Editorial

Immunology and Cell Biology of Parasitic Diseases 2011

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Infections caused by parasitic pathogens are still a global health problem. Parasitic infections are considered to be one of the leading causes of high morbidity and mortality in underdeveloped countries, particularly in children and the elderly. They affect the physical and intellectual capabilities of these populations, resulting in high treatment and rehabilitation expenses. Moreover, in developed countries, many parasitic infections are now a reemerging health problem, mainly due to massive migration of infected people from endemic countries, who carry the infection to novel and naïve fields. The goal of this special issue was to invite contributions from leading scientists in the field of parasitology with particular emphasis on immunobiology of parasitic diseases. In this special issue, we will discuss recent advances made in understanding the cellular and molecular basis of parasitic infections as well as immunological mechanisms for control of these diseases. In this light, we have new proposals as to how *Trypanosoma cruzi* can invade host cells as well as new methods to study cellular research in helminth infections. These original research papers and reviews are focused on different parasitic diseases emphasizing the need for high-impact research on public-health-related infectious diseases, including helminths (schistosomiasis, cysticercosis, trichinellosis, among others) and protozoan (toxoplasmosis, trypanosomiasis, amebiasis, and malarial) infections. We also have a couple of reviews to emphasize the current exciting research topic, how helminthic infections modulate immune responses to allergens and autoimmune diseases. Another hot topic of research is the search for cells that are key sources of Th2 responses during helminth infections and we have a nice review about the latest developments in

this field. And of course, the role of regulatory T cells in modulating parasitic infections cannot be missed.

This special issue was mainly supported by attendees of our IV Mexican Immunoparasitology meeting which has been held regularly every two years and was created to facilitate meetings for the exchange of ideas between Mexican scientists and overseas guest scientists interested in the field of the immunoparasitology. Though each time it has become increasingly difficult to find the right places for parasitological as well as in immunological meetings for discussion, this is an important area that requires exchange of knowledge. Similar to last year, approximately 35% of the papers submitted to this special issue were rejected or withdrawn after a rigorous review by our referees, thus trying to maintain the quality of JBB.

We start with an original contribution by X. Du et al., demonstrating that deficiency in IFN- γ leads to decreased egg burden in mice infected with *S. japonicum*, through an enhanced activation of T cells during acute infection. Their data suggests that IFN- γ is not always a positive regulator of immune responses and that, in certain situations, the disruption of IFN- γ signaling may upregulate the cytotoxic T-cell-mediated immune responses to this parasite. M. Esquivel-Velázquez et al. commented on how to improve the immunodiagnosis of neurocysticercosis (NCC), a disease of the central nervous system that is considered a public health problem in endemic areas. The authors highlight that immunodiagnosis of NCC is a useful tool that can provide important information on whether a patient is infected or not, but there are many drawbacks as not all infected patients can be detected by this technique. Thus, several important

methods for developing an immunodiagnostic test for NCC are listed and discussed in their contribution. The identification of a set of specific and representative antigens of *T. solium* and a thorough compilation of the many forms of antibody response of humans to the diverse forms of *T. solium* disease are also stressed as necessary. Following the *T. solium* paper, we have an original paper by A. Ochoa-Sánchez et al. that use a hamster model for taeniasis where they identified specific antigens from this tapeworm that could be used for differential diagnosis. With regards to another important helminth parasite, *Trichinella spiralis*, R. Hernández-Bello et al. evaluated the *in vitro* effects of sex steroids on the molting process of *Trichinella spiralis*. The molting process is the initial and a very crucial step in the development of the muscular larvae to adult worm. They demonstrate that progesterone is the only steroid that causes an effect by decreasing the molting rate. These authors also demonstrate that caveolin expression is downregulated by progesterone and estradiol. By using flow cytometry, a protein that is recognized by a commercial antiprogesterone receptor antibody was detected. The authors conclude that their findings may have strong implications in the host-parasite coevolution. The observation of sex-associated susceptibility to this infection could point to the possibility of using antihormone therapy to inhibit parasite development. Another very interesting contribution, which may have important application on parasitology, is the one of K. Nava-Castro et al., who designed a new method to disaggregate and analyze single isolated cells from helminths using flow cytometry. These authors mention that traditional methods to analyze molecules in parasites, particularly in complex parasites, such as worms, require homogenization of the whole helminth parasite, preventing evaluation of individual cells or specific cell types in a given parasite tissue or organ. The authors remark that the extremely high interaction between helminths and host cells (particularly immune cells) is an important point to be considered. It is really hard to obtain fresh parasites without host cell contamination. Then, it becomes crucial to determine which of the analyzed proteins are exclusively of parasitic origin, and not a consequence of host cell contamination. In their contribution, they describe a method to isolate and obtain purified helminth cells. On another front, the last few years have helped recognize helminths as very important parasites which can significantly modulate the immune response of their hosts. A series of studies have taken advantage of these properties and now there are several investigations on the immune modulatory capacities of helminthic infections. Thus, y. Osada and t. Kanazawa discuss both sides (benefit and harm) of the possible use of schistosome antigens to treat patients suffering from concomitant diseases. They argue the pros and cons of the hygiene hypothesis and also comment on the importance of controlling schistosomiasis. In a similar theory regarding helminths as potential regulators of the immune response, E. Daniłowicz-Luebert et al. have provided a comprehensive review on how different helminthic infections can modulate specific and allergy-related immune responses. They give us a growing list of parasites which have been reported to modulate beneficially

allergic and autoimmune responses. Finally, with respect to helminths, S. Leon-Cabrera and A. Flisser present a review on the role of basophils as a key cell type in inducing Th2-type responses in helminth infections. They compare several recently published papers which support the theory that basophils are Th2-inducers versus papers where this role is mainly attributed to helminth-modulated dendritic cells. Thus this review focuses on the origin of the Th2 responses during helminth infections as its central theme.

Protozoa are the most deadly parasites in the world, and in this special issue, we have several original papers describing their novel methods of infection, new genetic mechanisms of regulation as well as the role of recently discovered transcription factors in the development of these parasites. This section starts with a review on the role of interleukin-10 in malaria by M. Niikura et al. Interleukin- (IL)-10, an anti-inflammatory cytokine, is known to inhibit protective immune responses against malarial parasites and is involved in exacerbating parasitemia during *Plasmodium* infection. In contrast, IL-10 is regarded as necessary for suppressing severe pathology during *Plasmodium* infection. Thus, the authors summarize the role of IL-10 during murine malarial infection, focusing especially on coinfections with lethal and nonlethal strains of malaria parasites. R. Tuteja et al. discuss emerging data on the functions of transcription factors in malaria. *Plasmodium falciparum* is responsible for causing the most lethal form of malaria in humans. Although it shares some common features with eukaryotic transcription, it is assumed that mechanisms of transcriptional control in *P. falciparum* somehow differ from those of other eukaryotes. They argue that transcription factors are slowly emerging to have more defined roles in the regulation of gene expression in parasites. Coming back to immunity to malaria, S. Pathak et al. suggest that a protein from *Plasmodium* named PfP0 induces a deviant humoral response which may contribute to immune evasion mechanisms of the parasite. S. Muñoz-Hernández et al. demonstrate extensively the contribution of the residual body in the spatial organization of *Toxoplasma gondii* within the parasitophorous vacuole. They characterize the structure and function of the residual body in intracellular tachyzoites. They conclude that the absence of the network and presence of atypical residual bodies in ΔGRA2-HXGPRT knockout mutant parasites affect the intravacuolar organization of tachyzoites and their exteriorization. *Trypanosoma cruzi* is a flagellated protozoan and is the causative agent of Chagas disease which is prevalent in several regions in America. D. Pérez-Morales et al. analyzed the response of *T. cruzi* to temperature-induced stress. They discovered 24 proteins which showed changes in amounts of particular forms of protein in response to temperature stress, suggesting a potential role for them in heat shock response. In another study on *T. cruzi* by G. Ballesteros-Rodea et al. described the flagellar motility of this parasite, a phenomenon that had been poorly analyzed. Here the authors conclude that such movements are not random and are of capital importance for the survival of this parasite. Another extended protozoa infections is amoebiasis. With respect to this disease, C. Bañuelos et al. used genetic manipulation of the MVB protein trafficking pathway of

Entamoeba histolytica to overexpress 166 amino acids of its N-terminal Bro1 domain in trophozoites which resulted in diminished phagocytosis rates.

Finally, TP. Velavan and O. Ojurongbe performed a state-of-the-art review on the role of T regulatory cells in the outcome of both helminth and protozoan infections. Tregs have been observed in a variety of experimental as well as natural parasitic infections, and their role sometimes appears to favor parasite colonization but in many others these cells appear to help the host in order to maintain a regulated immune response avoiding hyperresponsiveness to disease. Thus, a fine balance in this T-cell subset is of great importance to maintain health and prevent disease development.

We hope that this collection of articles in the second special issue of immunobiology of parasitic diseases is of great interest to our readers and we also hope that you enjoy reading the contributions of the authors.

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