

»ANTABUS TEST« AND ABSENTEEISM IN WORKERS  
EXPOSED TO CARBON DISULFIDE

MILICA BESARABIĆ\*

»Incel« Health Unit, Medical Centre Banja Luka, Banja Luka

(Received for publication September 5, 1977)

This study represents our attempt to find a method for the pre-employment selection of workers in a viscose fibre plant. »Antabus test« was applied to 61 workers in a viscose factory exposed to carbon disulfide up to 4.5 years. After oral administration of 0.5 g Antabus (TETD, Disulfiram) the excretion of diethyldithiocarbamate (DDC) was determined in a four-hour urine sample.

The workers were divided into four groups according to the quantity of the excreted DDC. Data on absenteeism and specific morbidity were correlated between the groups. It was evident that with an increase in DDC excretion the specific morbidity and absenteeism decreased. In workers excreting more than 150  $\mu\text{g}$  of DDC/mg creatinine no absenteeism or specific morbidity were recorded. It seems that this group was naturally resistant to  $\text{CS}_2$ .

The test has been applied in the selection of new workers. Only persons with a DDC excretion over 150  $\mu\text{g}$ /mg creatinine were accepted for the job with  $\text{CS}_2$  hazard. However, further investigations are necessary to establish if »Antabus test« represents a reliable test for the assessment of individual sensitivity to  $\text{CS}_2$ .

*Djurić* and co-workers (1) studied the excretion of diethyldithiocarbamate (DDC) in the urine of workers exposed to  $\text{CS}_2$  after oral administration of Antabus (TETD, Disulfiram). In workers with a higher exposure they found a lower rate of Antabus metabolism, i. e. a slower excretion of DDC. This was especially noticeable in workers who were once poisoned with  $\text{CS}_2$  (invalids). The authors suppose that the same enzymatic system is engaged in the metabolism of  $\text{CS}_2$  and TETD, and that »Antabus test« could be useful in establishing the influence of this system on the toxicity of  $\text{CS}_2$  and also in evaluating individual suscepti-

\* Present address: Boris Kidrič, Vinča, Beograd

bility to these substances. Therefore we consider that »Antabus test« could be used for evaluation of absenteeism due to CS<sub>2</sub> exposure in workers in the viscose factory.

#### EXPOSED WORKERS AND METHODS

As a criterion for the selection of workers we used duration of exposure to CS<sub>2</sub> in the staple cell production of the viscose factory. The production started in 1971 and we selected 61 workers with the length of exposure of 4.5 years. The study included: 1) an examination of health documentation, a list of diseases and the rate of absences from 1 January 1971 to 30 June 1975; 2) a questionnaire about the social status, diet smoking and drinking habits; 3) a determination of DDC in the urine sampled during four hours after oral administration of 0.5 g TETD. The workers underwent the test during seven days of alcohol abstinence, and consumed TETD on the fourth day. For the determination of DDC a colorimetric method was used (2, 3).

The factory health service takes care of workers' health and possesses a good medical documentation including morbidity data.

Our criterion of the specific morbidity for workers exposed to CS<sub>2</sub> includes the following: exposure to CS<sub>2</sub> with an unclear symptomatology and a nonrecovery of iodine-azide test (4), acute CS<sub>2</sub> poisoning, and chronic CS<sub>2</sub> poisoning with a symptomatology according to the scheme of *Vigliani* (5).

#### RESULTS AND DISCUSSION

During the period of observation 56 different illnesses were recorded. Those with a specific symptomatology were highly frequent.

The analysis of the questionnaire showed that workers were from the same area, with similar habits and living standard. Also, they were all exposed to similar CS<sub>2</sub> concentrations. However, the consequences of the exposure were not the same. This could be explained by individual susceptibility to CS<sub>2</sub>.

Therefore we analysed the results of DDC determination in the urine of workers who received 0.5 g of TETD orally. DDC concentrations in the urine sampled during four hours after oral administration of TETD varied. According to DDC values in the urine all workers were divided into four groups. The number of days lost during 4.5 years of exposure due to a specific morbidity was correlated with the rate of DDC excretion in the urine for a given group. This relationship is presented in the table.

Table 1  
*DDC in urine after oral administration of TETD and total  
 and specific absenteeism*

DDC in $\mu\text{g}/\text{mg}$ of creatinine	Total number of working days lost		Number of days lost due to a specific morbidity	
	Absolute	Mean	Absolute	Mean
up to 50	2591	108.0	302	12.5
51--100	2221	79.5	273	9.5
101--150	1268	126.8	45	4.5
over 151	799	100.0	0	0

It is evident that the high value of DDC excretion in the urine is correlated with a low absenteeism due to a specific morbidity.

It should be added that in the first group with an excretion of up to 50 DDC per mg of creatinine, we found as a cause of absenteeism one case of acute  $\text{CS}_2$  poisoning, one psychosis, 43 psychoneuroses, 21 gastric disorders and nine cephalalgiae. In the second group (DDC from 51 to 100  $\mu\text{g}/\text{mg}$  creatinine) we found 13 psychoneuroses, one case of polyneuritis, one case of sexual impotence and one case with vertigo. In the third group there were only three cases of psychoneurosis and four gastric disorders.

When we divided the workers into two groups: the first with a DDC excretion up to 150  $\mu\text{g}/\text{mg}$  of creatinine and the second with a DDC excretion above this value, we noticed that in the second group there was no specific morbidity or days lost due to  $\text{CS}_2$  exposure.

From the results obtained we can conclude that workers with a DDC excretion over 150  $\mu\text{g}/\text{mg}$  creatinine after oral administration of TETD («Antabus test») are probably less susceptible to  $\text{CS}_2$ . On the other hand, the workers with a DDC excretion below 150  $\mu\text{g}/\text{mg}$  creatinine also had a higher rate of absences because of a specific morbidity. From our observation it appears that individual susceptibility to  $\text{CS}_2$  is variable and that an exposure of some workers to  $\text{CS}_2$  for a longer time might lead to the development of a specific symptomatology. It is our belief that «Antabus test» can be used for the assessment of individual susceptibility to  $\text{CS}_2$  and that an excretion of DDC in urine in a concentration above 150  $\mu\text{g}/\text{g}$  creatinine is a measurable parameter for less susceptible persons. It is necessary to continue such studies on larger groups of workers who start their work in operations with a  $\text{CS}_2$  exposure. Only those workers who show an excretion of DDC over 150  $\mu\text{g}/\text{mg}$  creatinine in the «Antabus test» would be allowed to work. We hope that the workers selected in such a way will show a lower susceptibility to  $\text{CS}_2$  and a lower morbidity and specific symptomatology due to the exposure.

Following the morbidity of such workers we would be able to evaluate the suitability of the »Antabus test« as a pre-employment test for the selection of workers less susceptible to CS<sub>2</sub>.

#### References

1. Djurić, D., Postić-Grujin, A., Graovac-Leposavić, Lj., Delić, V.: Arch. Environ. Health, 26 (1973) 287.
2. Scalica, B.: Prac. Lek., 19 (1967) 408.
3. Djurić, D.: Alkoholizam, 1—2 (1973) 137.
4. Graovac-Leposavić, Lj., Djurić, D., Pavlović, A., Jovičić, M.: Excerpta Medica Monograph, Amsterdam, 1967, 62.
5. Vigliani, E. C., in: Baader, E. W.: Handbuch der gesamten Arbeitsmedizin, Urban und Schwarzenberg, 1961, 313.

#### Sažetak

#### »ANTABUS TEST« I APSENTIZAM RADNIKA IZLOŽENIH UGLJENDISULFIDU

Ovaj rad rezultat je naših nastojanja da pronađemo metodu za selekciju radnika pre zapošljavanja u industriju viskoze.

U 61 radnika fabrike viskoze, koji rade 4,5 godina u pogonu cel-vlakna u ekspoziciji ugljendisulfidu primenjen je »Antabus test«.

Prema koncentraciji izlučenog DDK, radnici su podeljeni u 4 grupe, a dobijene vrednosti upoređene su sa apsentizmom zbog ukupnog i specifičnog morbiditeta. Utvrđeno je da sa porastom količine izlučenog DDK u urinu opada specifični morbiditet i broj izgubljenih radnih dana. Radnici koji izlučuju više od 150 mikrograma DDK/mg kreatinina nisu izostajali sa posla zbog mogućeg specifičnog morbiditeta. Ovo se može objasniti prirodnom rezistencijom na delovanje CS<sub>2</sub>.

Dalja ispitivanja su neophodna da bi se utvrdilo da li »Antabusni test« može poslužiti za određivanje individualne osetljivosti ili rezistencije na CS<sub>2</sub> i kojoj vrednosti izlučenog DDK odgovara granica rezistencije. Primena »Antabus testa« već je uvedena pri prijemu radnika u fabriku, a kriterijum za prijem u radni odnos je izlučivanje DDK preko 150 mikrograma na miligram kreatinina.

Dispanzer za zdravstvenu stanicu  
radnika pri »Incelu«,  
Medicinski centar, Banja Luka

Primljeno 5. IX 1977.