9	5.60	50	44.0	5.40	61	57.4	4.70	41	65.9	4.91
40-59	17	0.0	-	29	34.5	6.89	36	55.6	5.23	48	68.8	5.37
60+	9	0.0	-	8	37.5	5.47	5	20.0	1.50	20	70.0	5.75

Table 7—Proportion of Volunteers Having Plasma Chlorinated Hydrocarbon Residues and Mean Values of Measurable Residues Distributed by Age, Race and Residence

	pp'DDT Residues											
	Negro rural			Negro urban			White urban			White rural		
Age	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)
0-4	35	100.0	7.61	18	94.4	5.31	23	91.3	2.53	8	87.5	2.50
5-9	19	100.0	12.35	20	100.0	5.69	28	100.0	1.18	28	96.4	1.71
10-19	41	100.0	7.70	47	100.0	6.25	39	100.0	1.30	57	93.0	1.50
20-39	18	100.0	9.85	51	100.0	5.22	64	100.0	1.71	44	90.9	1.51
40-59	17	100.0	8.92	30	96.7	4.00	39	100.0	2.10	51	94.1	1.92
60+	9	100.0	9.81	9	100.0	8.34	6	100.0	2.53	22	100.0	2.49

blacks, pp'DDT residues (Table 7) were much higher in blacks, especially rural blacks, who exhibited an impressive prepubertal peak that was lacking in urban blacks. Whites exhibited dampened "U" shaped age distributions. DDE residues (Table 8) were highest in rural blacks, and intermediate in urban blacks while rural whites and urban whites trailed distantly.

Associations between residues—A correlation matrix furnished important clues regarding exposure routes and reassurance regarding possible analytical difficulties (Table 9).

DDE residues, derived primarily from the diet and endogenous storage depots, were highly correlated with pp'DDT derived from the same sources plus recent pesticide exposure. A small but significant portion of pp'DDT but not DDE variation was associated with op DDT which should be a better marker of recent pesticide exposure. DDD, a pesticide in its own right and a metabolite of the active DDT pool, was also highly correlated with op DDT, but not DDE or pp'DDT. Dieldrin, a common garden pesticide in the Charleston area at the time of survey was also well-correlated with the other indices of recent pesticide exposure. Conversely, PCB residues were not correlated with dietary exposures as indexed by DDE and pp'DDT. Only weak correlations were noted with DDD and dieldrin which were markers of recent urban pesticide usage. Fortunately, PCB were also poorly correlated with op DDT with which there could have been analytical confusion.[10] Thus, PCB residues were not strongly linked to recent chlorinated hydrocarbon pesticide usage, or to dietary indices.

Total DDT to PCB ratio—Ecologists have observed that the total DDT to PCB residue ratio in wildlife decreases when captures are made near the urban industrial centers. Ratios in excess of 15:1 in remote areas can be contrasted with under two after residence in urban areas. Similar ratios were computed for the human populations under study, as seen in Table 10. Ratios for urban and rural whites were consistent with those of birds captured near urban centers while those for blacks, especially rural blacks, were more like wildlife from remote areas. If the DDT loading of blacks had been like that of whites, no ethnic differences in urban ratios would have been apparent, and rural blacks would have exhibited ratios similar to these noted in ecological specimens from more remote locales.

Discussion

PCB residues were found in parts per billion concentrations in plasma. The prevalence of PCB residues varied remarkably over race-residence groupings, being greatest in urban residents and rural whites. No clear independent age and sex trends could be demonstrated. PCB residues were not linked to chlorinated hydrocarbon pesticide residues commonly found in food and were only weakly linked to pesticide residues that might better reflect recent household or garden pesticide exposure. The latter

Table 8—Proportion of Volunteers Having Plasma Chlorinated Hydrocarbon Residues and Mean Values of Measurable Residues Distributed by Age, Race and Residence

	Plasma DDE residues											
	Black rural			Black urban			White urban			White rural		
Age	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)	N	Per cent with measurable residues	Mean of measurable residues (ppb)
0-4	35	100.0	6.42	18	88.9	5.43	23	100.0	2.27	18	100.0	1.58
5-9	19	100.0	13.73	20	100.0	5.60	28	100.0	2.52	28	100.0	3.29
10-19	41	100.0	9.57	47	100.0	6.47	39	100.0	2.36	57	100.0	3.01
20-39	18	100.0	13.21	51	100.0	6.61	64	100.0	2.83	44	100.0	3.45
40-59	17	100.0	14.17	30	100.0	6.14	39	100.0	2.76	51	100.0	3.65
60+	9	100.0	12.08	9	100.0	6.78	6	100.0	3.03	22	100.0	4.76

Table 9—Correlation Matrix for Plasma Chlorinated Hydrocarbon Residues (Percentile Transformation)

	pp'DDT N=723	DDE N=723	op'DDT N=723	DDD N=723	Dieldrin n=723	PCB N=616
pp'DDT	|	.7785	.1093	−.0094	−.1878	−.2288
DDE		|	.0604	−.0583	−.2406	−.2141
op'DDT			|	.7601	.2300	.0515
DDD				|	.3163	.1229
Dieldrin					|	.1293
PCB						|

Table 10—Ratio of Plasma DDT and PCB Residues Distributed by Race-Residence Grouping

Race residence grouping	Mean plasma residue Total DDT*	PCB	DDT to PCB ratio
Rural black	20.9	.35	60.0
Urban black	12.53	1.97	6.4
Urban white	4.71	2.35	2.0
Rural white	5.57	3.18	1.8

* Total DDT = pp'DDT + op'DDT + 1.14 DDE.

observation indicates the use of PCB's as chlorinated hydrocarbon pesticide synergists was not an overwhelmingly important exposure factor. Household PCB exposure may have occurred through its use as a binder for the organophosphate pesticide DDVP that was a fixture in many Charleston homes.

Water exposures would not on first appraisal seem important as rural whites and blacks used a variety of independent water systems, but PCB containing materials may have been used in these systems. Moreover, many rural whites in the study were actually recent suburban "pioneers" with previous urban living experience while rural blacks were usually lifelong residents.

PCB residues have been detected in Charleston County harbor sediments.[11] These may have been derived from local industry which include a paper mill, petrochemical plants, textiles, fertilizer manufacturing, wood preservation, shipping and electrical generating. Local solid wastes were used as land fills which may have become terrestial chromatography columns slowly releasing toxicants. In addition, upstream industrial sources in the Santee and Edisto river basins may have been involved. In any case, fish and shellfish could have concentrated the residue with subsequent exposure to local residents. Open incineration of wastes (including old automobiles) was, until recently, a common practice in the central city.[12] PCB's have been detected in urban air samples and this route of exposure must be considered.[13]

PCB residues constituted an important human pollutant burden, but no changes in mortality, morbidity or even physiology have been linked to residue levels here reported. However, one would expect PCB levels in organs with a high lipid content to be much greater as is the case with the chlorinated hydrocarbon pesticides.[14] Levels may well be high enough to stimulate microsomal enzymes leading to alterations of drug and possibly hormone metabolism. Long-term, low-level exposure effects upon man are unknown, but there is growing concern regarding potential carcinogenic, teratogenic and mutagenic effects. The interactive effects of the various chlorinated hydrocarbon residues with each other are poorly understood, as are their effects upon other disease agents. For example, the effect of PCB's upon human virus infections have not been investigated, but PCB's and chlorinated hydrocarbon pesticides act synergistically with duck hepatitis virus.[15] Adverse ecological effects upon birds, shrimp and oysters are also well-established.[1,2]

PCB's represent only one of the myriad of inadvertent pollutant problems created by industrialized mankind. Yawning gaps in legislative authority, research resources, and technology forecasting characterize this problem set. Few would even venture an estimate of how many "hidden pollutant problems" already face us. Most would agree that the past policy of environmental "control by crisis" must be replaced by a systematic effort. Candidates for the next crisis include metals, chlorinated naphthalenes, chlorinated aliphatics, brominated biphenyls, one or more of the several hundred fuel additives, optical brighteners, and unknown intermediates in the manufacture or disposal of synthetic organic chemicals.[16]

These "hidden pollutant problems" may mean that well-intentioned environmental controls could result in additional health hazards. Two current examples include the contamination of breakfast cereals by PCB's from boxes which were made from recycled paper and the possibility that the newer incinerators with precipitators and afterburners may convert PCB residues in garbage or sewage sludge into respirable suspended particulates.[17] Re-use and recycling of water and solid wastes now carry health risks associated with as yet unknown toxic substances.

In his environmental message of 1971, President Nixon asked the Congress to pass legislation aimed at the control of toxic substances not already covered by existing air, water, pesticide, radiation, food, drug and cosmetic legislation.[18] The Environmental Protection Agency will do everything possible within the constraint of existing legislation and the framework of national priorities to protect the people of our nation. If we are to succeed, a greatly expanded effort is mandatory.

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Approve Two New Sections and Occupational Health Council

Action by the Executive Board has paved the way for establishment of new sections and a new council, issuance of Centennial awards and commemorative medals, and a shift of APHA dues billing to an anniversary basis.

At the Board's February meeting, members approved in principle the establishment of two new sections—on Podiatry and Injury Control—and of a Council on Occupational Health. The recommendation on sections will be forwarded to the Governing Council for action at the November Annual Meeting.

The Board also asked the Committee on Constitution and By-laws to develop revisions on new sections and other units, in order to facilitate the entrance of new types of health workers into the Association. New sections have traditionally been formed after interested individuals, meeting as a conference, participate in APHA annual meetings and work with the Executive Board, clarifying their proposed role in APHA. This generally necessitates a wait of two or three years before an interested group can be formally recognized as a section.

The conference and waiting period requirements were established, board members said, to insure that a new section would attract a sufficient membership of its own, rather than drawing members from existing sections. The proposed revision of the Constitution would facilitate the establishment of new sections particularly when, for example, federal legislation creates a new category of health worker.

The Executive Board also asked the APHA staff to prepare a feasibility study of a proposed switch to dues billing on an anniversary basis, as opposed to the current system of billing on a calendar year basis. Dues notices are currently sent to all members in January, but under the new system, members would be billed on the anniversary of the date they joined the Association.

In other business, the Board voted to issue a Centennial commemorative medal to each registrant at the 100th Annual Meeting, and permit each section to present at least one Centennial Award at the meeting. The Board also acted favorably on a request from the School Health and Public Health Education Sections to participate in the Coalition of National Health Education Organizations.