SERUM PROTEINS AND SERUM GLYCOPROTEINS IN
THE DIFFERENTIAL DIAGNOSIS OF SILICOSIS
AND SILICO-TUBERCULOSIS

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The serum proteins and glycoproteins in 73 males were investigated with the object of deciding
which tests differentiated most clearly between “pure” silicosis and silico-tuberculosis. None
of the tests was entirely satisfactory as, although significant differences between the averages for the
various groups were found, the scatter of the individual results was so wide that the tests were
not considered useful in individual cases.

Differentiation between “silicosis” and “silico-
tuberculosis” has usually been based on the finding
of tubercle bacilli in the sputum, but it is not un-
reasonable to suppose that tuberculous pathology
may be present in the lung concealed by the massive
shadow without tubercle bacilli being found in the
sputum. For this reason many attempts have been
made to discover some simple way of determining
the presence of the added tuberculous infection
without resorting to lung puncture. Similar problems
arise in progressive massive fibrosis of coal-miners
where 43% can be shown to suffer from tuberculous
infection at death but only between 1 and 2% are
found to be infectious in life, and it seems reason-
able to suppose that many such cases have tuber-
culous infection before it becomes overt in the
sputum. The proof that a case is tuberculous is not
only of value therapeutically, prognostically, and
epidemiologically, but in nearly every country it
assumes medico-legal importance.

There have been several accounts in the literature
of attempts to find specific differences between
silico-tuberculosis without a positive sputum and
silico-tuberculosis with a positive sputum. The main
work has been done on serum proteins by Vigliani,
Boselli, and Pecchiai (1950), Beckmann, Antweiler,
and Hilgers (1953), Prignot (1959), and Rosenkranz
(1957), and on glycoproteins by Pernis and Clerici
(1957), Sonnet and Prignot (1956) and Wang,
Ts’ai, Chu, Wu, and Chang (1959). Most of these
studies show differences in their average values
between the different groups, some of which have
reached the conventional limit of statistical signi-
ficance, but there has always been a very large over-
lap in the value for the different groups. Our objective
in this paper has been to study the differences between
cases of silicosis and silico-tuberculosis and normal
people, measuring not only the serum proteins and
glycoproteins but also the electrophoretic pattern of
the glycoproteins. This technique has not, as far as
we know, been used on such cases before.

Population Studied

The populations on which tests were carried out
were as follows:

Group 1.—Twenty physically healthy males drawn
from a mental hospital.

Group 2.—Twenty “silicotic” males of various
categories but without tubercle bacilli in their
sputum, drawn from the Out-patients Clinic of the
Occupational Health Service;

Group 3.—Thirteen males with silico-tuberculosis
with tubercle in their sputum drawn from chest
hospitals and sanatoria;

Group 4.—Twenty males with advanced tuber-
culosis who had never been exposed to silica dust,
drawn from chest hospitals and sanatoria.

The mean age for each group was about 44 years
with a range of 30 to 60. Most of the tuberculous
and silico-tuberculous cases were receiving anti-
biotic treatment.
Methods

All cases had a clinical examination; the pathological cases had a standard radiograph, and for the apparently healthy cases, fluoroscopy or radiography was carried out. In addition all cases had tests on a fasting specimen of blood (20 ml).

The following tests were carried out on the blood.

Serum Levels.

(a) Glycoproteins (mucoproteins) were estimated by the method of Winzler (1955). The results were expressed as mg. tyrosin per 100 ml. serum.

(b) Protein-bound hexoses were estimated according to the original method of Winzler (1955). The results were expressed in mg. per 100 ml. serum. The readings were made by means of the Coleman Spectrophotometer, Model 14. The total protein level was not measured.

Serum Electrophoresis.—The tests for total proteins and glycoproteins were carried out according to the method of Morales (1958), working with the Elphor apparatus and Bender and Hobein paper No. 2043-a. The readings were performed in the Beckman-Spinco Analitrol automatic densitometer.

Results

Glycoproteins.—Table 1 shows the average values together with their standard deviations for the serum glycoproteins; probabilities of significant differences are given in Table 1a. The results confirm those found by others in that there are large differences in the average values for the various groups, and that the scatter in the groups is so large that the determination is of no particular value diagnostically in any individual case. It is also of interest that the differences between the silicotic and silico-tuberculous on the one hand, and the silico-tuberculous and the tuberculous on the other do not reach the conventional levels of statistical significance.

Protein-bound Hexoses.—Table 2 summarizes results of the estimations of serum-bound hexoses; probabilities of significant differences are given in Table 2a. The results follow the same pattern as those in Table 1, but in this series there is a statistically significant difference between the silicotic and
silico-tuberculous groups, but there is still a large overlap between individual cases.

**Electrophoresis of Total Proteins.**—Table 3 summarizes the results of the electrophoresis of total proteins. There is a gradual increase in the \( \alpha_1 \), \( \alpha_2 \), and \( \gamma \) fractions through the various groups, while the \( \beta \) fraction remains relatively constant. This confirms the work of the authors previously cited.

**Electrophoresis of Glycoproteins.**—The differences between groups are slight and more irregular than those for total proteins (Table 4). None of the differences achieves the conventional level of statistical significance.

**Discussion**

Our results confirm previous findings that none of the tests is satisfactory in individual cases owing to the wide overlap between the various groups. Our results with the electrophoresis of glycoproteins, which has not previously been used in this connexion, do not suggest that this method is any better at differentiating between the groups than the others; if anything, it is worse.

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**REFERENCES**


