MASS SPECTRAL STUDIES OF STEROIDAL BENZOTHIAZEPINES

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ABSTRACT
The mass spectra of structurally related steroidal benzothiazepines [4α,6-bc] have been examined which show strong resemblances by giving the same ion peak or corresponding peaks by similar fragmentation so much so that it can be used as of diagnostic value. Common ion peaks at m/z 163 and m/z 95 or 93 can be taken as diagnostic peaks. The fragmentations pathways have been suggested which are tentative in absence of deuterated analogues but different substitutions at C3 compensate the deficiency to some extent.

Keywords: Steroidal ketones, benzothiazepines, mass fragmentation, heterocycles.

INTRODUCTION
The benzothiazepines are important nitrogen and sulfur-containing seven-membered heterocyclic compounds in drug research since they possess diverse bioactivities.1-3 As should be expected, the fusion of heterocycles to steroidal skeleton often led to a change in their physiological activities and the appearance of new interesting biological behavior. As a result, various procedures have been worked out for their synthesis and numerous derivatives have been published in the literature. The reaction of α,β-unsaturated ketones and 2-aminothiophenol is an especially convenient and versatile method for their preparation. As we know that mass spectroscopy has proved to be a powerful and commonly used tool in the identification and structure elucidation of sterols. Detailed knowledge of the fragmentation triggering behavior of the common functional groups on the steroid skeleton is essential, however, for reliable structure assignments by this technique. In the present paper, we report the fragmentation4-7 routes of steroidal benzothiazepines and their 3β-substituted derivatives.

EXPERIMENTAL
The mass spectra were measured on a JMSD-100 mass spectrometry at 70eV using direct insertion technique at a source temperature 250°C. The molecular formula of all the ions mentioned in the text were established by accurate mass measurement relative to fragment ions of heptacosfluorotributylamine at the resolving power of 15000.
Compound I, II and III were prepared accordingly to the procedure describe in the literature\(^8\)-\(^{13}\).

**RESULTS AND DISCUSSION**

The present study give the mass spectra of 5α-colestane [4α, 6]-2′, 3′-dihydro-1′, 5′-benzothiazepine \(^8\)-\(^{13}\) (I), 3β-ethanolyloxy-5α-cholestan [4α, 6-bc]-2′, 3′-dihydro-1′, 5′-benzothiazepine (II), 3β-propanoyloxy-5α-cholestan [4α, 6-bc]-2′, 3′-dihydro-1′, 5′-benzothiazepine (III).

The mass spectra \(^14\)-\(^{15}\) of all the free compounds have strong resemblances. The structure of the (I) (Fig.1) is dealt with to explained the formation of important ion peaks, the mechanism of fragmentation is tentative for want of suitably deuterated analogues but different substitution at C3 has to great extends compensation the deficiency. Formation of characteristic fragment ions 458, 396, 95, 354, 243, 229, and 507 can be shown as given in scheme 1, 2, 3, 4, 5, 6 & schemer 6 are given to explain the formation of some other important ion peaks from I which in others II-III (fig. 2 and 3) corresponding peaks are observed. Alternatively the fragment ion m/z 458/456 can be shown to arise from the molecular ion as in the following Scheme 1. It may be pointed out that ion peaks both at m/z 490 and 458 are very weak. The fragment ion m/z 396 corresponds to the loss of mass unit 95 which may involve the loss of ring ‘A’ and angular methyl group at C\(_{10}\) according to Scheme-2. The fragment ion peak at m/z 396 is very weak. It is expected to be so in view of the ion structure (Ib) having two four membered strained rings. The loss of 2-aminothiophenol moiety can be shown according to Scheme 3. Perhaps the most significant in peak in the spectrum is m/z 243. Its formation can be shown to occur in more than one way. One of the possibilities is the involvement of the ion m/z 244 (a small peaks which on one hydrogen loss can given rise to the ion m/z 243 (Scheme 4).

These important ions m/z 230, 229 and 228 can be shown to arise according to (Scheme-5). These ions along with the ion m/z 243 are of diagnostic value for [4α, 6-bc] benzothiazepine (I-III) derivatives. Alternatively the ion m/z 229 can be shown to arise without the involvement of ion m/z 230.

The presence of nitrogen and sulfur in the ion m/z 163 clearly indicates that the steroid framework is lost in a manner that three carbon i.e. C4-C6 remains with the fragment ion. This ion m/z 163 may be arising according to fragmentation proposed in Scheme-6 and according to this Scheme-6, it can also be taken as a characteristics fragmentations.

This fragment ion may occur as shown in Scheme- 7. The ion m/z corresponds to the loss of ketene (CH\(_2\)=C=0) from the molecular ion. The peak is common in all acetate derivatives and may be shown according to Scheme-8.

**ACKNOWLEDGEMENTS**

We are thankful to the chairman, department of chemistry, A.M.U., Aligarh for providing necessary facilities. One of the authors (Azhar.U. Khan) is also thankful of the chairman of SITM for providing computer lab.
Fig.-1

Fig.-2
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(Received: 7 September 2010 Accepted: 25 September 2010 RJC-642)