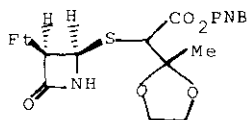
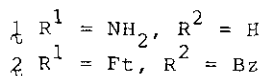
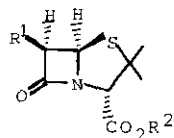
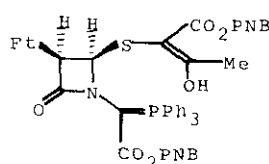
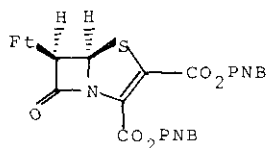
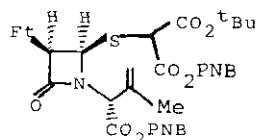
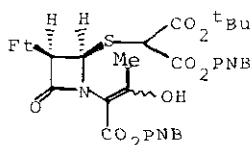
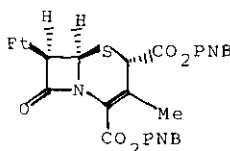


SYNTHESIS OF PENEM AND CEPHEM ANTIBIOTICS EMPLOYING CARBENE REACTION

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Since the first synthesis of penems reported by Woodward, this important class of non-classical β -lactam antibiotics is becoming an interesting compound with regard to both biology and synthesis. Our synthesis of the above compound starts from readily available 6-aminopenicillanic acid (1). The reaction of **1** with the diazo compound in the presence of rhodium acetate afforded the seco-penicillin derivative in good yield which was easily converted to **3** by two steps. After the introduction of phosphonyl group by the usual way, the phosphorane (**4**) was converted to the penem (**5**) by treatment with ozone, followed by an intramolecular Wittig reaction. Whereas the ozonolysis of the seco-penicillin derivative (**6**) afforded the triester (**7**), whose conversion into the cephem (**8**) was effectively achieved by an intramolecular Michael addition. Thus, the conversion of 6-aminopenicillanic acid into the penem (**5**) and the cephem (**8**) was successfully carried out by employing carbene reaction as a key step.

**3****4****5****6****7****8**