

KERTAS KERJA RISET UNGGULAN TERPADU (RUT)

JUDUL PENELITIAN

**Respon Imunologi dan Kadar Radikal Bebas
Plasma pada Populasi Rentan
Pencemaran Makanan**

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Bidang : Teknologi Hasil Pertanian
Topik : Keamanan Pangan
Program : Ilmu Pengetahuan Terapan
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Lembaga Penanggung Jawab : Fakultas Teknologi Pertanian,
IPB

MATRIKS PENELITIAN RUT

TUJUAN	HASIL YANG DICAPAI	MASALAH YANG DIHADAPI	HASIL YANG DIPROYEKSIKAN
(1)	(2)	(3)	(4)
Seberapa jauh makanan jajanan telah mempengaruhi kekebalan dan kadar radikal bebas plasma pada populasi rentan pencemaran makanan	<p>Tahun I :</p> <p>a) Pengumpulan data analisa biokimia darah dari 240-320 responden yang meliputi :</p> <ul style="list-style-type: none"> -proliferasi limfosit -kadar malonaldehid -zat gizi antioksidan (vit. A,E, dan C) -kadar albumin <p>b) Data mengenai status sosial dan kebiasaan makan dari 320 responden</p> <p>c) Data mengenai kesehatan klinis dari 320 responden</p>	<p>1) Mekanisme penurunan sistem kekebalan tubuh oleh pencemaran makanan</p> <p>2) Penangkalan radikal bebas dan pencegahan kerusakan imunologi melalui intervensi makanan yang mengandung antioksidan tinggi</p> <p>3) Status keracunan klinis belum diketahui</p> <p>4) Tingkat kontaminasi makanan jajanan oleh pencemar spesifik perlu diverifikasi</p>	<p>1) Data ilmiah mengenai mekanisme kerusakan sistem kekebalan oleh pencemar makanan</p> <p>2) Perbaikan status kekebalan populasi rentan pencemaran makanan melalui intervensi makanan lokal yang mengandung antioksidan tinggi.</p> <p>3) Memperbaiki pola makan masyarakat berpenghasilan rendah</p> <p>4) Verifikasi tingkat pencemar makanan jajanan oleh Hg, Pb, dan aflatoksin</p>

Detection of spontaneous *Salmonella typhi* and *Vibrio cholerae* antibody in sera of adolescents around Bogor area as related to their habits of consuming street foods. Zakaria-Rungkat F, Wiriaatmaja TG, Sanjaya, Madaniyah-Pramudya S, Fardiaz S and LeBron CI.

ABSTRACT

Street foods in Indonesia were recently reported to be contaminated with pathogenic microorganism and hazardous chemicals. *Salmonella typhi* and *Vibrio cholerae* which are both intestinal pathogens are among the contaminants. Tourists visiting developing countries were reported to be vulnerable to diarrhea. These incidents were thought to be due to lack of immunological resistance as compared to the local individuals. Frequent exposure to these bacteria could induce natural immune response in the individuals, however a critical evaluation on the degree of exposure, type of antigen and nutritional and health status of the individuals must be exercised.

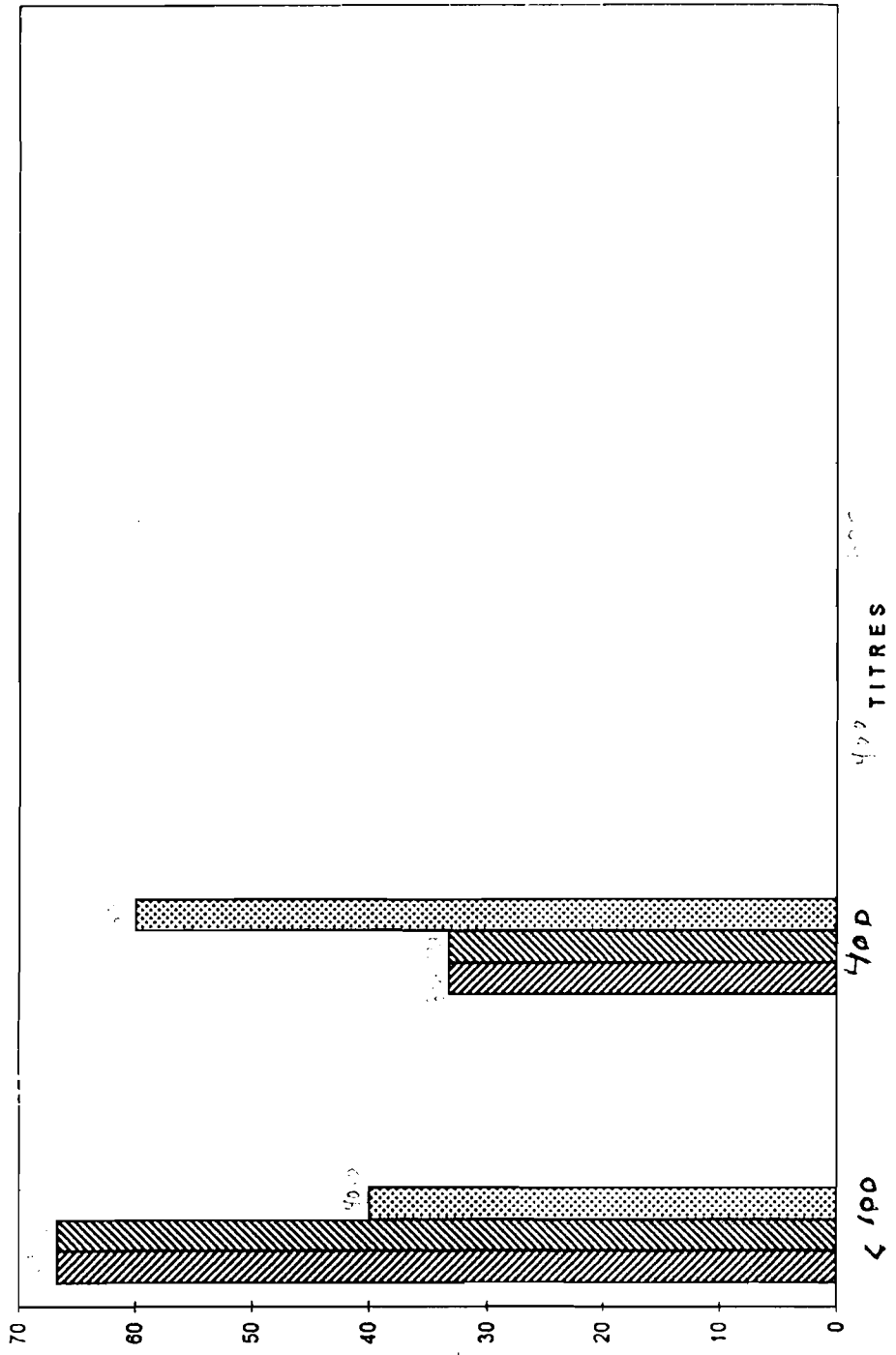
The objective of this research is to analyze the presence of antibody anti *S typhi* and *V cholerae* in the adolescent population in Bogor area that consume street foods as part of their daily meals. Subjects were divided into three groups classified as low income highly exposed (group I); low income moderately exposed (group II) and high income moderately exposed (group III). Group I consisted of male and female respondents selected from industry labors, n= 55; group II from an isolated village, n= 31, and group III from local elite high school, n= 30. The health of all subjects were physically examined by a certified physician before blood samples were taken for antibody analysis. Interviews were conducted using standardized questionnaires designed to cover social economic and food habit data. To confirm data obtained by interviews, 20 percent of the subjects were observed for their two-day food consumptions. Ig-*S typhi* titer was determined in the sera diluted at 100, 400, 1600 fold with ELISA method using *S typhi* lipopolysaccharide as coating antigen while Ig-*V cholerae* was determined by vibrocidal complement method in sera diluted two fold at seven intervals.

The results of sera analysis showed that 22.2 percents of the subjects in group I, 55.0 and 35.0 percents in groups II and III have positive Ig-*S typhi* titer. At 1600 dilution only in 4.7 percents female subjects from group I were detected to have antibody titer. Positive vibrocidal titers were seen in 71.6 percents of the subjects in group I, 93.1 and 75.0 percents in group II and III. Only 5.2 percents of the female subjects in group II showed titers at 640 dilution. The score of street food consumption frequency and the degree of contamination revealed exposure of the three population groups to both *S typhi* and *V cholerae* with group II having the highest score.

Based on these findings it is concluded that antibody productions in individuals exposed to food bacterial contaminations through street food consumption are possible. The correlation between nutrient intake and nutritional status and other food chemical contaminations are discussed in order to determine the critical degree of exposure, nutrient status and the effects of other food contaminants.

Manuscript will be submitted in : Journal of Food and Agriculture Immunology

FIG. 10. ANTIBODY TITRES AGAINST SALMONELLA TYPHI IN ADOLESCENTS SAMPLES (MALE)






-  Male Exposed To Food Contamination (Workers & Drivers)
-  Male Didn't Expose To Food Contamination (IPB Staff)
-  Rural Area's Male

FIG.11. ANTIBODI TITRES AGAINST SALMONELLA TYPHI IN ADOLESCENTS SAMPLES (FEMALE)

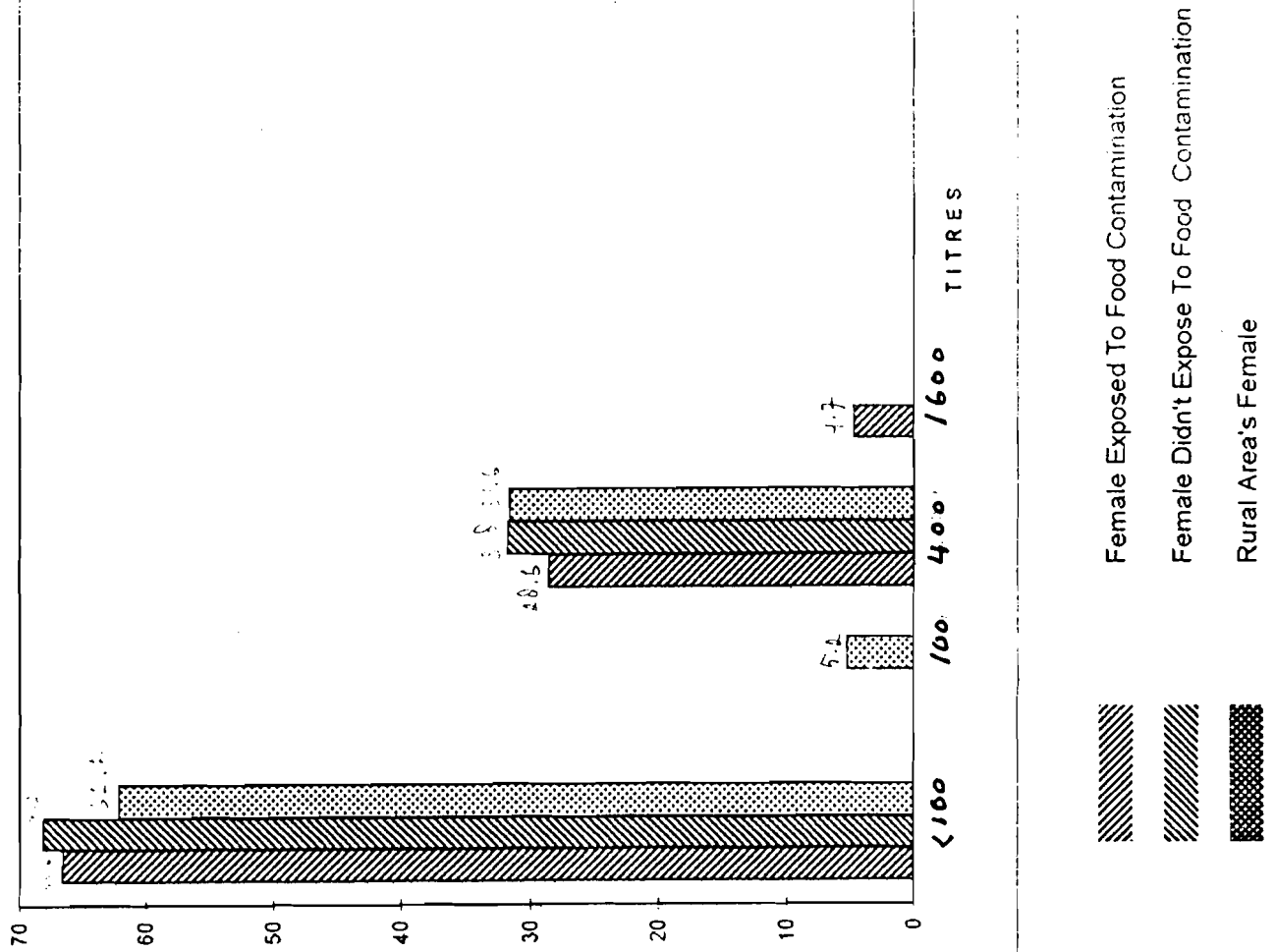
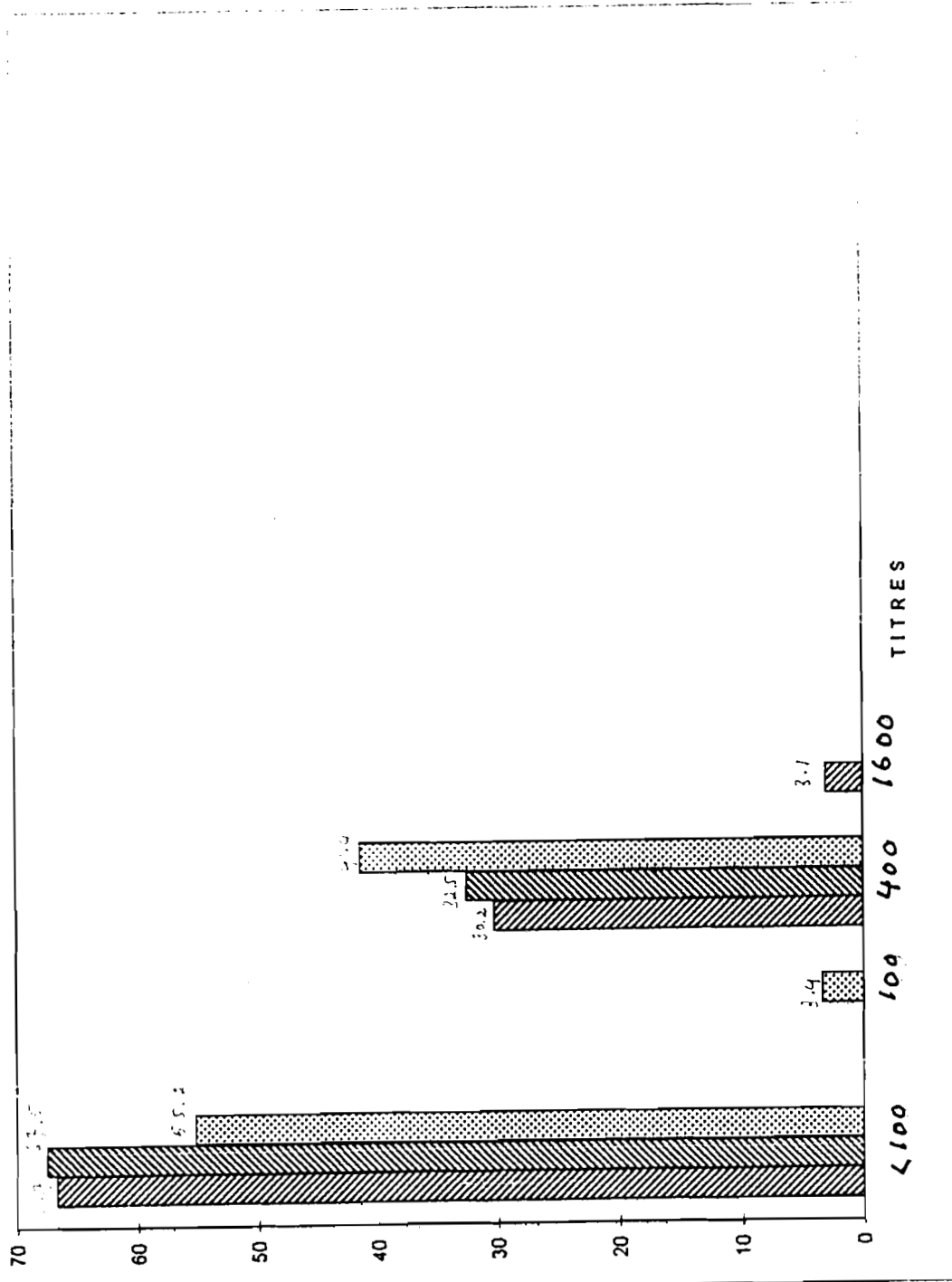


FIG.12. ANTIBODI TITRES AGAINST SALMONELLA TYPHI IN ADOLESCENTS SAMPLES

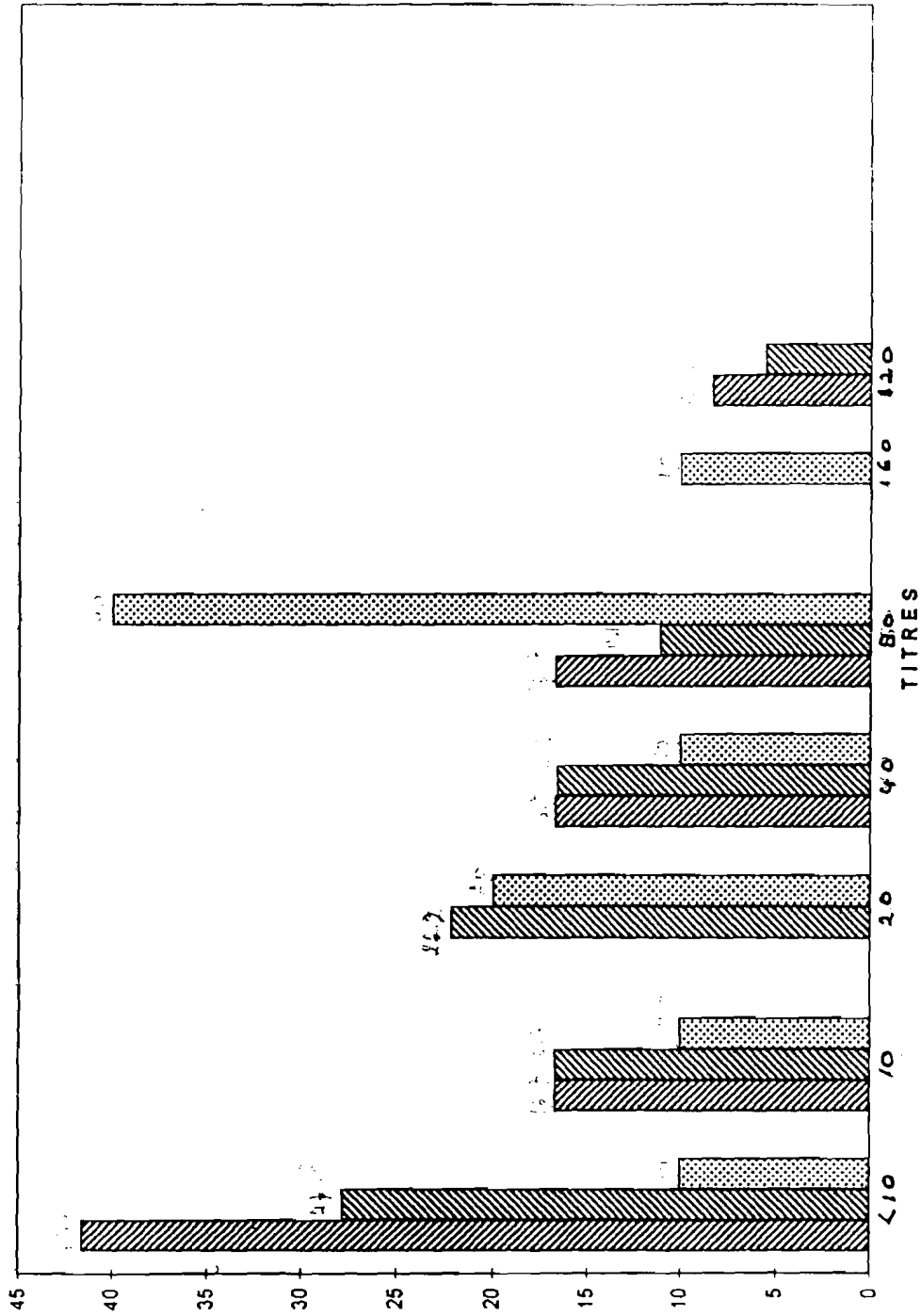


Adolescents Exposed To Food Contamination

Adolescents Didn't Expose To Food Contamination

Rural Area's Adolescents

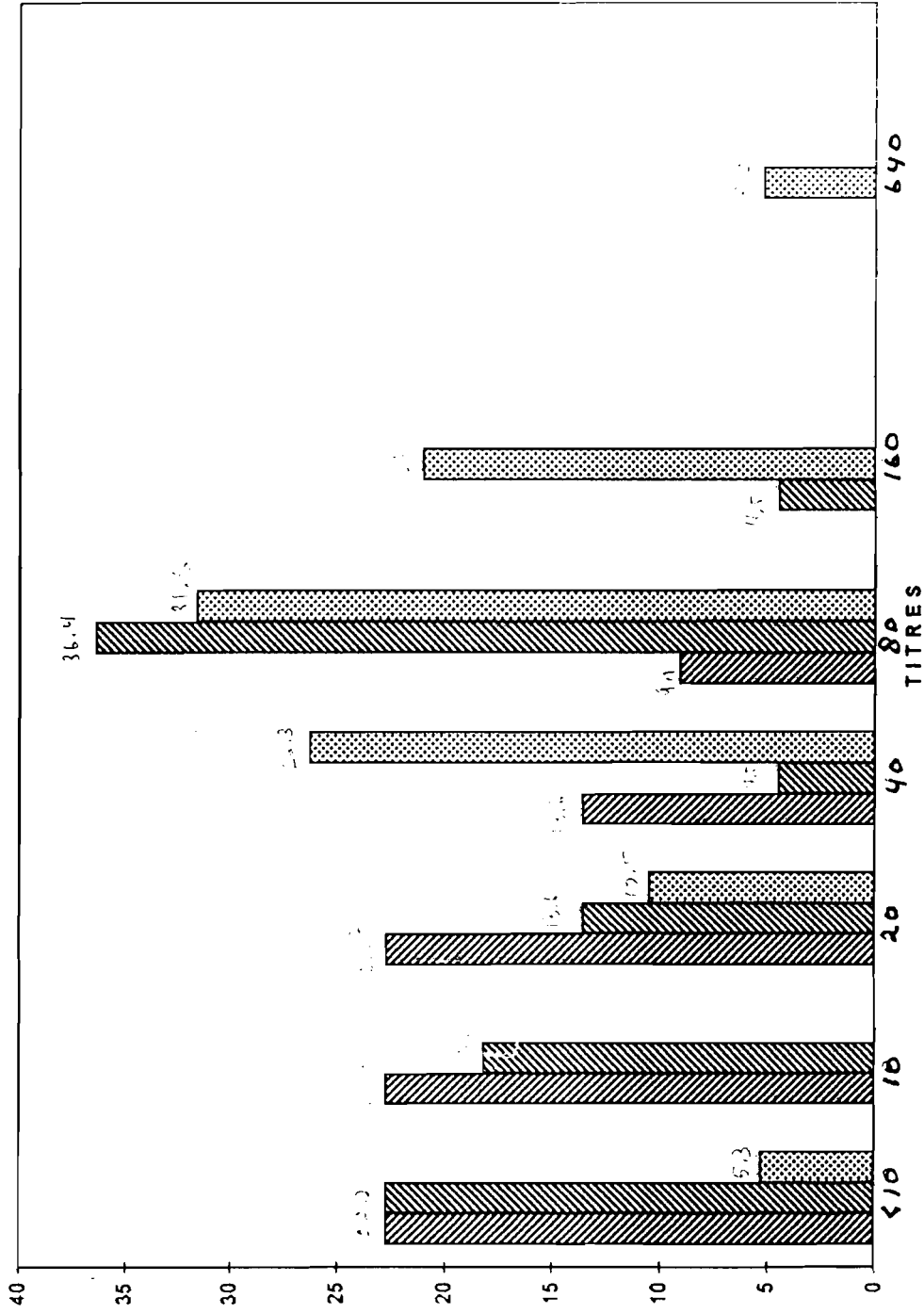
FIG. 4. VIBRIOSIDAL TITRES IN ADOLESCENTS SAMPLES (MALE)



- Male Exposed To Food Contamination
- Male Didn't Expose To Food Contamination
- Rural Area's Male

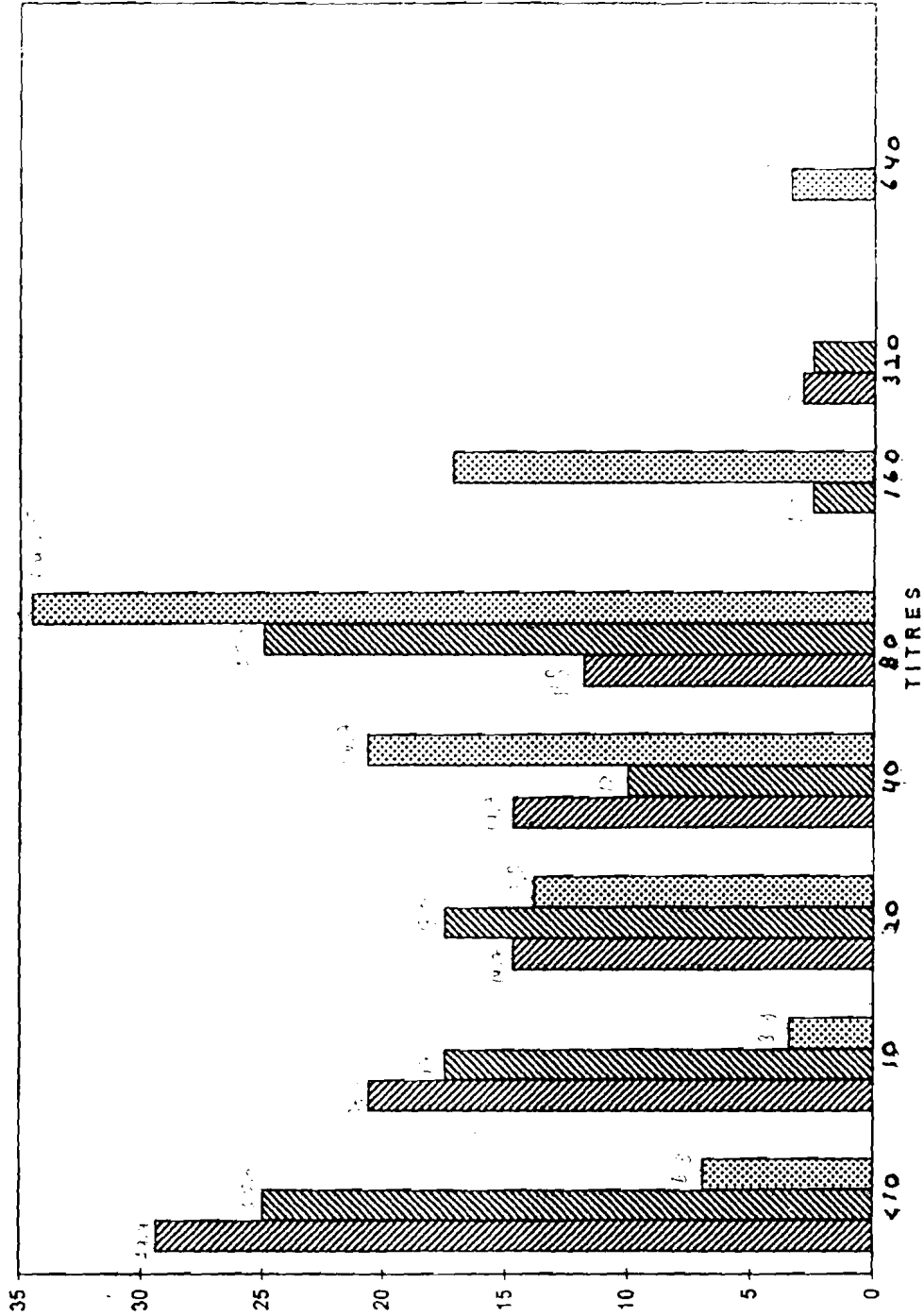
420 3017




FIG. 5. VIBRIOSIDAL TITRES IN ADULTS SAMPLES (FEMALE)



Female Exposed To Food Contamination
Female Didn't Expose To Food Contamination
Rural Area's Female

FIG. 6. VIBRIOSIDAL TITRES IN SAMPLES (ADOLESCENTS)



 Adolescents Exposed To Food Contamination
 Adolescents Didn't Expose To Food Contamination
 Rural Area's Adolescents

% of samples

Spontaneous acquired immunity against *Salmonella typhi* and *Vibrio cholerae* in adult population around Bogor area related to their consumption habits of street foods. Zakaria-Rungkat F, Wiriaatmaja TG, Sanjaya, Madaniyah-Pramudya S, Fardiaz S and LeBron Cl.

ABSTRACT

Data of contamination of street foods in Indonesia with pathogenic microorganism and hazardous chemicals had been reported. Amongst the contaminants are *Salmonella typhi* and *Vibrio cholerae* which are both intestinal pathogens. Depending on the degree of exposure, type of antigen and nutritional and health status, frequent exposure to these bacteria could result in antibody titer in the individuals. The incidence of tourist diarrhea when visiting developing country was thought to be due to lack of immunological resistance as compared to the local individuals.

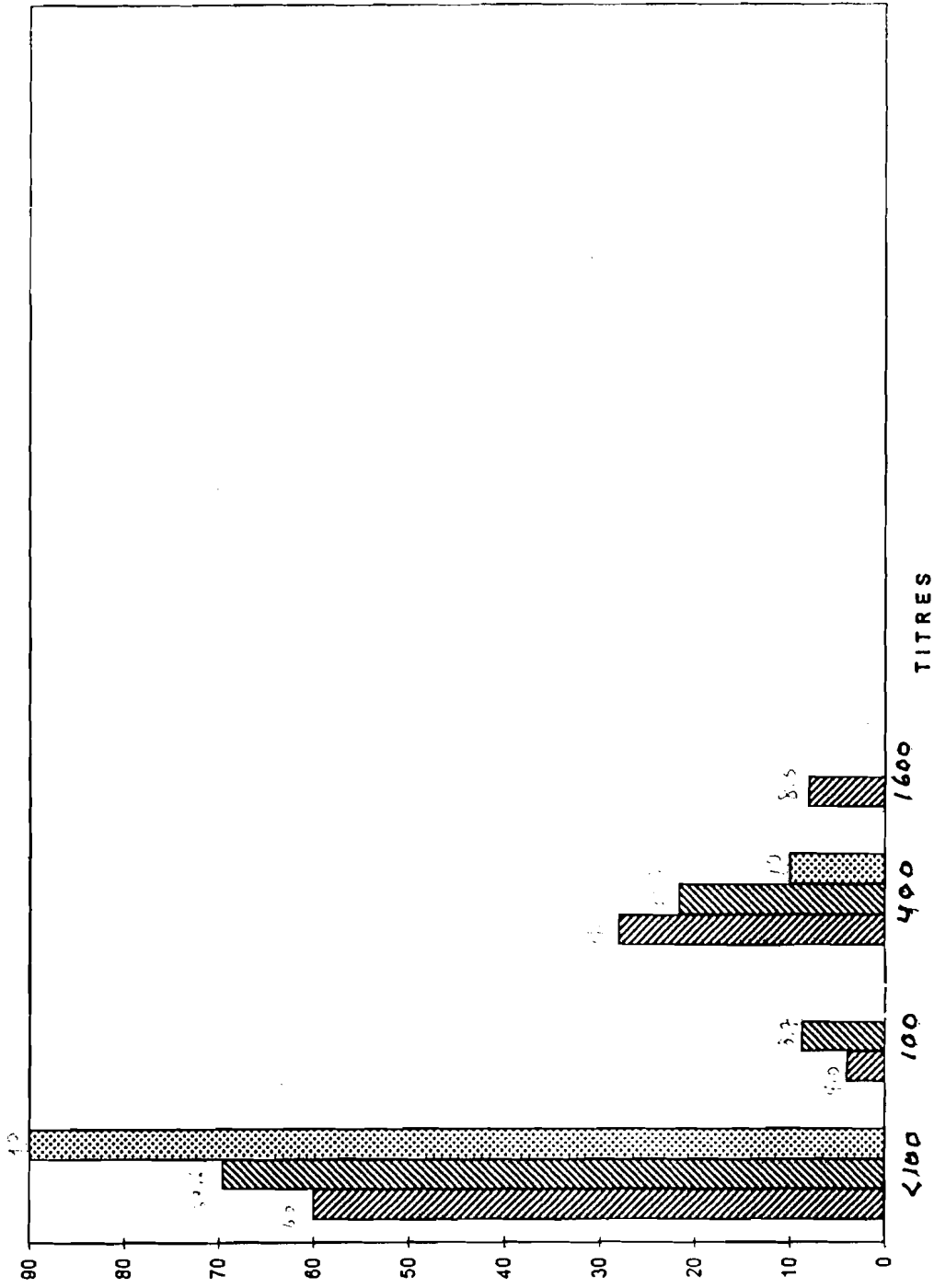
The aim of this research is to analyze the presence of antibody anti *S typhi* and *V cholerae* in populations in Bogor area that regularly consume street foods contaminated with the corresponding bacteria. Respondents were divided into three groups categorized as low income highly exposed (group I); low income moderately exposed (group II) and high income moderately exposed (group III). To represent group I, male and female respondents were chosen from industry labors, n= 87; group II from an isolated village, n= 38, and group III from local university staffs, n= 46. All respondents were screened for physical health by a certified physician then blood samples were taken for antibody analysis. Respondents were interviewed using standardized questionnaires covering socio economic and food habit aspects. The data obtained were confirmed by food consumption observation on 20 percent of the respondents. Ig-*S typhi* titer was determined in the sera diluted at 100, 400, 1600 fold with ELISA method using *S typhi* lipopolysaccharide as coating antigen while Ig-*V cholerae* was determined by vibrocidal complement method in sera diluted two fold at seven intervals.

On the average, positive Ig-*S typhi* titer were observed in 35.9 percents of respondents in group I, 19 and 52.1 percents in groups II and III respectively. Titres at 1600 dilution were detected only in 12.0 percents female respondents and 5.3 percents in male from group I. Positive vibrocidal titers were 64.4 percents in group I, 95 and 84.8 percents in group II and III. Titers at 640 dilution were observed only in 4.3 percents of male respondents from group III. Street food consumption frequency and the degree of contamination score showed exposure of the three population groups to both *S typhi* and *V cholerae*, with group II having the highest score.

The results of this research demonstrate antibody productions in individuals exposed to food bacterial contaminations through street food consumption. The correlation between nutrient intake and nutritional status and other food chemical contaminations will be discussed.

Manuscript will be submitted in: Journal of Applied Microbiology

FIG. 7. ANTIBODI TITRES AGAINST SALMONELLA TYPHI IN ADULTS SAMPLES (MALE)

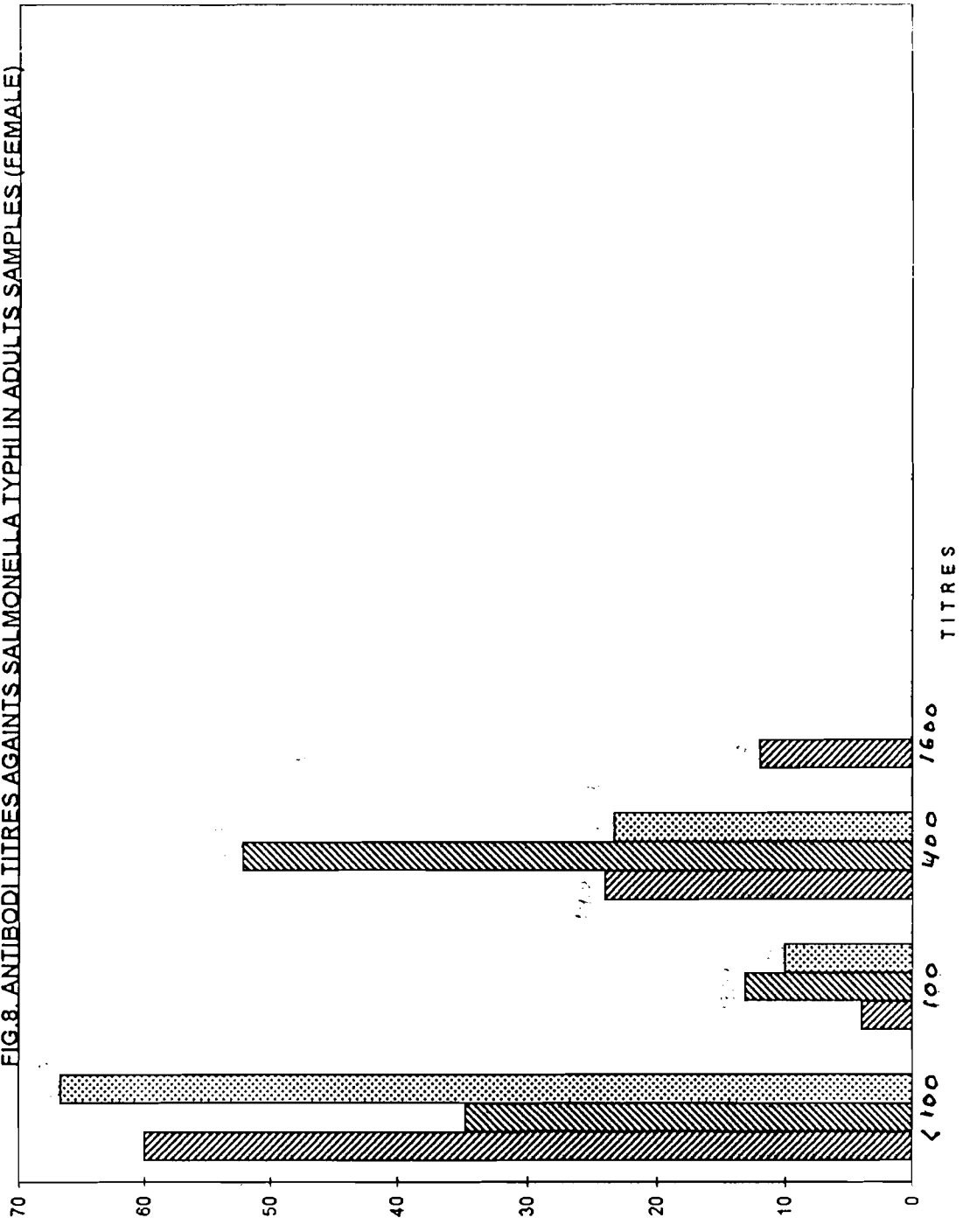


Male Exposed To Food Contamination
 Male Didn't Expose To Food Contamination
 Rural Area's Male

69

% of samples

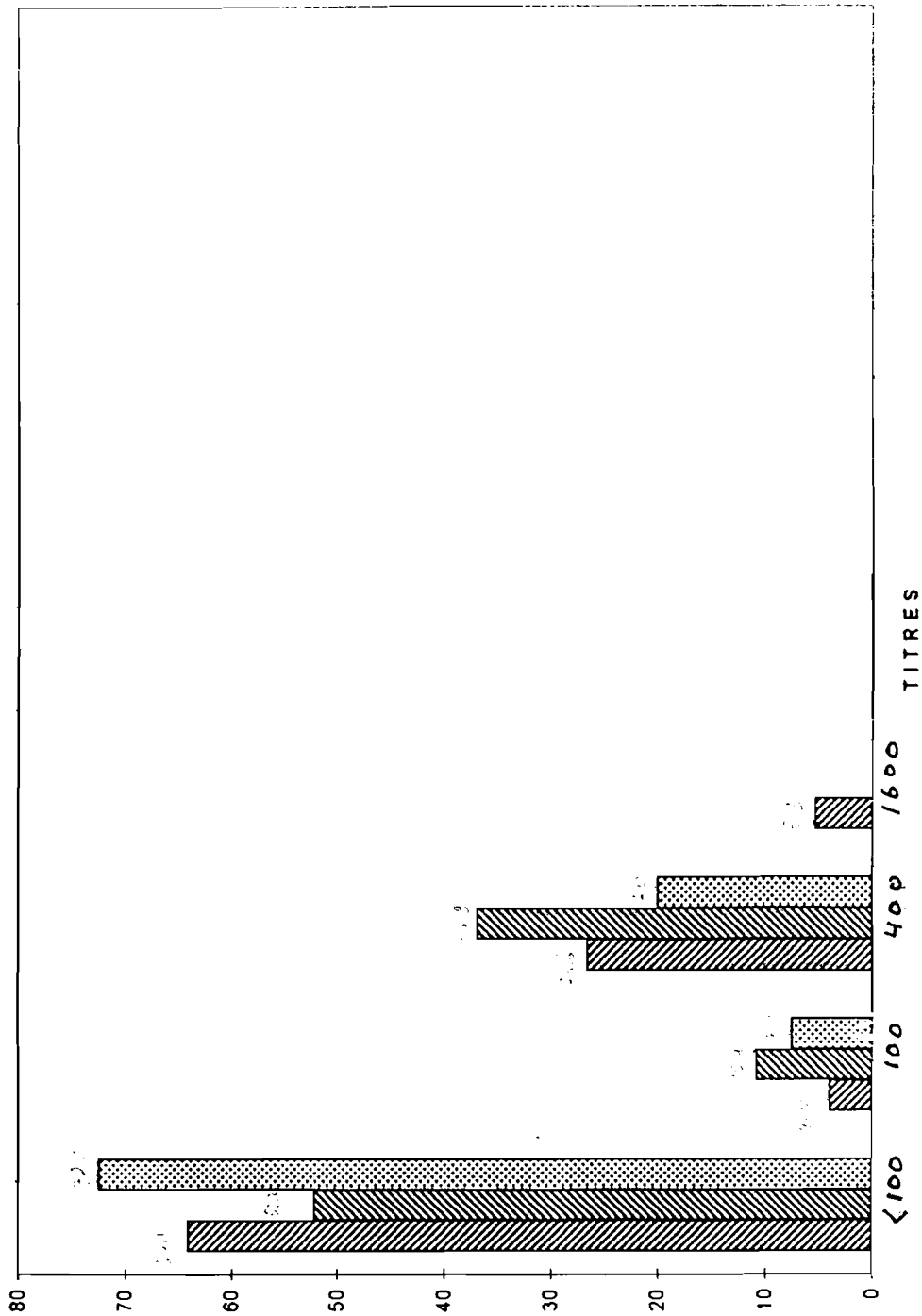
FIG. 8. ANTIBODY TITRES AGAINST SALMONELLA TYPHI IN ADULTS SAMPLES. (FEMALE)



Female Exposed To Food Contamination
 Female Didn't Expose To Food Contamination
 Rural Area's Female

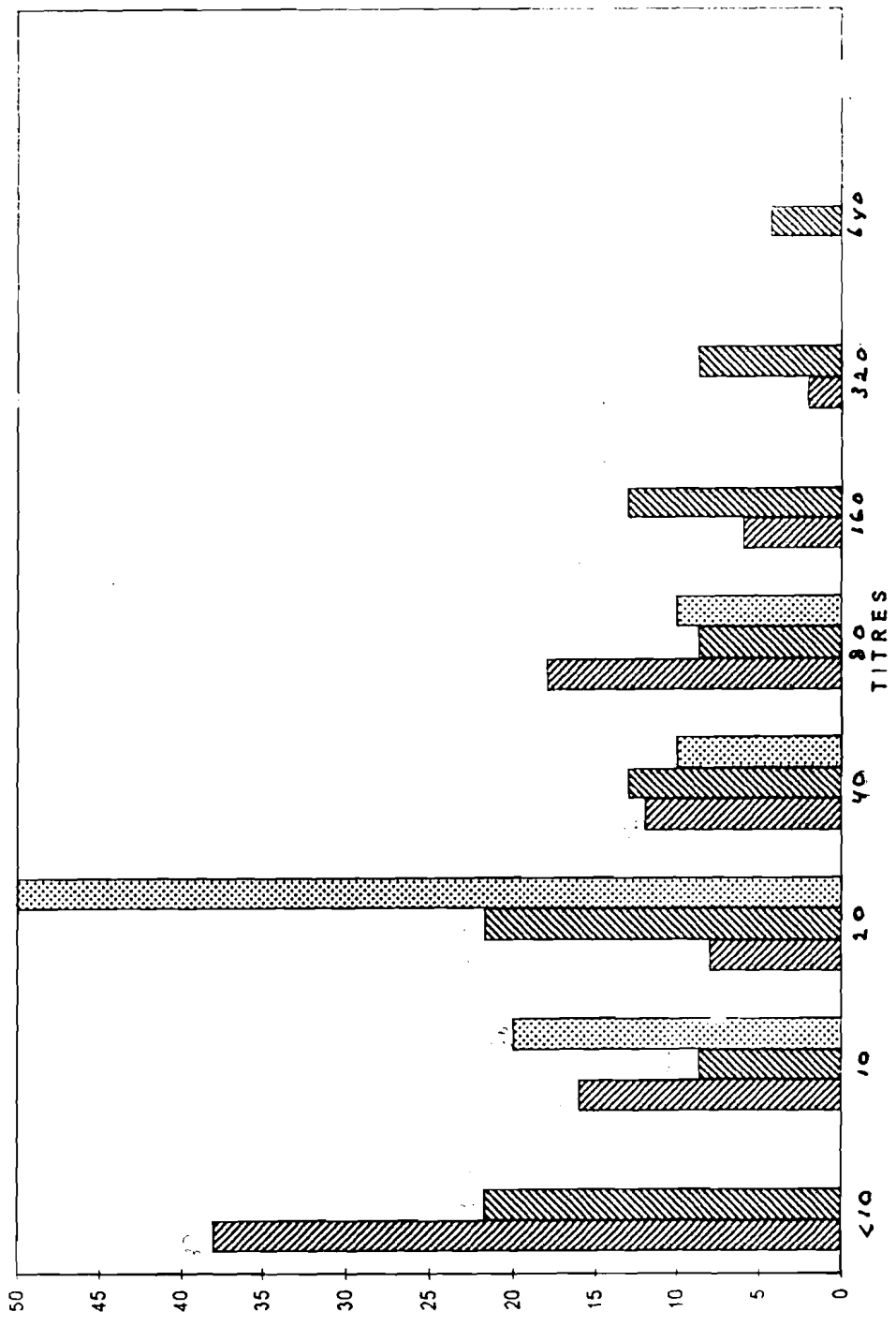
% of samples

FIG. 9. ANTIBODI TITRES AGAINST SALMONELLA TYPHI IN ADULTS SAMPLES



5/10/70

FIG. 1. VIBRIOSIDAL TITRES IN ADULTS SAMPLES (MALE)






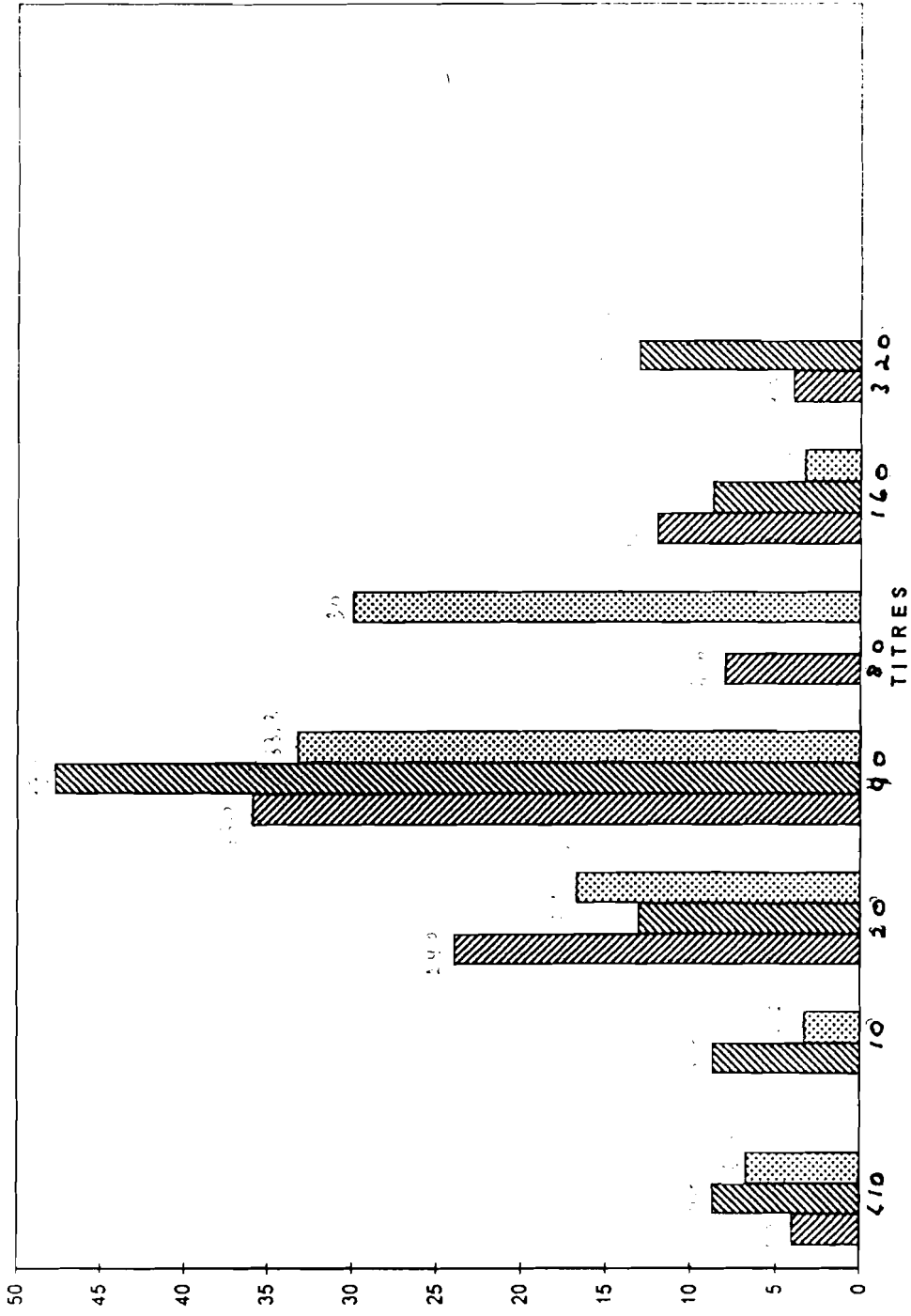
-  Male Exposed To Food Contamination (Workers & Drivers)
-  Male Didn't Expose To Food Contamination (IPB Staff)
-  Rural Area's Male

FIG. 2. VIBRIOSIDAL TITRES IN ADULTS SAMPLES (FEMALE)






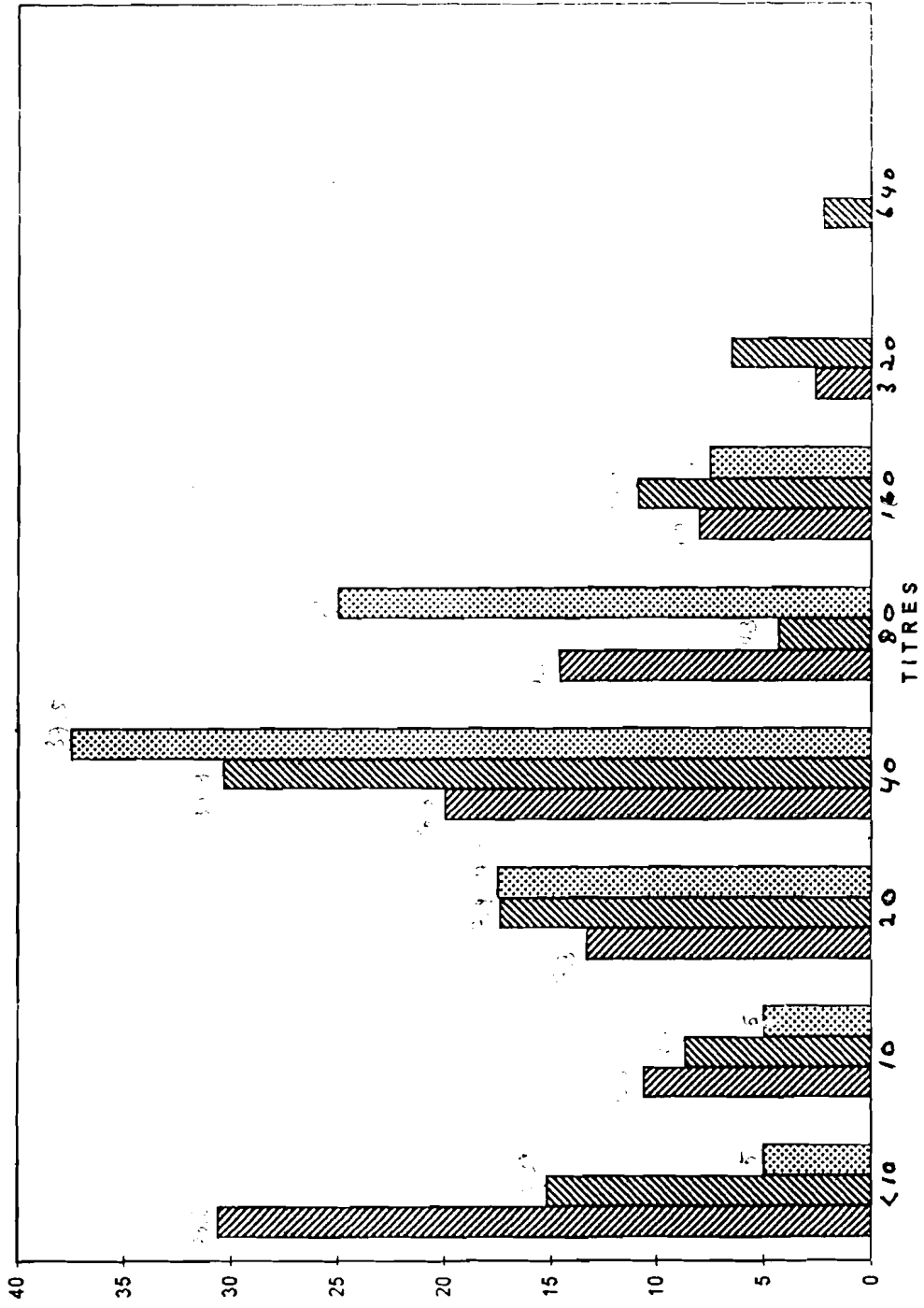
-  Female Exposed To Food Contamination (Workers & Drivers)
-  Female Didn't Expose To Food Contamination (IPB Staff)
-  Rural Area's Female

FIG.3. VIBRIOSIDAL TITRES IN ADULTS SAMPLES (ADULTS)



- Adults Exposed To Food Contamination
- Adults Didn't Expose To Food Contamination
- Rural Area's Adults

Immunological status of adolescents around Bogor area as related to their street foods consumption pattern. Zakaria-Rungkat F, Nurfaidah D, Sanjaya and Madaniyah-Pramudya S.

ABSTRACT

Contamination of street foods produced around Bogor area with non edible food colorants, heavy metals, mycotoxins and pesticide residues had been reported recently. Therefore, it is necessary to evaluate the effects of regular consumptions of these products on the overall health status of the population. In this research, the effects on immunological status of three different population groups was determined by analyzing the in vitro proliferative capacity of the lymphocytes.

Subjects were divided into three groups according to their apparent income and degree of street food consumption and clasified as low income highly exposed (group I); low income moderately exposed (group II) and high income moderately exposed (group III). Group I consisted of male and female respondents selected from industry labors, n= 28; group II from an isolated village , n= 29, and group III from local elite high school, n= 38. Subjects health were screened by physical examination by a certified physician. Interviews were conducted using standardized questionnaires designed to cover social economic and food habit data. Data obtained by interviews, were confirmed by observing 20 percent of the subjects' two-day food consumptions.

Blood samples (10 ml) were taken in heparinized sterile disposable syringes from healthy subjects and the polymorphonuclear monocytes were cultured in the presence of mitogenes and chemical contaminants. Lymphocyte DNA synthesis were traced with the addition of ^3H -thymidine. The index of stimulation (SI) of lymphocytes derived from group I and cultured with poke weed (PW), concanavaline (Con A), *S typhi* -lipopolysaccharide (LPS) 5 and 8 ug/ml, 1,1-bis(4-chlorophenyl)-2,2,2-trichloroethane (DDT) 5 and 8 ug/ml and Rhodamine B were 9.3, 13.4, 5.1, 3.4, 2.1, 1.8, and 1.8 respectively. The SI of lymphocytes derived from group II and cultured with the same mitogenes and contaminants were 18.8, 21.3, 7.0, 3.0, 2.7, 1.9, and 1.7 respectively. The SI of lymphocytes from group III treated equally to the other goupes were 41.2, 43.6, 18.7, 17.5, 18.1, 17.1, and 1.3 respectively.

It sis clearly demonstrated by this research that lymphocyte proliferation capacity of individus in group I wich are consisted of workers with low income and highly exposed to food chemical contaminations are markedly reduced. More detail investigations on the subset cell population affected and its relation with free radicals resulted in during xenobiotic activations is interesting.

Manuscript will be submitted in : Journal of Food Chemical Toxicology

INDEKS STIMULASI PROLIFERASI LIMFOSIT MANUSIA
KELOMPOK REMAJA EKSPLOS GIZI RENDAH

No.	Sampel	Kontrol	Pokeweed 10µg/ml	SI Pokeweed	Con A 10µg/ml	SI Con A	LPS1 10µg/ml	SI LPS 1	LPS2 10µg/ml	SI 16µg/ml	DDT 1 10µg/ml	SI DDT1	DDT2 16µg/ml	SI DDT 2	Rhodamin 10µg/ml	SI Rhodamin
1	104	291	2057	7.1	2514	8.64	242	0.9	246	0.9	350	1.2	348	1.2	248	0.85
2	105	268	2143	8	2659	9.9	392	1.5	286	1.1	410	1.5	392	1.5	309	1.2
3	107	409	2554	6.2	3122	7.6	341	0.8	254	0.6	446	1.1	306	0.75	227	0.6
4	108	598	2404	4	3252	5.4	446	0.8	525	0.8	502	0.8	322	0.5	368	0.6
5	109	398	2647	6.7	2686	6.8	332	0.8	346	0.9	463	1.2	318	0.8	238	0.6
6	115	455	1664	3.7	1243	2.7	899	2	422	0.9	876	1.9	376	0.8	280	0.6
7	306	9496	16702	1.76	17108	1.8	14128	1.5	7793	0.82	9877	1.04	9051	0.95	1412	0.15
8	314	486	22029	45.3	26792	55.1	7221	14.86	3631	7.5	1539	3.2	1007	2.1	1803	3.7
9	315	1247	10759	8.6	6093	4.9	5339	4.3	2991	2.4	2085	1.8	2400	1.9	5439	4.4
10	298	877	1231	1.4	32191	36.7	10099	11.5	13145	14.9	1638	1.9	3394	3.9	7002	8
11	316	171	8537	49.9	24482	143	6537	38.2	4358	25.5	738	4.3	448	2.6	1622	9.2
		1,336	6,611.55	12.97	11,103.82	25.69	4,179.64	7.01	3,090.64	5.12	1,720	1.81	1,669	1.55	1,722.55	2.72
putri																
1	98	270	1740	6.4	2215	8.2	399	1.5	276	1	333	1.2	196	0.7	201	0.7
2	100	326	1712	5.25	2289	7	516	1.6	301	0.9	278	0.9	247	0.8	181	0.6
3	101	254	1791	7.1	2081	8.2	296	1.2	358	1.4	208	0.8	200	0.78	175	0.69
4	102	428	2374	5.6	2285	5.3	305	0.7	318	0.7	736	1.7	284	0.7	268	0.6
5	103	486	2479	5.1	2244	4.62	567	1.17	440	0.91	638	1.31	397	0.82	247	0.51
6	110	479	2497	5.11	2817	5.88	458	0.96	381	0.79	480	1	299	0.62	401	0.84
7	113	365	983	2.7	1059	2.9	522	1.4	293	0.8	538	1.5	298	0.8	263	0.7
8	116	449	907	2	952	2.1	445	1	314	0.7	491	1.1	278	0.6	162	0.4
9	118	266	980	3.7	1662	6.2	431	1.6	273	1	415	1.6	199	0.7	113	0.4
10	292	10046	29520	2.9	37157	3.7	15348	1.5	22811	2.3	8029	0.8	12623	1.3	11418	1.1
11	294	12303	26369	2.1	33441	2.7	16844	1.4	12921	1.1	5712	0.5	5589	0.5	5031	0.4
12	300	2643	17059	6.5	23921	9.1	29726	8.9	8506	3.2	5138	1.9	5902	2.2	6557	2.5
13	301	1107	36953	33.4	14967	13.5	18667	16.9	17119	15.5	1443	13.0	11451	10.34	7192	6.5
14	302	3792	10539	2.8	19847	5.2	16897	4.5	11530	3	11553	3	6087	1.6	4843	1.3
15	303	1446	33574	23.2	15661	10.8	24067	16.6	4920	3.4	7218	5	8008	5.54	3530	2.4
16	313	1899	9723	5.1	20628	10.9	1002	5.3	5167	2.7	4334	2.3	4334	4.1	3854	2
17	322	1630	34904	21.4	13855	8.5	7471	4.6	2416	1.5	2975	1.8	766.3	0.5	2616	1.6
18	323	1515	19558	12.91	14722	9.7	6628	4.4	3052	2	6179	4.1	2129	1.5	1566	1
		2284.9	11200	7.435	11451.62	6.64375	7905.62	4.139	5370.5	2.46	2971.	2.35	3524.5	2.006	2777.25	1.3525

INDEKS STIMULASI PROLIFERASI LIMFOSIT MANUSIA
KELOMPOK REMAJA NON EXPOS GIZI RENDAH

No.	Sampel	Kontrol	Pokeweed 10µg/ml	SI Pokeweed	Con A 10µg/ml	SI Con A	LPS1 10µg/ml	SI LPS 1	LPS2 16µg/ml	SI LPS 2	DDT 1 10µg/ml	SI DDT1	DDT2 16µg/ml	SI DDT 2	Rhodamin 10µg/ml	SI Rhodamin
putra																
1	175	2124	22791	10.73	21643	10.2	5777	2.7	4254	2	3516	1.7	3117	1.5	3075	1.5
2	187	1256	20782	16.5	17294	13.8	5649	4.5	1105	0.9	4642	3.7	2487	1.9	1219	1
3	190	1410	22266	15.8	27653	19.6	6353	4.5	812	0.6	564	0.4	1124	0.8	2610	1.85
4	191	997	15927	16	24333	24.4	11132	11.2	4185	4.2	2987	3	2784	2.8	1357	1.4
5	206	236	16266	68.9	11885	50.4	2937	12.44	1616	6.9	1542	6.5	2027	8.59	1213	5.1
6	207	1371	13254	9.7	21878	15.9	7720	5.6	4063	2.9	4292	3.1	4303	3.1	2395	1.8
7	208	1487	20297	13.7	20927	14.1	8990	6.1	2069	1.4	2487	1.7	2125	1.4	2131	1.4
8	214	521	28737	55.2	50610	97.1	10188	19.6	3432	6.6	2779	5.3	1163	2.2	4079	7.8
9	215	3543	14173	4	22814	6.4	8389	2.4	6589	1.9	3061	0.9	1695	0.5	1134	0.3
10	216	1378	20839	15.1	27991	20.3	10023	7.3	4103	3	3718	2.7	836	0.6	1469	1.1
11	209	1054	21754	20.6	28180	26.7	9866	9.4	3825	3.6	5618	5.3	4596	4.4	3433	3.3
12	210	1376	13919	10.1	15848	11.5	9266	6.7	2214	1.6	2516	1.8	2795	2	3109	2.3
13	237	4231	40179	9.5	36332	8.6	33535	7.9	6715	1.6	6307	1.5	6646	1.6	9685	2.3
		1614.1	20860.30	20.44846	25183.69	24.5384	9986.53	7.718	3460.153	2.86	3386.	2.89	2746	2.414	2839.153	2.39615
putri																
1	171	1929	14816	7.7	17326	9	7308	3.8	6682	3.5	5711	2.96	3472	1.8	1125	0.6
2	172	1009	15235	15.1	19394	19.2	2332	2.3	874	0.9	1773	1.8	992	0.98	1365	1.35
3	173	975	21298	21.8	20064	20.6	8105	8.3	4229	4.34	1278	1.3	1150	1.2	1226	1.3
4	174	826	20849	25.2	30841	37.3	5145	6.2	1501	1.8	4576	5.54	961	1.16	2159	2.61
5	176	1604	22768	14.2	23931	14.9	7173	4.5	1881	1.2	1752	1.1	1538	0.96	2515	1.6
6	177	1388	12492	9	11409	8.2	7281	5.2	3666	2.6	3433	2.5	1792	1.3	984	0.7
7	189	973	22917	23.6	15335	15.8	3046	3.1	4319	4.4	3114	3.2	1068	1.1	1676	1.7
8	203	2730	17746	6.5	16106	5.9	5018	1.8	3979	1.5	3034	1.1	1675	0.6	1375	0.5
9	204	1258	26839	21.3	35522	28.2	9428	7.5	2360	1.9	2453	1.9	2281	1.8	3184	2.5
10	205	478	22128	46.3	13349	27.9	8970	18.8	3978	8.3	1509	3.2	667	1.4	1661	3.5
11	217	1218	28922	23.8	40656	33.4	15937	13.1	9484	7.8	5866	4.8	1408	1.2	2278	1.9
12	221	1558	21978	14.1	25487	16.4	5906	3.8	3207	2.1	2120	1.4	1535	1	911	0.6
13	226	953	19147	20.1	15766	16.5	3452	3.7	4107	4.3	3486	3.7	4674	4.9	971	1
14	239	3427	26133	7.6	33987	9.9	10649	3.1	5161	1.5	5668	1.7	4091	1.2	5395	1.6
15	240	3458	39181	11.3	36594	10.6	29158	8.4	4220	1.2	5346	1.5	3220	0.9	5428	1.6
16	230	1312	17303	13.19	31496	24	12739	9.7	5779	4.4	4134	3.15	1978	1.51	1672	1.27
17	237	5464	28426	5.202	16903	3.1	11694	2.1	7665	1.4	4361	0.79	5245	0.96	2059	0.38
		1797.6	22245.76	17.54937	23774.47	18.6125	9020.05	6.456	4299.529	3.23	3506.	2.55	2220.4	1.438	2120.312	1.52062

INDEKS STIMULASI PROLIFERASI LIMFOSIT MANUSIA
KELOMPOK REMAJA NON EXPOS GIZI TINGGI

No.	Sampel	Kontrol	Pokeweed 10 μ g/ml	SI Pokeweed	Con A 10 μ g/ml	SI Con A	LPS1 10 μ g/ml	SI LPS 1	LPS2 16 μ g/ml	SI LPS 2	DDT 1 10 μ g/ml	SI DDT1	DDT2 10 μ g/ml	SI DDT 2	Rhodamin 10 μ g/ml	SI Rhodamin
Putra																
1	128	853	35484	41.6	44715	52.4	50843	59.6	41094	48.2	24989	29.3	51605	60.5	704	0.8
2	129	290	42970	148.1	51645	178.1	35567	122.6	30213	104.	28726	99.1	38022	135	1098	3.8
3	130	213	23964	112.5	38804	182.2	16014	75.2	21569	101.	13597	63.8	30234	141.9	252	1.2
4	132	622	34548	55.5	36888	59.3	24512	39.4	31121	50	27989	45	32477	52.2	841	1.4
5	133	464	13339	28.7	18483	39.8	9144	19.7	16078	34.7	14055	30	8347	18	484	1
6	134	683	36199	53	57748	84.6	24215	35.5	34344	50.3	24079	35.3	15113	22.1	1057	1.5
7	135	343	27272	79.5	15070	43.9	11975	34.9	9249	26.9	21501	62.7	3564	10.4	308	0.9
8	136	644	22795	35.4	18436	28.6	6498	10.1	1070	1.2	4016	5.2	2900	4.5	330	0.5
9	137	525	25824	49.2	22494	42.8	15529	29.6	5242	10.1	8241	15.7	3681	7	398	0.76
10	142	465	28063	60.4	18338	39.4	3390	42.1	19819	7.3	17341	37.3	6898	14.8	755	1.6
11	152	3612	36159	10	26851	7.4	10468	2.9	4577	1.3	5868	1.6	4986	1.4	2776	0.8
12	153	1593	40004	25.1	48885	30.7	24834	15.6	18042	11.3	14536	9.1	16576	16.4	2074	1.3
13	160	1177	41951	35.64	18805	15.98	1872	1.59	516	0.44	1100	0.93	417	0.35	602	0.51
14	161	4385.5	16830.33	3.84	18325	4.18	13609	3.1	3145	0.72	3040.	0.69	2869	0.65	3399	0.78
15	164	1057	27413.33	25.92	25041.67	23.68	4638.67	4.39	1647.33	1.56	3415	3.23	2906.6	2.75	922	0.87
16	166	880	10282	11.68	23132.33	26.29	10129.3	11.51	4418	5.02	2949	3.35	2288	2.6	1082	1.23
17	169	1351.6	25436	18.82	44213.33	32.71	14035.3	10.38	11396.33	8.43	13865	10.2	7958.6	5.89	591	0.44
		1126.9	28737.27	46.75882	31051.43	52.4729	16310.1	30.48	14914.15	27.2	13488	26.6	13578.	29.20	1039.588	1.14058
Putri																
1	131	926	44971	43.6	49427	53.4	21678	23.4	31059	33.5	24316	26.3	34075	36.8	625	0.7
2	138	479	13006	27.2	13372	27.9	5047	10.5	1351	2.8	4375	9.1	3880	801	161	0.4
3	139	528	35835	67.9	42355	80.2	21162	40.1	5204	9.9	17266	32.8	13781	26.1	634	1.2
4	141	987	27023	27.3	16562	16.8	16562	14.7	2485	2.5	12955	13.1	5874	5.9	532	0.5
5	143	959	15845	16.1	23915	25	1112	11.6	2228	2.3	11044	11.5	3354	3.5	1410	1.5
6	144	252	24968	99.1	27169	107.8	2095	11.5	21495	84.9	18342	72.8	5282	20.9	1600	6.3
7	148	5393	37448	7	43041	8	18854	3.5	6108	1.1	8825	1.6	4689	0.9	4235	0.8
8	149	1874	66998	35.8	51294	27.4	4745	2.5	2446	1.3	4388	2.3	1015	0.5	1505	0.8
9	150	2358	53601	22.7	38585	16.4	7611	3.2	4155	1.8	5150	2.2	1670	0.7	5839	2.5
10	151	2347	65504	27.1	36634	15.6	5755	2.5	2939	1.3	3456	1.5	1838	0.8	939	0.4
11	154	1045	52165	49.9	30346	29	3308	3.2	3744	3.6	2391	2.3	1271	1.2	2139	2
12	155	1641	76473	46.6	66648	40.6	17493	10.7	4082	2.5	6387	3.9	1468	0.9	2028	1.3
13	156	2789	28683	10.29	31726	11.38	8434	3.02	3978	1.43	4516	1.63	3474	1.25	1438	0.52
14	157	1010	21044	20.84	15144	15	1386	1.37	1314	1.3	1608	1.59	700	0.69	898	0.89
15	159	815	53095	65.15	47260	57.99	9796	12.02	2837	3.48	4718	5.79	1434	1.76	2068	2.54
16	162	1726	31774.5	18.41	29309	16.98	1935	1.12	1021.67	0.59	1716.	0.99	1447	0.84	986.33	0.57
17	165	2293	17816.33	7.77	21815.33	9.51	11584	5.05	8673.67	3.78	4095	1.79	3462	1.51	1857	0.81
18	168	718.33	20782	28.93	14518.67	20.21	794.33	1.11	785.33	1.09	877	1.22	719	1	539	0.75
19	170	548	36667	66.91	45096	82.29	3267	5.96	1184	2.16	6848	12.5	5729	10.45	151	0.28
20	146	448	22421	50	28555	63.7	7370	16.5	11396	25.4	13865	30.9	8920	19.9	1676	3.7
21	147	424	13156	31	16435	38.8	4001	9.4	6848	16.2	1182	2.8	4767	11.2	146	0.3
		1407.6	36155.99	36.64761	32819.38	36.3790	8285.20	9.188	5968.27	9.66	7539	11.3	5183.2	45.13	1495.539	1.36952

The relationship of street foods consumption pattern and the immunological status of adults around Bogor. Zakaria-Rungkat F, Anis M, Sanjaya and Madaniyah-Pramudya S.

ABSTRACT

Contamination of street foods produced around Bogor area with non edible food colorants, heavy metals, mycotoxins and pesticide residues had been reported recently. However, the effects of regular consumptions of these products on the overall health status of the population are still unknown. In this research, the effects on immunological status of three different population groups was determined by analyzing the in vitro proliferative capacity of the lymphocytes.

Respondents were divided into three groups according to their apparent income and degree of street food consumption and classified as low income highly exposed (group I); low income moderately exposed (group II) and high income moderately exposed (group III). Group I consisted of male and female respondents selected from industry labors, n= 44; group II from an isolated village, n= 38, and group III from local elite high school, n= 46. Subjects health were screened by physical examination by a certified physician. Interviews were conducted using standardized questionnaires designed to cover socio economic and food habit data. Data obtained by interviews, were confirmed by observing 20 percent of the subjects two-day food consumptions.

Blood samples (10 ml) were taken in heparinized sterile disposable syringes from healthy subjects and the polymorphonuclear monocytes were cultured in the presence of mitogenes and chemical contaminants. Lymphocyte DNA synthesis were traced with the addition of ^3H -thymidine. The proliferation of lymphocytes derived from group I and cultured with poke weed (PW), concanavaline (Con A), *S typhi*-lipopolysaccharide (LPS) 5 and 8 ug/ml, 1,1-bis(4-chlorophenyl)-2,2,2-trichloroethane (DDT) 5 and 8 ug/ml and Rhodamine B were 2126, 11944, 9088, 6320, 4516, 2353, 2781, and 2153 cpm respectively. The proliferation of lymphocytes derived from group II and cultured with the same mitogenes and contaminants were 1748, 20360, 21833, 8135, 3005, 3107, 3190, dan 2395 cpm respectively. The proliferation of lymphocytes from group III treated equally to the other groups were 3543, 26948, 22861, 7183, 5099, 12044, 7043, 3960 cpm respectively.

The results of this research revealed that lymphocyte proliferation capacity of individuals in low income highly exposed group are markedly reduced. A more detail mechanism of the effects on subset cell population and its relation with free radicals producing from detoxification activation is important to be elucidated.

Manuscript will be submitted in : International Archives of Allergy and Applied Immunology.

Proliferasi Limfosit Manusia
Kelompok Dewasa Ekspose Gizi Rendah (cpm)

No	Subyek	Kontrol	Pokeweed (10 µg/ml)	Concanavalin A (10 µg/ml)	LPS ₁ (10 µg/ml)	LPS ₂ (10 µg/ml)	DDT ₁ (10 µg/ml)	DDT ₂ (10 µg/ml)	Rhodamin B ₁ (10 µg/ml)	Rhodamin B ₂ (10 µg/ml)
1	85 P	245	794	3814	1754		1007	516	375	326
2	86 P	253	950	977	2440		460	1807	299	371
3	87 P	267	2149	2404	2829		1115	2484	257	241
4	88 P	158	2402	1861	286		302	504	334	267
5	90 L	231	2151	2189	262		319	267	178	254
6	91 L	178	1691	1259	202		133	141	133	211
7	92 L	142	1344	736	182		142	174	107	163
8	93 L	108	1077	650	156		184	277	199	133
9	94 L	201	1759	1955	218		194	187	137	195
10	95 L	137	1097	914	161		144	170	149	149
11	99 L	314	1885	2851	495	544	531	462	392	
12	112 P	399	975	1227	460	387	447	256	207	
13	114 P	340	1090	314	453	302	539	266	241	
14	117 P	458	1020	1284	563	422	885	332	226	
15	119 L	337	969	1678	338	181	573	293	144	
16	120 L	256	1337	1904	419	213	417	279	158	
17	121 L	309	1357	2134	519	268	507	385	179	
18	123 P	317	1413	1378	479	205	473	198	190	
19	124 L	188	1370	1945	847	375	438	522	230	
20	125 L	209	1356	1447	756	403	881	655	249	
21	126 L	297	1351	2521	475	467	444	515	203	
22	127 P	214	927	957	313	284	254	318	215	
23	287 L	1600	20569	20421	10499	4937	7035	7944	6087	
24	288 L	1828	29771	15613	10975	11087	5496	7266	6714	
25	289 P	1055	42337	7999	12017	6785	4417	6609	7679	
26	291 L	14648	26461	33074	19227	14412	3738	14820	8767	
27	293 P	11921	25188	23770	17694	18055	5514	12171	10108	
28	295 P	3985	18078	16836	13013	6146	1850	5080	4135	
29	296 P	1620	23538	24389	19798	5558	1532	5856	8934	
30	297 L	1131	17246	31117	33038	14834	1120	3337	2988	
31	304 P	4566	21962	20406	18285	10462	6012	4195	4939	
32	305 L	5923	18064	12468	17806	12402	10308	4524	1605	
33	308 L	12440	12271	16452	11710	5418	4651	8534	1771	
34	317 L	5909	18300	18179	7842	3639	4986	3508	851	
35	318 P	933	58365	3155	2574	3084	2756	1632	2606	
36	319 P	1985	22352	14042	32287	3143	3927	5212	1576	
37	320 P	904	16735	19661	5930	1294	3233	1357	1832	
38	325 P	5605	25831	15608	2639	4232	8517	4043	3934	
39	326 P	1703	29532	20588	784	2646	3592		3576	
40	327 P	1712	20717	13363	2082	3304	5047	1390	3242	
Rata-rata :		2,125.65	11,944.53	9,088.50	6,320.18	4,516.30	2,353.00	2,781.69	2,153.65	210.00

Proliferasi Limfosit Manusia
Kelompok Dewasa Non Ekspose Gizi Tinggi (cpm)

No	Subyek	Kontrol	Pokeweed (10 µg/ml)	Con A (10 µg/ml)	LPS ₁ (10 µg/ml)	LPS ₂ (16 µg/ml)	DDT ₁ (10 µg/ml)	DDT ₂ (16 µg/ml)	Rhodamin B (10 µg/ml)
1	241 L	2619	20587	18538	4147	3375	3593	1748	5460
2	242 P	1017	26241	24646	3244	2126	11117	3899	1894
3	243 P	1086	40773	21479	1550	3271	4580	2850	1482
4	244 L	2190	16105	27628	1829	4153	8371	3749	2211
5	245 L	1962	40421	25060	6692	3467	7972	4141	3463
6	246 L	1853	34131	48830	12163	6554	16875	11366	1913
7	247 L	2302	12867	8824	4285	3147	2237	5989	2008
8	248 P	2439	5791	6885	2249	3952	693	2196	2353
9	249 L	4727	11090	9529	1799	5597	6377	2416	2235
10	250 L	3369	23495	11667	1968	5035	1428	3520	899
11	251 L	6594	4594	13517	1733	7206	2010	3581	1490
12	252 P	5761	15010	11185	1227	2519	3125	1998	1066
13	253 P	3335	17732	4373	9944	4593	4943	3211	806
14	256 L	3048	33922	42671	9241	6062	23254	12984	3672
15	257 L	2773	15044	8969	5490	3493	7857	6306	503
16	258 L	3687	19223	23216	4473	5905	6314	5420	1244
17	259 L	2436	18797	20692	7884	9904	6351	4932	1008
18	260 L	4157	9923	13687	2007	3071	6236	1932	1522
19	262 L	2653	14998	9327	3712	4707	9082	5311	1472
20	263 P	5770	31293	27080	1880	2880	12178	2173	2988
21	264 L	3603	20902	31235	5621	2836	14821	3870	1869
22	265 L	5567	26268	36877	3778	2808	5189	2034	1242
23	266 P	4040	50763	27239	5675	5977	8244	3538	10126
24	267 L	2576	24484	28162	9843	3977	22387	9385	3604
25	268 L	2172	26818	29627	3135	2817	4883	2680	1599
26	269 L	1845	24815	7077	7043	10396	11471	6011	5234
27	270 P	6375	29257	14902	6192	3288	17343	10669	3047
28	271 P	9021	42789	35271	9161	5701	23227	4177	6428
29	272 P	3895	8752	16593	6541	6433	5031	8752	8643
30	273 P	3317	15502	33348	14880	5439	25933	5997	7111
31	274 P	2187	69275	61143	19370	5164	21843	10041	6656
32	275 L	5235	29116	16858	8799	8303	8016	7220	5615
33	276 P	3892	35541	15076	20067	5793	19290	4580	5297
34	277 P	6804	58304	42458	3476	2307	13700	17398	2764
35	278 P	1756	24999	15778	4739	5900	42020	3494	2571
36	279 P	2539	56762	46247	9502	10343	33801	23710	3884
37	280 P	1226	21047	23375	18542	4032	9288	1967	5323
38	281 P	2708	26189	18342	31321	20682	55085	5556	27121
39	282 P	5381	30705	34748	9958	2283	15575	7981	7859
40	283 P	2332	44581	12825		2214	2616	4121	738
41	284 L	6195	14028	17886	11189	5353	4975	7811	1484
42	285 P	3422	35637	13452	10304	3989	4761	58337	3417
43	286 P	2525	30208	26730	2218	2218	3803	3803	8994
Rata-rata :		3,543.98	26,948.35	22,861.67	7,183.05	5,099.30	12,044.07	7,043.12	3,960.81