

# Serum angiotensin converting enzyme, ceruloplasmin, and lactic dehydrogenase in anthracosilicosis and anthracosilicotuberculosis

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We have determined the activities of serum angiotensin converting enzyme (SACE), ceruloplasmin (SCP), and lactic dehydrogenase (SLDH) in anthracosilicosis and anthracosilicotuberculosis in order to see if any biochemical changes take place and to find laboratory indices for the early diagnosis and evaluation of the treatment in patients with anthracosilicosis and anthracosilicotuberculosis.

## Subjects and methods

### SUBJECTS

On the basis of changes seen in the chest x ray films 95 male anthracosilicotic patients were recruited with the study. They included 24 suspected cases, 25 cases in category 1, 24 in category 2, and 22 in category 3. In addition, the study included 20 cases of anthracosilicotuberculosis. The ages of the subjects ranged from 32 to 73 (mean  $48.7 \pm 9.1$ ) with a working life from six to 34 years (mean  $12.8 \pm 4.8$ ) and all had been exposed to both silica and coal dust in coal mines. Twenty four male workers with mixed dust

exposure with an age range of 30-63 (mean  $48.1 \pm 5.3$ ) and 26 healthy men with no dust exposure and an age range of 26-55 (mean  $44.3 \pm 6.7$ ) served as controls.

### METHODS

SACE was analysed using ultraviolet spectrophotometry with hippurylglycine glycyl as substrate as described by Lieberman *et al.*<sup>1</sup> SCP was assayed using the photoelectrometric method of Bauer *et al.*<sup>2</sup> and SLDH by the colorimetric method of Frankel *et al.*<sup>3</sup>

The mean and standard deviations were calculated for each variable; comparison between the different groups was carried out using Student's *t* test for unpaired data.

## Results

The results are shown in tables 1 and 2.

Table 1 SACE, SCP, and SLDH values ( $M \pm SD$ )

Group	No of cases	SACE (u/ml)	SCP (u/dl)	SLDH (u/dl)
Normal	26	$33.44 \pm 12.84$ (26.10-56.74)	$299.96 \pm 57.41$ (215-380)	$314.35 \pm 78.26$ (120-402)
Exposed	24	$43.29 \pm 16.65$ (23.13-93.71)	$308.50 \pm 63.01$ (190-465)	$313.13 \pm 100.47$ (148-509)
Suspected	24	$44.22 \pm 17.94$ (14.07-78.29)	$357.75 \pm 80.17$ (210-505)	$310.38 \pm 94.52$ (191-578)
Category 1	25	$53.14 \pm 18.65$ (27.20-89.32)	$439.00 \pm 103.65$ (245-590)	$347.57 \pm 81.59$ (202-597)
Category 2	24	$53.53 \pm 14.62$ (27.85-89.54)	$595.46 \pm 115.13$ (400-870)	$342.88 \pm 77.00$ (123-477)
Category 3	22	$63.32 \pm 23.98$ (20.13-144.26)	$645.68 \pm 126.51$ (437-960)	$373.86 \pm 65.18$ (142-558)
Anthracosilicotuberculosis	20	$48.39 \pm 17.00$ (18.21-87.18)	$583.55 \pm 118.90$ (330-1000)	$362.30 \pm 138.80$ (176-736)

Table 2 Statistical significance of differences among the groups (*p* value)

	<i>AvsB</i>	<i>AvsC</i>	<i>AvsD</i>	<i>AvsE</i>	<i>AvsF</i>	<i>AvsG</i>
SACE	>0.05	>0.05	<0.01	<0.01	<0.01	<0.05
SCP	>0.05	>0.05	<0.01	<0.01	<0.01	<0.01
SLDH	NS	NS	NS	NS	NS	NS
	<i>BvsC</i>	<i>BvsD</i>	<i>BvsE</i>	<i>BvsF</i>	<i>BvsG</i>	
SACE	>0.05	<0.05	<0.05	<0.01	>0.05	
SCP	>0.05	<0.05	<0.01	<0.01	<0.01	
SLDH	NS	NS	NS	NS	NS	
	<i>CvsD</i>	<i>CvsE</i>	<i>CvsF</i>	<i>CvsG</i>		
SACE	>0.05	>0.05	<0.01	>0.05		
SCP	>0.05	<0.05	<0.01	<0.01		
SLDH	NS	NS	NS	NS		
	<i>DvsE</i>	<i>DvsF</i>	<i>DvsG</i>	<i>EvsF</i>	<i>EvsG</i>	<i>FvsG</i>
SACE	>0.05	<0.05	>0.05	>0.05	>0.05	>0.05
SCP	<0.05	<0.05	>0.05	>0.05	>0.05	>0.05
SLDH	NS	NS	NS	NS	NS	NS

## Discussion

Angiotensin converting enzyme (ACE) or peptidyl-peptide hydrolase exists in part on the endothelial surface of the pulmonary capillaries. The human alveolar macrophages contain and may secrete ACE. Factors that are harmful to endotheliocytes and macrophages can release ACE. The SACE level is greatly raised in active sarcoidosis and, recently, raised SACE levels have been reported in silicosis and asbestosis.<sup>4,5</sup> The results of our study confirm that levels of SACE and SCP in anthracosilicosis and anthracosilicotuberculosis are higher than in controls and that the rise in SACE and SCP levels is associated with the progression of anthracosilicosis. In addition, the rise in SACE level closely paralleled the rise in SCP levels. We consider that the rise in SACE and SCP levels is a signal both of the continuing harm done to the pulmonary macrophages and of the progression of pulmonary fibrosis. Therefore, SACE and SCP may be used clinically as an index to show the progression

of pulmonary fibrosis, as well as to evaluate the effects of treatment.

Since the levels of SACE and SCP are also increased in patients with anthracosilicotuberculosis, they cannot be used to differentiate anthracosilicosis from anthracosilicotuberculosis.

## References

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