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Editorial

Going Molecular

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Almost everyone and everything in biomedicine is going molecular these days. Certainly molecular biotechnology is revolutionizing human medicine from bench to bedside and from diagnosis to therapy. The impact on laboratory animal medicine has been predictably less dramatic, at least from the clinical perspective, but genetic engineering is nudging that gear shift forward. Genetically altered mice are currently the brightest stars of the new molecular age featuring animals created by human as well as divine handiwork. They are provoking strategies to accommodate novel or unpredictable health care needs, as befitting their scientifically exalted status. Although designer genes expressed in pricey founder animals are leading more often to individualized diagnosis and therapy, mouse medicine must remain — and by virtue of sheer volume — primarily population medicine, and continue to rely more heavily on prevention than therapy. Nevertheless, both approaches require rapid, specific, sensitive, affordable state-of-the-art diagnostic support. Thus, it is not surprising that molecular diagnostics, which possess many of these attributes, are the portals through which molecular laboratory animal medicine is emerging. As Susan Compton and Lela Riley illustrate in this issue, molecular testing for infectious agents is becoming an important component for decision-making in today's rodent medicine. It is not hard to envision the growing influence of this technology on health care for other species in the near future. One significant take-home message inherent to these changes is that solid grounding in molecular biotechnology must be internalized by laboratory animal practioners. This does not mean that everyone must walk the walk, but it does imply a pervasive and immediate need to talk the talk. Respectable fluency in the principles of molecular diagnosis, including its strengths and potential pitfalls, is a reasonable initial goal. The review by Compton and Riley provides some basics for the early stages of the learning curve and compliments a review of epidemiological methods by Benjamin Weigler which will appear in the June issue. It also illustrates, however, that molecular assays are not yet (and perhaps never will be) a panacea; often being most useful in concert with more traditional diagnostic methods such as serology, in vitro culture and microscopy.

PCR-based assays are leading the transition to molecular testing. Although they are being used primarily to assess specimens from individual or small groups of animals, or animal products, additional clever uses are on the horizon. For example, there is at least one group determining if PCR can be used for "macromonitoring" individually ventilated cage racks by testing exhaust air for viral and bacterial nucleic acids. On the immunodiagnostic scene, recombinant proteins, developed by molecular methods, promise increased specificity and sensitivity for the serological and immunohistochemical detection of infection, such as the identification of virus strains using capsid-specific antigens. The influence of molecular methods would not be complete without also acknowledging their value for genotyping mice, an application that preceded the current interest in infectious disease diagnosis. Although enthusiasm for molecular testing is justified, it is worthwhile to remember, as new tests and reagents are launched, that their credibility also will depend greatly on standardized preparation and use. While several international groups appear to be working on this issue, such as the effort initiated at the 1999 AALAS meeting in Indianapolis, standards and recommendations have not yet materialized.

While molecular technology holds much relevance for laboratory diagnostics, its development and application to other laboratory animal health issues should be considered. For example, the vector-based expression of purified antigens, such as viral capsid proteins, offer possibilities for effective and selective vaccination of genetically altered breeding mice and colostrally derived protection of their offspring. On a different front, microarray analysis, a new and powerful product of molecular technology, offers opportunities to study gene expression and function in rodents thereby enhancing investigation of disease mechanisms as well as developing more sophisticated phenotyping paradigms. Going molecular will provoke and answer important questions about the biology and diseases of laboratory animals—exciting prospects for laboratory animal science and comparative medicine.

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