A New Test for the Presumptive Diagnosis of Neoplastic Disease. Further Investigations of Cholinesterase in Plasma, Whole Blood and Blood Cells on Cancer of the Lung, Extrapulmonary Tumors and Tuberculosis*

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We commenced our study on cholinesterase activity in whole blood, plasma, and blood cells in patients suffering from diseases of the respiratory apparatus in 1958, and found there was increased activity in asthmatic patients as compared to normal subjects (P<0.001); this increase was directly related to the intensity of the symptoms.1 Simultaneously we proved for the first time in the literature, the stimulating action of ACTH on blood cholinesterase activity, both in normal subjects and patients suffering from asthma (P<0.001).

These findings were later confirmed experimentally by the administration of ACTH and corticosterone to Wistar rats, finding here also a statistically highly significant increase in cholinesterase activity (P<0.001), principally in the globular fraction (acetylcholinesterase). Adrenalectomy carried out on these experimental animals produced a noticeable fall in cholinesterase activity (P<0.001) which returned to normal figures when corticosterone was injected.4

In 1964, we commenced the study of plasma and globular cholinesterase activity in cancer, and the first results were published in a previous article* and agree with the present ones. A greater number of patients were used in this study and these do not include the ones used before. For this present paper we studied cholinesterase activity in patients suffering from cancer of the lung and pulmonary tuberculosis, to find a differential diagnosis between these two diseases. We studied neoplastic diseases in other locations in an endeavor to find a presumptive diagnostic test for malignant tumor.

Materials and Methods

Determination of cholinesterase activity in plasma, whole blood and blood cells was done in 32 men suffering from cancer of the lung which had been confirmed by histopathology (biopsy).

The disease had commenced, on the average, four months previously, and in the majority of cases there was no possibility of surgical cure. At the time the determinations were done, the patients were receiving symptomatic treatment only. The general condition of the patients under study was apparently not affected, only a slight loss of weight being evident. Their average age was 42 years.

Determinations were also done on 22 men suffering from neoplastic disease of organs other than the lung (stomach, esophagus, larynx, thyroid, etc.). The average
Table I—Units of Cholinesterase Activity Found in Normal Adult Men and Those Suffering from Bronchopulmonary Cancer

<table>
<thead>
<tr>
<th></th>
<th>Plasma</th>
<th>Whole Blood</th>
<th>Blood Cells</th>
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<tbody>
<tr>
<td></td>
<td>Normals</td>
<td>Lung Cancer</td>
<td>Difference</td>
</tr>
<tr>
<td>Average Ch. U. Activity</td>
<td>109</td>
<td>77</td>
<td>-32xxx</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>± 9.3</td>
<td>±13.2</td>
<td>±11.5</td>
</tr>
<tr>
<td>Standard error</td>
<td>± 1.9</td>
<td>±2.3</td>
<td>±2.4</td>
</tr>
<tr>
<td>Normal range</td>
<td>91-127</td>
<td>157-193</td>
<td>201-277</td>
</tr>
<tr>
<td>Number of cases</td>
<td>23</td>
<td>32</td>
<td>23</td>
</tr>
</tbody>
</table>

To evaluate differences, Student's test was used:

\[ t = \frac{\bar{X} - \bar{X}'}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}, \]

where \( \bar{X} \) and \( \bar{X}' \) are the means of the two groups, and \( s \) is the pooled standard deviation.

Highly significant difference for \( P < 0.001 \)

The age of these patients was 56 years. The same determinations were done on three patients suffering from malignant lymphogranulomatosis.

Cholinesterase activity in plasma, whole blood and blood cells was determined in 42 adult women suffering from pulmonary tuberculosis.

Cholinesterase activity was also determined in 56 women suffering from neoplastic diseases in diverse locations.

Twenty apparently healthy women were used as controls.

The colorimetric method of Biggs et al., was used.

![Graph showing the averages found in normal subjects and in patients suffering from pulmonary cancer, (men), expressed in units of cholinesterase activity.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21432/)
RESULTS

As a first step, we analyzed the values found in the patients suffering from cancer of the lung (Table 1, Fig. 1).

Plasma cholinesterase showed decreased values, the average being 77±2.2 cholinesterase units (Ch.U.). The average in the normal subjects of the same sex was 109±1.9 Ch.U. Normal limits were established by adding and subtracting the average of the square of standard deviation; there were 91–127 Ch.U. The difference was statistically highly significant (P<0.001).

Out of 32 patients, only five were above the lower limit of normal value, the remainder (82.2 per cent) showed noticeably decreased values.

As regards cholinesterase in blood cells, also called true cholinesterase or acetyl cholinesterase, the average in patients with cancer of the lung was 180±3.4 Ch.U.; a very low value when compared with the control group whose average was 239±3.9 Ch.U. (normal limits 201-277).

In only two cases, i.e., 6.2 per cent, did the values pass the normal lower limits. In the remaining 93.8 per cent, the results showed a marked decrease.

The determination in whole blood also showed important changes. There was a noticeable decrease in the cases of lung cancer; the average being 120±2.6 Ch.U., the normal average being 170±2.4 Ch.U. The minimum and maximum limits were 157–193 Ch.U., respectively.

The difference, statistically, is highly significant (P<0.001). In this fraction no values above the normal lower limit were found, there being a decrease in 100 per cent of cases.

We wish to make it clear that those cases where cholinesterase activity was within normal limits in plasma or blood cells were not the same patients, but others who had normal figures in some of the fractions, but were abnormally low in the remainder. This shows the necessity of performing these determinations in plasma, whole blood and blood cells in order to be safe, as in none of the cases studied was normal value found in more than one fraction.

Of the 22 patients suffering from extrapulmonary cancer, the decrease in cholinesterase activity was also very marked (Table 2, Fig. 2). These differences were also statistically highly significant (P<0.001).

The average cholinesterase activity in plasma was 74 Ch.U. (Normal: 109), in blood cells 167 Ch.U. (Normal: 230), and in whole blood 111 Ch.U. (Normal: 170). In these patients, no value within normal limits was found in any of the fractions studied.

A noticeable decrease in the values in all fractions was found in the three patients suffering from malignant lymphogranulomatosis.

In the 53 women suffering from cancer of different organs, the following were the results: (Table 3, Fig. 3). The plasma

| Table 2—Units of Cholinesterase Activity Found in Normal Adult Men and Those Suffering from Extrapulmonary Cancer |
|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
|                                |                                |                                |
| Plasma                         | Whole Blood                    | Blood Cells                    |
|                                |                                |                                |
| Normals                        | Cancer                         | Difference                      | Normals                        | Cancer                         | Difference                      | Normals                        | Cancer                         | Difference                      |
| Average Ch. U. Activity        | 109                            | 74                             | -35xxx                         | 170                            | 111                           | -59xxx                         | 239                            | 167                           | -72xxx                         |
| Standard deviation             | ±9.3                           | ±8.4                           |                                | ±11.5                          | ±13.4                         |                                | ±19.0                          | ±17.7                         |                                |
| Standard error                 | ±1.9                           | ±1.8                           |                                | ±2.4                           | ±2.9                          |                                | ±3.9                           | ±3.8                          |                                |
| Normal range                   | 91-127                         | 157-193                        |                                | 201-277                        |                                |                                |                                |                                |                                |
| Number of cases                | 23                             | 22                             |                                | 23                             | 22                            |                                | 23                             | 22                            |                                |

To evaluate differences, Student's test was used

xxxHighly significant difference for P<0.001
**Figure 2:** Graph showing the values found in normal subjects and in patients with cancer extrapulmonary, (men), expressed in units of cholinesterase activity.

Cholinesterase activity was decreased, the difference being statistically highly significant (P<0.001), the average in the neoplastic patients being 71±1.1 Ch.U. and 94±2.3 Ch.U. in the normal patients. The normal limits were 73-115 Ch.U. In 35.8 per cent of the cases some values were found to be slightly above the lower limit of the normal subjects, but in 64.2 per cent, the values were noticeably decreased.

Cholinesterase activity in blood cells was also noticeably decreased, the difference in comparison with normal women being highly significant (P<0.001). The average in the neoplastic cases was 171±2.1 Ch.U. and in normal persons 200±2.9 Ch.U. The

<table>
<thead>
<tr>
<th>TABLE 3—Units of Cholinesterase Activity Found in Normal Adult Women and Those Suffering from Different Localization of Cancer</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td>Average Ch.U. Activity</td>
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<tr>
<td>Standard deviation</td>
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<tr>
<td>Standard error</td>
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<tr>
<td>Normal range</td>
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<tr>
<td>Number of cases</td>
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</tbody>
</table>

To evaluate differences, Student's test was used

***Significant difference P<0.01***
normal limits were 174-217 Ch.U. and in 33.9 per cent of cases values slightly higher than the minimum figure were found, but in the remaining 66.1 per cent the values were noticeably decreased.

In whole blood, the averages in cholinesterase activity in the patients was very low, the difference being also highly significant (P<0.001). The average in cancer patients was 107±1.6 Ch.U., whereas in normal women it was 139±1.9. The normal limits fluctuated between 122 and 156 Ch.U. In 5.6 per cent of the cases, values slightly higher than the lower limit of the normal figures were found. The remaining 94.4 per cent showed definitely low values.

The three determinations showed values that were slightly higher than the normal lower limit in only one patient. Therefore, it is indispensable that the three determinations be carried out simultaneously, so as to discard the percentages of normal values in some of the fractions, and give the necessary value to the pathologically decreased figures, whether in plasma, whole blood, or blood cells. This increases the sensitivity of the test proposed by us.

Plasma cholinesterase was lower in the patients suffering from pulmonary tuberculosis (Table 4, Fig. 4) than in normal subjects of the same sex; the first showed 84±2.3 Ch.U. and the latter 94±1.6 Ch.U. Statistical analysis showed a difference which was highly significant (P<0.001).

Cholinesterase in blood cells was not statistically significant in tuberculous patients, the average being 193±2.8 Ch.U. (normal: 200±2.9 Ch.U.).

As was to be expected, the decrease in whole blood was between that found in plasma and blood cells due to the fact that these fractions were combined. The average found in tuberculous patients was 130±1.8 Ch.U. and in the control group 139±
TABLE 4—UNITNS OF CHOLINESTERASE ACTIVITY FOUND IN NORMAL ADULT WOMEN AND THOSE SUFFERING FROM PULMONARY TUBERCULOSIS

<table>
<thead>
<tr>
<th></th>
<th>Plasma</th>
<th>Whole Blood</th>
<th>Blood Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Ch.U. Activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normals</td>
<td>94</td>
<td>139</td>
<td>200</td>
</tr>
<tr>
<td>TBC</td>
<td>84</td>
<td>130</td>
<td>193</td>
</tr>
<tr>
<td>Difference</td>
<td>-10</td>
<td>-9</td>
<td>-7</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>±10.5</td>
<td>±11.9</td>
<td>±18.0</td>
</tr>
<tr>
<td>Standard error</td>
<td>±2.3</td>
<td>±2.9</td>
<td>±2.9</td>
</tr>
</tbody>
</table>

Normal range 73-115 122-156 174-217
Number of cases 20 41 20 41

To evaluate differences, Student's test was used

**xx**Significant difference P<0.01

**xxx**Highly significant difference P<0.001

1.9 Ch.U. The difference is significant (P<0.01).

As can be seen, the decrease in plasma cholinesterase in tuberculosis patients was less than that of the neoplastic cases and, more important still, no statistically significant change was found in the globular fraction. This is of great value for differential diagnosis between cancer and pulmonary tuberculosis.

**DISCUSSION**

We refer in the first instance to the changes found in plasma cholinesterase. The biologic function of plasma cholinesterase, also called pseudocholinesterase or non-specific cholinesterase, is not yet well known. This enzyme is probably synthesized in the liver, and its formation is related to that of albumin. It is found with decreased values, principally in those dis-

Figure 4: Graph showing the average found in normal subjects and in patients suffering from pulmonary tuberculosis, (women), expressed in units of cholinesterase.
cases where the liver function is compromised (cirrhosis, hepatitis, chronic biliary obstruction). It has also been found decreased in cases of very advanced malnutrition and in some acute cases of burns, traumatic shock, operations, and myocardial infarction. Some drugs, such as propranolol, also tend to decrease this enzyme, also some anesthetics of the curare type, some insecticides, (esters of phosphate). The latter also inhibits globular cholinesterase or true cholinesterase, which leads to death of the patient poisoned by the insecticide.

Plasma cholinesterase is found to be increased principally in nephrosis and asthma.

The values do not change in normal subjects, though in exceptional cases there is a congenital absence of plasma cholinesterase, this being sometimes hereditary. This does not apparently affect the health of the person concerned; in these persons, the use of suxamethonium chloride in anesthesia is dangerous because of the prolonged periods of apnea it causes. Plasma cholinesterase was studied in neoplastic patients, decreased values being found in 90 per cent of cases of cancer of gastric origin, but only in one-third of the breast cancer cases (Wetstone et al.). Our findings with regard to plasma cholinesterase agree with those of the authors mentioned.

With respect to globular cholinesterase, also called acetylcholinesterase or true cholinesterase, the physiologic function of which is to destroy acetylcholine, there are few papers in the literature. In 1960, we demonstrated that globular cholinesterase was greatly increased in asthma to a much larger degree than plasma cholinesterase, and that ACTH and the glycoorticoids have an intensely stimulating action on this fraction. We have not been able to find in the literature any papers on its behavior in other diseases, such as exist with respect to plasma cholinesterase; also, due to its different biologic action and chemical composition, there is no strict parallelism in its variations; for example, a much more noticeable decrease was found in globular cholinesterase activity than in plasma cholinesterase activity in the experimental rats adrenalectomized by us. We have also proved that in pulmonary tuberculosis there is a decrease in plasma cholinesterase, but not globular cholinesterase.

The present paper shows conjointly the determination of plasma, globular, and total cholinesterase in cancer patients. The value of this new method is proved because, as we have shown, plasma cholinesterase gives a percentage of normal results in proved cancer patients who, on the other hand, showed pathologically decreased values in the globular fraction and in whole blood. From this it can be seen that determination of the three fractions at the same time is of very much greater diagnostic value than determination of plasma cholinesterase alone. We have also observed a variation in the behavior of the different fractions, because the difference between normal persons and neoplastic cases are generally greater in the globular fraction than in plasma.

As to the diagnostic value of the determination of cholinesterase activity in plasma, whole blood and blood cells, we believe this can be of the greater use, as the difference between normal subjects and neoplastic cases are so accentuated as to exceed purely physiopathologic interest. It can help towards a clinical diagnosis, if other diseases causing plasma cholinesterase depression are discarded, i.e., hepatitis, cirrhosis and cachexia. As regards this latter, we wish to emphasize that the patients studied were in good general health, their weight being within normal limits.

As can be seen from the results analyzed, there is a decrease in plasma cholinesterase in pulmonary tuberculosis which is statistically significant, but which is of less intensity than in cancer patients. However, globular cholinesterase activity showed no statistically significant changes. This disassociation in the changes in cholinesterase acti-
vity is of great interest for differential diagnosis between tuberculosis and cancer of the lung as in the latter disease both fractions are noticeably decreased.

**Summary**

Cholinesterase activity in plasma, in whole blood and blood cells was determined in 103 adult patients suffering from cancer and 42 adult patients suffering from pulmonary tuberculosis. These are classified as follows: 32 men with cancer of the lung and 22 men with extrapulmonary cancer; 53 women patients suffering from malignant tumors of various organs and 42 women suffering from tuberculosis. Twenty-three men and 20 women, all apparently in good health, were used as controls.

**Plasma cholinesterase activity** was found to be noticeably decreased in cancer of the lung. The difference when compared with the controls was statistically highly significant (P<0.001). Values lower than the lowest of the normal limits were found in 82.8 per cent of cases. As regards globular cholinesterase activity this was also found to be intensely decreased (P<0.001). The values were lower than the normal limits in 93.9 per cent of the cases studied. In none of the patients were both values normal.

The decrease in whole blood was also statistically highly significant (P<0.001). The values in all patients were found to be lower than the normal limits.

In extrapulmonary cancer the cholinesterase activity in plasma, blood cells and whole blood all showed the same pronounced decrease (P<0.001). The values were lower than normal in all these patients and in all the fractions studied.

Statistically significant decreases (P<0.001) in plasma, whole blood and blood cells were found in the 53 women patients suffering from cancer of different organs. In only one case, i.e., 1.9 per cent, were values found that were higher than the lower normal limit in all determinations (plasma, whole blood and blood cells).

Three patients suffering from malignant lymphgranulomatosis also showed decreased values in all fractions.

As regards the 42 tuberculous patients, a statistically highly significant decrease (P<0.001) was found in the plasma fraction, but this was not so pronounced as in the cancer cases. On the other hand, no statistically significant changes were found in the globular fraction. This dissociation is valuable for differential diagnosis between tuberculosis and cancer of the lung, as in cancer both fractions are decreased.

On the basis of these original findings, we consider that the test of cholinesterase activity in its different fractions, proposed by us, is of value in the presumptive diagnosis of cancer of lung and cancer of other localizations. It is considered necessary that determinations of plasma, whole blood and blood cells be made in order to discount the generally reduced percentage of normal values present in some of these fractions, and also as a new element for the differential diagnosis between lung cancer and tuberculosis.

**Acknowledgment:** We wish to thank Prof. Dr. Diego L. Perazzo, Chief of the Clinical Department, Oncologic Institute, Dr. A. H. Roffo, and Prof. Dr. Oscar A. Vaccarezza, Director, Institute of Thoracic Surgery and Tuberculosis, who gave us the clinical material, and Dr. Elvira A. de Bochi for supplying the controls.

**Resumen**

Se determinó la actividad colinesterásica en plasma, sangre total y células sanguíneas en 103 adultos enfermos de cáncer y en 42 adultos enfermos de tuberculosis pulmonar, clasificados de la siguiente forma: 32 enfermos de cáncer pulmonar y 22 enfermos de cáncer de localización extrapulmonar de sexo masculino; 53 enfermos de sexo femenino con tumores malignos de distintas localizaciones y 42 enfermos tuberculosos del mismo sexo.

Se tomaron como testigos 23 adultos de sexo masculino y 20 de sexo femenino, todos aparentemente sanos.

Se comprobó en las neoplasias pulmonares que la actividad colinesterásica plasmática se encontraba muy disminuida. La diferencia con respecto a los testigos fue estadísticamente altamente significativa (P<0.001). Se observaron valores inferiores a los límites normales en el 82.8% de los casos. En cuanto a la actividad colinesterásica celular también se la encontró intensamente disminuida (P<0.001). Se verificó que los valores eran inferiores a los límites normales en el 93.9% de los casos estudiados. En ningún enfermo se presentaron ambos valores normales.
En sangre total también la disminución fue estadísticamente altamente significativa (P<0.001). En todos los enfermos se comprobaron valores inferiores a los límites normales.

En los enfermos de cáncer extrapulmonar se observó la misma intensa depresión de la actividad colinesterásica en plasma, células sanguíneas y sangre total (P<0.001). Todos estos enfermos dieron valores inferiores a lo normal y en cada una de las fracciones estudiadas.

En 53 enfermos de sexo femenino afectados de neoplasia de diferentes localizaciones se comprobaron disminuciones también estadísticamente significativas (P<0.001) en plasma, sangre total y células sanguíneas. Solamente en un caso, o sea en 1,9% se comprobaron valores que sobrepasaban el límite inferior de lo normal en todas las determinaciones (plasma, sangre total y células sanguíneas).

En 3 enfermos de limfogranulomatosis maligna se comprobaron valores también disminuidos en las distintas fracciones.

En cuanto a los 42 enfermos tuberculosos, se comprobó una disminución estadísticamente altamente significativa (P<0.001) en la fracción plasmática pero de menor intensidad que en los neoplásicos. En cambio, la fracción celular no presentó variaciones estadísticamente significativas. Esta disociación tiene valor en el diagnóstico diferencial entre tuberculosis y cáncer de pulmón pues en las neoplasias ambas fracciones están intensamente disminuidas.

En base a estas comprobaciones originales, consideramos que el test de la actividad colinesterásica en sus diferentes fracciones, propuesto por nosotros, tiene valor en el diagnóstico presuntivo de cáncer pulmonar y de otras localizaciones. Se insiste en la necesidad de efectuar las determinaciones en plasma, sangre total y células sanguíneas, a fin de descartar el generalmente reducido porcentaje de valores normales presente en alguna de estas fracciones, y como nuevo elemento de diagnóstico diferencial con la tuberculosis pulmonar.

Resumen

On a determiné l'activité cholinestérasique dans le plasma le sang total et les cellules sanguines chez 103 adultes, malades de cancer et chez 42 adultes malades de tuberculose pulmonaire et on les a classifiés de la manière suivante: 32 malades de cancer pulmonaire et 22 malades de cancer de localisation extra-pulmonaire de sexe masculin, 53 malades de sexe féminin avec des tumeurs malignes de diverses localisations et 42 malades tuberculeux de même sexe.

On a pris comme témoins 23 adultes de sexe masculin et 20 de sexe féminin, tous apparemment sains.

On a constaté dans les néoplasies pulmonaires que l'activité cholinestérasique plasmatique se trouvait très diminuée. La différence chez les témoins a été statistiquement hautement significative (P<0.001). On a observé des valeurs inférieures aux limites normales dans le 82,8% des cas. Quant à l'activité cholinestérasique cellulaire on l'a trouvée aussi intensément diminuée (P<0.001). On a vérifié que les valeurs étaient inférieures aux limites normales dans le 93,9% des cas étudiés. On n'a pas trouvé chez les mêmes sujets les deux valeurs normales dans aucun cas.

Dans le sang total, la diminution a été statistiquement hautement significative (P<0.001). Chez tous le malades on a constaté des valeurs inférieures aux limites normales.

Chez les malades de cancer extra-pulmonaire on a observé la même dépression intense de l'activité cholinestérasique dans le plasma, les cellules sanguines et le sang total (P<0.001). Tous ces malades ont donné des valeurs inférieures à la normale dans chacune des fractions étudiées.

Chez les 53 malades de sexe féminin atteints de néoplasie de diverses localisations on a constaté aussi une diminution statistiquement haute ment significative (P<0.001) dans le plasma, le sang total et les cellules sanguines. Seulement dans un cas, c'est à dire dans 1,9%, on a trouvé des valeurs que surpassaient la limite inférieure de la normale dans toutes les déterminations (plasma, sang total et cellules sanguines).

Chez 3 malades de limphogranulomatosc maligne on a trouvé aussi des valeurs diminuées dans les différentes fractions.

Quand aux 42 malades tuberculeux on a constaté une diminution statistiquement hautement significative (P<0.001) dans la fraction plasmatica, mais d'intensité moindre que chez les néoplasiques. Par contre la fraction cellulaire n'a pas présenté de variations statistiquement significatives. Cette dissociation a valeur dans le diagnostic différentiel entre la tuberculose et le cancer de poumon, puisque dans les néoplasies les deux fractions se trouvent intensément diminuées.

D'après ces constatations originales, nous considérons que le test de l'activité cholinestérasique dans ses différentes fractions, proposé par nous, a valeur dans le diagnostic présomptif du cancer pulmonaire et dans d'autres localisations. On insiste sur le besoin d'effectuer les déterminations dans le plasma, sang total et cellules sanguines afin d'écartar le généralement réduit pourcentage de valeurs normales présentes dans quelqu'une de ces fractions, et comme nouvel élément de diagnostic différentiel avec la tuberculose pulmonaire.

Zusammenfassung

Aktive Cholesterinase im Plasma, im Gesamtblut und in den Blutzellen wurde ermittelt bei 130 Erwachsenen mit Krebserkrankung und 42 Erwachsenen mit Lungentuberkulose. Diese werden wie folgt klassifiziert: 32 Männer mit Lun-
genkrebs und 22 Männer mit extrapulmonalem Karzinom; 53 Frauen mit bösertigen Tumoren der verschiedensten Organgruppen und 42 Frauen mit Tuberkulose. 23 Männer und 20 Frauen als Kontrolle und waren in normalem Gesundheitszustand. Aktive Plasma-Cholesterase wurde als beträchtlich verringert ermittelt bei dem Lungenkrebs. Die Differenz war im Vergleich zu den Kontrollen statistisch in hohem Grade signifikant (P<0.001). Werte, die niedriger lagen als der niedrigste innerhalb der normalen Grenzen, wurden in 82,8% der Fälle gefunden. Was die globuläre aktive Cholesterinasie angeht, so war auch diese als ausgesprochen herabgesetzt ermittelt worden (P<0.001). Die Werte waren niedriger als die normalen Grenzwerte und zwar bei 93,9% der untersuchten Fälle. Lei keinem der Patienten waren beide Werte normal.

Die Verringerung im Gesamtblut war ebenfalls statistisch in hohem Maße signifikant (P<0.001). Es fanden sich diese Werte bei allen Patienten niedriger als innerhalb der normalen Grenzen. Beim extrapulmonalen Karzinom zeigte die aktive Cholesterinasie im Plasma, den Blutzellen und dem Gesamtblut die gleiche intensive Abnahme (P<0.001). Die Werte waren niedriger als bei den Gesunden und bei allen Patienten und bei allen geprüften Fraktionen.

Es fanden sich statistisch signifikante Erniedrigungen (P<0,001) im Plasma, im Gesamtblut und in den Blutzellen bei den 53 an Krebs der verschiedenen Organgruppen leidenden Frauen. Nur bei einem Fall (1,9%) fanden sich werte, die höher lagen als die niedrigsten innerhalb der normalen Grenzen bei allen Bestimmungen (Plasma, Gesamtblut und Blutzellen).

Drei an bösertiger Lymphogranulomatose leidende Patienten zeigten ebenfalls herabgesetzte Werte in allen Fraktionen.

Was die 42 tuberkulösen Patienten angeht, so fanden wir eine statistisch in hohem Grade signifikante Verringerung (P<0.001) in der Plasmafraktion, aber diese war nicht so ausgesprochen wie bei den Krebsfällen. Andererseits fanden wir keine statistisch signifikanten Veränderungen in der globulären Fraktion. Diese Dissoziation ist von Wert bei der Differential-Diagnose zwischen Tuberkulose und Lungenkrebs, da beim Krebs beide Fraktionen fühlbar verringert sind.

Auf der Basis dieser grundlegenden Befunde halten wir den Test auf aktive Cholesterinasie in ihren verschiedenen Fraktionen, wie sie von uns vorgeschlagen ist, als wertvoll bei der Wahrscheinlichkeitsdiagnose des Lungenkarzinoms und des Karzinoms mit anderen Lokalisationen. Es wird für notwendig erachtet, daß Bestimmungen im Plasma und im Gesamtblut und in den Blutzellen vorgenommen werden, um den allgemein reduzierten Prozentsatz der Normalwerte bei Seite lassen zu können, die sich bei manchen Fraktionen ergeben, und auch als ein neues Element für die Differentialdiagnose gegenüber dem Lungenkarzinom.

**References**


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