Pharmacogenomics

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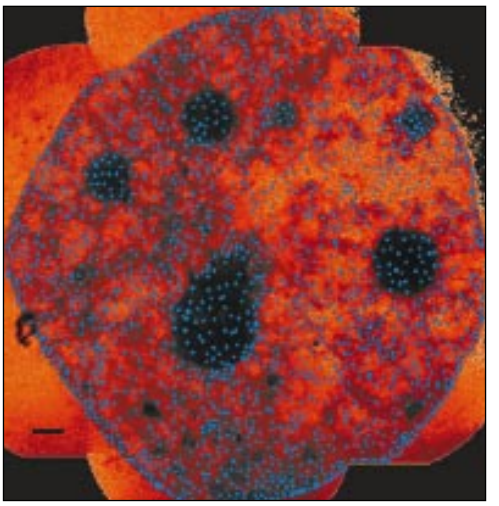
The focus for the front cover of *CJHP* in 2002 will be the Human Genome Project and advances in science, medicine, and technology related to this project.



This image of a human mammary cell was produced using soft X-ray microscopy at Lawrence Berkeley National Laboratory. The blue dots label proteins of the nuclear pore complex, through which molecules enter and exit the nucleus. Courtesy US Department of Energy Genomes to Life program (DOEGenomesToLife.org).

In the front cover stories for the 2 most recent issues of *CJHP*, I reviewed the human genome project[1] and how it might assist us in treating genetically based disease.[2] Pharmacogenomics, the study of how an individual's genetic inheritance affects the body's response to drugs,[3] is the next step in this process. Environment, diet, age, lifestyle, and state of health can all influence a person's response to a drug, but understanding an individual's genetic makeup is thought to be the key to creating "personalized" drugs with greater efficacy and safety.[3] The 20th century saw the development of drug therapies directed against major diseases, but such therapies target the broadest patient population and often are not curative.[4] However, much more genetic variation exists than was previously thought, and these variations in genes and their protein products can be exploited to develop safer, more effective drugs.[5] The 20th-century "one drug fits all" approach could, with the fruits of pharmacogenomic research, evolve into an individualized approach to therapy whereby drugs are matched to a patient's unique genetic profile to become optimally effective.[6] This approach will involve classifying patients with the same phenotypic disease profile into smaller subpopulations, defined by genetic variations associated with disease, drug response, or both.[4] The assumption underlying this approach is that drug therapy for genetically defined subpopulations can be more efficacious and less toxic than in a broad population.[4] In the future, instead of adjusting a patient's drug dosage regimen to achieve a concentration within the therapeutic range, we may make dosage recommendations on the basis of the patient's genotype.[7]

Despite the attractions that this approach would offer, the cost implications could be staggering. Bringing a single new drug to market currently costs approximately $500 million, which makes it economically impractical to target small patient populations.[4] If smaller patient populations are to be served and if costs are to be controlled, it may be necessary to change the entire drug development process, including the regulatory process that governs approval.

References

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