

## 3<sup>rd</sup> International Conference on **Integrative Biology**

August 04-06, 2015 Valencia, Spain

### Route to the fully-optical sorting of biological matter: A case study

**Juan Sebastian Toterogongora**

King Abdullah University of Science and Technology, Saudi Arabia

While optics has historically been mainly used for imaging applications, light has now become a tool of manipulation and direct interaction with biological samples. It is well known that when light impinges on an object, it exerts a small pressure on it known as optical force. An immediate application of optical forces is found in optical tweezers, which in biology are usually employed as a non-invasive technique to immobilize cellular organisms for imaging purposes. These techniques, including more pioneering ideas such as, e.g., cell optical sorting and in-vivo manipulation, require a precise understanding on how the optical pressure affects biological organisms. This calls for the development of precise numerical methods, whose development will be crucial for applications of the aforementioned techniques. In this respect, ab-initio techniques represent a very important tool that can provide quantitative answers to the problem. By employing a series of massively parallel FDTD simulations, we study how optical forces act on biological matter. As a representative case study, we here consider deformed Red Blood Cells (RBC) illuminated by a monochromatic plane wave. We consider typical deformations arising due to the presence of a disease such as malaria. Realistic parameters for the geometry and the refractive index are then taken from published experiments. In our theoretical campaign, we study the dependence of the optical force on the particle shape and the incident wavelength. We show that optical forces change appreciably with the deformation, with amplitude variation in the pN range for RBCs affected by disease.

[js.totero@kaust.edu.sa](mailto:js.totero@kaust.edu.sa)

### Integrative studies with multidisciplinary approach from monoterpenoids to treatment of peptic ulcer disease

**Clelia Akiko Hiruma-Lima**

Sao Paulo State University, Brazil

The peptic ulcer disease (PUD) is a disease of modern times with relatively significant incidence on the developing country's population. The increase in human life expectancy, excessive alcohol intake, the currently stress life style associated with prolonged therapy with non-steroidal anti-inflammatory drugs (NSAID) has required the development of new drugs to treat this disease. The PUD is a complex and multi-factorial process including bacterial infections, the increase of acid secretion, generation of reactive oxygen species (ROS), inhibition of the endogenous PGs and the degradation of the extracellular matrix. This disease has increasing mainly in elderly people because the intrinsic weak mucosal barrier induced by aging and also the more frequent use of NSAIDs. The treatment of PUD nowadays is related to some severe side effects thus, the searches for safer and more effective pharmacotherapy are required. The last decade has offered new insights in the preventative therapy and also the healing of PUD and monoterpenes from natural products could be the new perspective for treatment of this disease. In our project entitle "Evaluation of monoterpenes in preventing and healing peptic ulcer disease" (FAPESP) our research group realized integrative studies with multidisciplinary approach. Based on these integrative studies, we evaluated the effects of monoterpenoids (geraniol,  $\beta$ -mycene and citral) and ensure the efficacy and safety as antiulcer drugs. The antiulcer studies of these monoterpenoids were investigated against different ulcerogenic agents including NSAID, HCL, pyloric ligation, absolute ethanol and ischemia-reperfusion procedure. We evaluated the gastroprotective effect of monoterpenoids by analyzing the gastric juice secretion, mucus, nitric oxide (NO), sulfhydryl compound, vanilloid receptor, glutathione (GSH) levels and myeloperoxidase (MPO) activity in the gastric and duodenal mucosa. We also evaluated the gastric and duodenal healing effects of monoterpenes and evaluated the effect of matrix metalloproteinase activity (MMP-2 and MMP-9) and roles of VEGF, PCNA and COX-2 in cell proliferation. The aim of this study is to gather and expose the numerous studies related to antiulcer activity of monoterpenoids, demonstrating their relevance to scientific research and presenting these natural compounds to the world population as future therapeutic ways.

[hiruma@ibb.unesp.br](mailto:hiruma@ibb.unesp.br)