

INVESTIGATION OF BIOCHEMICAL MARKERS OF CHRONIC ALCOHOLISM

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ABSTRACT: Alcohol is a prominent risk factor in traffic accidents. Investigations have shown that both in Germany and in Hungary a significant number of chronic alcoholics take part in traffic and form a special risk-group. Diagnosing chronic alcoholism at present is almost exclusively based on psychiatric and psychological tests. It is necessary to work out an objective laboratory investigation method, by means of which chronic alcoholics can be identified in time and, if necessary, sanctioned effectively. Besides the high concentration of blood alcohol, the so-called biochemical markers of chronic alcoholism are taken into account, one of which is the increased methanol level of the blood. The methanol level of the blood and the methanol content of consumed beverages are related to each other. There are significant regional differences in alcohol-consuming habits and in the quality of alcoholic beverages. In our work we collected blood samples from chronic alcoholics in the Szeged region, Hungary. The samples were analysed with headspace gas chromatography. The following biochemical markers of alcoholism were measured: ethanol, methanol, acetone, 2-propanol and 1-propanol. Our data were compared with similar data from Düsseldorf and Vienna. The result of the investigation contributes to the unambiguous evaluation of methanol as a biochemical marker of chronic alcoholism. The results can be used in Hungary for the modification of the traffic safety regulations.

KEY WORDS: Alcoholism; Biological markers; Methanol.

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INTRODUCTION

The diagnosis of chronic alcoholism is based almost exclusively on psychiatric and psychological examinations [6]. Recent tests of the biochemical markers of alcoholism have provided a more reliable assessment. In addition to an increased blood alcohol concentration, elevated values of the biochemical markers are also indicative of chronic alcoholism [3]. Blood tests of alcoholics revealed that there is a correlation between

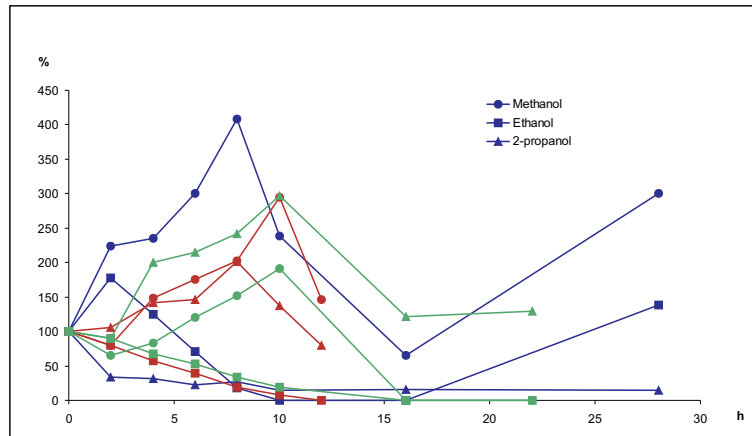


Fig. 1. Ethanol, methanol, 2-propanol changing in the percentage of the admission values.

Methanol [mg/l]	14.67	12.22	13.14	13.61	12.85	13.75	15.11	14.24	5.32
Aceton [mg/l]	8.05	9.05	8.82	7.88	7.77	9.54	10.98	11.63	3.8
Ethanol [g/l]	2.79	2.40	2.97	2.4	1.99	1.46	0.96	0.50	1.75
2-Propanol [mg/l]	3.90	4.21	2.8	3.59	3.21	2.27	2.58	1.99	0.85
1-Propanol [mg/l]	0.50	0.42	0.35	0.34	0.3	0.18	0.16	0.00	0.6
	Person 2								
	00:00	02:00	04:00	6:00?	8:00?	10:00?	12:00?	18:00?	30:00?
Methanol [mg/l]	2.24	1.66	4.55	3.38	3.55	3.62	2.17	0.00	6.58
Aceton [mg/l]	5.3	8.57	3.42	8.06	10.2	9.75	14.17	12.95	3.86
Ethanol [g/l]	1.86	1.48	2.13	0.7	0.3	0.05	0.00	0.00	1.89
2-Propanol [mg/l]	0.97	1.33	1.19	2.18	1.87	0.75	0.52	0.00	0.91
1-Propanol [mg/l]	0.9	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.53
	Person 3								
	00:00	02:00	04:00	06:00	08:00	10:00		16:00	28:00
Methanol [mg/l]	2.77	6.2	6.5	8.31	11.31	6.6		1.79	8.32
Aceton [mg/l]	14.09	4.3	4.4	5.83	7.16	5.28		2.39	5.74
Ethanol [g/l]	0.97	1.73	1.21	0.69	0.17	0.00		0.00	1.34
2-Propanol [mg/l]	2.36	1.6	1.5	1.1	1.26	0.72		0.76	0.7
1-Propanol [mg/l]	0.38	0.15	0.1	0.00	0.00	0.00		0.00	0.65
	Person 4								
	00:00	02:00	06:00		08:00	10:00			
Methanol [mg/l]	35.03	28.36	42.72		37	8.18			
Aceton [mg/l]	3.49	4.05	6.01		7.13	6.91			
Ethanol [g/l]	2.8	2.41	1.9		1.48	0.96			

1-Propanol [mg/l]	0.9	0.68					0.14	
	Person 17							
	00:00	02:00				10:15		
Methanol [mg/l]	10.81	9.84				12.1		
Aceton [mg/l]	2.32	3.34				12.84		
Ethanol [g/l]	2.81	2.44				0.7		
2-Propanol [mg/l]	1.71	2.08				2.76		
1-Propanol [mg/l]	3.36	3.26				0.38		
	Person 18							
	00:00	02:00				09:45		
Methanol [mg/l]	3.59	2.75				4.87		
Aceton [mg/l]	2.92	3.15				4.46		
Ethanol [g/l]	3.32	2.92				1.47		
2-Propanol [mg/l]	0.92	1.02				1.49		
1-Propanol [mg/l]	1.65	0.98				0.22		
	Person 19							
	00:00	02:00						
Methanol [mg/l]	8.47	8.54						
Aceton [mg/l]	2.78	4.26						
Ethanol [g/l]	2.98	2.65						
2-Propanol [mg/l]	0.5	0.46						
1-Propanol [mg/l]	0.69	0.57						
	Person 20							
	00:00	02:00					13:40	
Methanol [mg/l]	9.66	9.61					12.33	
Aceton [mg/l]	1.51	1.65					4.06	
Ethanol [g/l]	2.62	2.21					0.21	
2-Propanol [mg/l]	0.36	0.9					1.17	
1-Propanol [mg/l]	1.18	0.97					0.00	
	Person 21							
	00:00	02:00					14:50	
Methanol [mg/l]	6.57	5.7					1.73	
Aceton [mg/l]	3.24	3.2					31.07	
Ethanol [g/l]	3.02	2.23					3.43	
2-Propanol [mg/l]	0.9	1.25					1.17	
1-Propanol [mg/l]	1.45	0.98					0.00	
	Person 22							
	00:00	02:00					11:15	
Methanol [mg/l]	17.23	18.5					19.04	
Aceton [mg/l]	2.93	3.31					4.18	
Ethanol [g/l]	2.4	2.01					0.63	
2-Propanol [mg/l]	0.78	0.74					1.29	
1-Propanol [mg/l]	0.59	0.5					0.21	

	Person 23							
	00:00	02:00					11:00	
Methanol [mg/l]	7.02	6.96					8.73	
Aceton [mg/l]	5.17	7.36					10.66	
Ethanol [g/l]	3.12	2.79					1.28	
2-Propanol [mg/l]	1.71	1.59					2.22	
1-Propanol [mg/l]	2.36	2.23					0.31	
	Person 24							
	00:00	02:00		05:15				
Methanol [mg/l]	3.36	4.39		5.67				
Aceton [mg/l]	1.14	1.47		1.69				
Ethanol [g/l]	1.47	1.12		0.79				
2-Propanol [mg/l]	0.66	0.66		1.39				
1-Propanol [mg/l]	1.37	1.29		1.01				
	Person 25							
	00:00	02:00					12:00	
Methanol [mg/l]	36.01	33.09					13.63	
Aceton [mg/l]	6.81	7.74					13.82	
Ethanol [g/l]	3.92	3.63					0.02	
2-Propanol [mg/l]	2.08	2.16					1.27	
1-Propanol [mg/l]	1.19	1.22					0.00	

Methanol elimination is prolonged in alcoholics due to high ethanol concentration [7]. The authors' findings confirmed this in some of the patients (see Figure 1). In some patients SMC oscillated and dropped by the end of the period of analysis when ethanol concentration likewise dropped.

Methanol elimination independent of ethanol was not found in any of the 25 patients.

Acetonaemia occurred in 8 patients (specifically patients 5, 7, 8, 9, 10, 11, 12 and 13). This indicates a metabolic disorder. Thus acetone could not be used as a marker, except for its initial value, in the case of acute metabolic disorder (such as diabetes and dehydration).

Change in the level of 2-propanol is similar to methanol, though it is absorbed more slowly (Figure 1).

Acetone + 2-propanol concentration exceeded the pathological limit of 10 mg/l in six of the patients.

Elimination of 1-propanol was found to be quick in five patients irrespective of the blood ethanol concentration (patients 2, 3, 4, 7, 8). At the same time there was a slow rise in methanol concentration in the same patients (Figure 1).

CONCLUSIONS

1. An elevated SMC exceeding 10 mg/l can be indicative of regular intake of drinks rich in methanol [2].
2. Prolonged methanol elimination was observed in some patients.
3. In the 25 patients no methanol elimination occurred independently of ethanol.
4. Some patients showed quick 1-propanol elimination unrelated to ethanol metabolism.

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