The insulin hexamer is an allosteric protein that exists in three conformational states: T₆, T₃R₃ and R₆ [1]. Transitions between conformational states are mediated by the binding of phenolic compounds or by the coordination of anions to the bound metal ions [2-5]. It was found that T₃R₃ hexamer in the chloro-derivative can accommodate different number of Zn²⁺ ions per hexamer with different coordination of the zinc ion [4,5].

In the present study four new insulin derivatives (two human and two bovine) crystallized in the presence of bromide or iodide ions and were structurally characterized. Single crystal diffraction data at 100 K were collected to high resolution at synchrotrons ELETTRA and ESRF.

In the bromo-derivatives four different coordinations of the Zn²⁺ ion were found: i) tetrahedral with two histidines and two bromide ions, ii) disordered site – tetrahedral with three histidines and one bromide ion and – octahedral with three histidines and three water molecules and; iii) tetrahedral tetraaquazinc(II) ion which was not found in the published chloro-derivatives and is rarely found in small molecule crystal structures. All bromo-derivatives are of the T₃R₃ type.

In the iodo-derivative only the ii) type of the disordered octahedral-tetrahedral site is found. The human bromo-derivative is a superstructure with a doubled c-axis. This derivative is also T₃R₃ but is of the 2Zn type with Zn²⁺ ions only on the three-fold axis.

Keywords: insulin; bromine; iodine