In connection with the development of cancer chemotherapy, searches are being made for new cytotoxic compounds. Compounds, carrying the active bifunctional dichlorodiethylamino group, have received wide recognition. The analogous bifunctional dichlorodiethyl sulfide group has received little study up to now as an antitumor agent.

Two types of compounds were synthesized in the present paper:

\[
\begin{align*}
A & : \text{CH}_3 \quad \text{Cl} \quad \text{COR} \\
& \quad \text{S} \quad \text{CH}_2\text{CH}_2\text{Cl}
\end{align*}
\]

\[
\begin{align*}
B & : \text{CH}_3 \quad \text{Cl} \quad \text{COR} \\
& \quad \text{S} \quad \text{Cl}\text{CH}_2\text{CH}_2\text{Cl}
\end{align*}
\]

The presence of the carboxyl group in A and B makes it possible to obtain esters, amides, and peptides, which function as transport groups. β-(β-Chloroethylthio)-α-chloroisobutyryl chloride (I) was obtained previously [1] by the cleavage of α-methyl-α-chloro-β-propiothiolactone with chlorine and the subsequent addition of ethylene to the obtained α-chloro-β-chlorosulfenylisobutyryl chloride according to the scheme:

\[
\begin{align*}
\text{CH}_3 \quad \text{Cl} \quad \text{COR} \quad \text{Cl} \quad \text{COR} \\
\quad \text{S} \quad \text{CH}_2\text{CH}_2\text{Cl} \quad \text{S} \quad \text{Cl}\text{CH}_2\text{CH}_2\text{Cl}
\end{align*}
\]

Four moles of alkali (using phenolphthalein as indicator) is consumed when (I) is treated with 0.1 N KOH solution at room temperature. But if the reaction is run carefully, in an organic solvent, then it becomes possible to replace only the acid halide. A number of derivatives, listed in Table 1, were obtained in this manner from the amines and esters of amino acids.

The careful hydrolysis of (I) with moist ether made it possible to obtain the crystalline β-(β-chloroethylthio)-α-chloroisobutyric acid (VIII). The NMR spectrum of (VIII) is shown in Fig. 1.

For the purpose of comparing the chemical properties and physiological activity, compounds of the B types were synthesized by the addition of β-chloroethylsulfenyl chloride to derivatives of methacrylic acid. Previously it had been shown [2] that the addition of alkylsulfenyl chlorides to acrylic acids and their derivatives goes predominantly with the formation of the α-alkthio-β-chloro derivatives of propionic acid, according to the polarity of the starting reactants:
Using NMR spectroscopy, it was also shown by us that the methyl- and phenylsulfenyl chlorides add unambiguously to the amides of methacrylic acid with the formation of the amides of the \( \alpha \)-methylthio-\( \beta \)-chloro- \( \alpha \)-phenylthio-\( \beta \)-chloroisobutyric acids [3].

The addition of ClSCH\(_2\)CH\(_2\)Cl to the anilide of methacrylic acid gave the anilide of \( \beta \)-chloro-\( \alpha \)-(\( \beta \)-chloroethylthio)isobutyric acid (IX), isomeric with (II), which had the same melting point (Table 2, Figs. 2 and 3).

The benzylamide of \( \beta \)-chloro-\( \alpha \)-(\( \beta \)-chloroethylthio)isobutyric acid (X), isomeric with (III), was obtained in a similar manner.

As a result, the addition of ClSCH\(_2\)CH\(_2\)Cl to various amides of methacrylic acid gave a number of compounds with the general formula ClCH\(_2\)CH\(_2\)S-CH\(_2\)-CCI(\( \text{CH}_3\))COR, but \( \beta \)-chloro-\( \alpha \)-(\( \beta \)-chloroethylthio)isobutyric acid (XI) could not be obtained in the pure state by the addition of \( \beta \)-chloroethylsulfenyl chloride to methacrylic acid. After removal of the solvent, we constantly obtained an oil, from which we were able to isolate after some time up to 50\% of the crystalline \( \beta \)-(\( \beta \)-chloroethylthio)-\( \alpha \)-chloroisobutyric acid, identical with (VIII).