Special issue on anthelmintics and ion channels

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From December 1 to 3 of last year, about 50 scientists from three continents assembled in Philadelphia for a Symposium of “Membrane Ion-channels in Helminth Parasites: Resistance and Sites of Action for Anthelmintics.” This symposium, organized by Richard Martin (Iowa State University) with some help from myself, was intended to highlight recent advances in our understanding of helminth ion channels and the way they are exploited as targets for parasite control by existing drugs. Of course, these drugs are not perfect, and problems of emerging anthelmintic resistance were highlighted. We also heard about some possibilities for improving parasite control by developing novel compounds that affect newly described channels and receptors. The attendees heard and read 40 oral and poster presentations, which generated lively and informed discussion and demonstrated the high quality of the science being carried out in this area.

It is impossible to reproduce the complete symposium within the pages of any learned journal, but we felt that it would be worthwhile to put together some examples of the current work in this area, highlighting a few of the current opportunities and challenges in the area of worm control, and these are included in this issue of *Invertebrate Neuroscience*. Ligand-gated chloride channels are well established as drug targets, but with the exception of piperazine, an old drug with a rather narrow spectrum of activity, the GABA receptors expressed on nematode muscle cells have not been properly exploited. Accardi et al. provide a coherent and tightly argued case for paying increased

attention to these key parasite receptors. Control of schistosome infections is currently reliant on a single compound, praziquantel, and it is widely agreed that this is unsatisfactory and that alternatives are urgently required. Ribeiro et al. argue persuasively that the biogenic amine receptors might be the source of novel anti-schistosome drugs. Emodepside is a fascinating drug in many ways, and the complexity of its interactions with the nematode nervous system, including the calcium-activated potassium channels encoded by *slo-1*, is beautifully summarized by Holden-Dye et al. Even for the best drugs, resistance can emerge, and one way to overcome this, and possibility delay it happening in the first place, is to use drug combinations. Hu and Aroian discuss the potential synergism between established nicotinic drugs, such as levamisole, and the bacterial toxins derived from *Bacillus thuringiensis*. Some of these toxins show marked anthelmintic effects, and their safety and efficacy against insect pests make them worthy of further consideration for worm control.

The nicotinic acetylcholine receptors are a well-established drug target, but they continue to provide new opportunities and new insights. Charvet et al. illustrate this complexity and exploit their ability to reconstitute these receptors *in vitro* to examine the interactions of buphenium with the levamisole-sensitive receptor from *Haemonchus contortus*.

We hope that the other attendees will agree that these articles present a flavor of the symposium. The organizers would like to thank the National Institutes of Health, Burroughs-Wellcome Foundation, Merial Ltd and Pfizer Animal Health for their generous support of the symposium. None of these funding bodies had any input into the papers included in this special issue of *Invertebrate Neuroscience*.

Conflict of interest None.

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