In recent years the combination of Raman scattering and microscopy has opened a new frontier in the biological application of Raman spectroscopy. Micro-Raman has taken advantage from the impressive technical improving of laser and detection devices which nowadays allows the study of materials with reduced dimensions and small objects such as cells or tissues. In addition Raman imaging provides a new vision of biological objects with promising applications in the study of the biological molecules structure and functionality, as well as the effect of exogenous molecules such as drugs, inhibitors or pollutants.

In general, Raman spectroscopy is an ideal technique for the characterization of biological macromolecules since the Raman bands features inform about the composition, secondary structure and interactions of these molecules. Besides confocal Raman spectroscopy allows a high spatial resolution (1-5 µm³), which can be applied to selectively study different part of cells and tissues.

In this work confocal micro-Raman spectroscopy and Raman imaging are applied to study the polytenic single chromosomes of Chironomus thummi. In particular, we are interested in the characterization of the telomeric regions of these chromosomes. Chromosome ends, or telomeres, are formed by a special chromatin structure where highly repetitive DNA sequences are found. The functionality of telomeres has been shown to impact on both cancer and aging, as well as on the organisms sensitivity to ionizing radiation. It is of interest the characterization of DNA conformation as well as the secondary structure of the bases in these telomeric regions of the chromosomes where highly repetitive DNA sequences are found. C. thummi telomeres are particularly interesting in this sense since they consist of tandem repeats of a 176bp-long AT-rich sequence [1]. This molecular organization differs from that found in most eukaryotes.

Besides, the micro-SERS (Surface Enhanced Raman Scattering) spectra of the chromosome obtained adding Ag Lee and Meisel colloids, previously aggregated with nitrate, to the same chromosome samples, are dominated by adenine bands in extended regions where this base is more accessible to the Ag nanoparticles. In more condensed parts, the adenine signal is lower and could be even weaker than that of guanine and cytosine.