(The opinions expressed in this section are those of the authors and do not represent the official opinion or position of the Journal, the Health Physics Society, or the authors' institutions.)

IMBA Expert USDOE-Edition Phase I, Version 2.0.22, ACJ & Associates, Inc., Richland, WA 99352 (http://www.imbaexpert.com), and the National Radiological Protection Board, Chilton, Didcot, Oxon OX11 ORQ United Kingdom. The version tested is available to users in the U.S. Department of Energy (DOE) community and is commercially available.

IMBA EXPERT USDOE-Edition Phase I[†] is a software application for PC computers that is designed to handle a variety of problems in internal dosimetry and radiobioassay. Designed for both the current needs of users in the U.S. and abroad, IMBA Expert can handle old and new dosimetry systems and biokinetic models. Specifically, the dosimetry system published in 1977 by the International Commission on Radiological Protection (ICRP) in its Publication 26 and adopted by U.S. regulatory agencies, and the biokinetic models in ICRP's Publication 30 series is fully supported. Also supported are the ICRP Publication 60 dosimetry system, the ICRP Publication 66 respiratory tract model, as well as the biokinetic models published by the ICRP since 1990.

Installation completed in less than one minute on a state-of-the-art laptop, even taking time to read the warnings about uninstalling earlier versions. IMBA Expert worked well under Microsoft Windows XP[‡] on the author's system, and based on experience of many users (including the author) at the 2002 Health Physics Society Summer School, a slightly earlier version worked well on Windows 98[‡] and Windows 2000.[‡] The version of IMBA Expert tested here does not run on dual- or multi-processor PCs.

IMBA Expert is a successor to a variety of internal dosimetry codes that include GENMOD, INDOS, REMEDY, CINDY, and LUDEP, among others. It is the first fully-integrated package of tools whose native environment is Windows.[‡]

The version of IMBA Expert reviewed here comes with a 149-page user manual and a 121-page Appendix titled "Technical Basis." Both are printed in color. The user manual provides a visual tour of the three principal screens in IMBA Expert, and detailed chapters on the screens: Main, Bioassay Calculations, and Dose Calculations. For users with color vision, IMBA Expert is very helpful in its use of color to indicate information that is needed but that has not yet been filled in, and to indicate the context in which the user finds himself, i.e., in the intake-to-bioassay-quantity mode or in the bioassay-quantity-to-intake mode. The Main screen includes seven menus (File, Edit, Parameters, Calculations, Tools, Advanced, and Help) and eight tool buttons (Open, Save, New, Quick Save, Load ICRP Default Values, Load DOE 10 CFR 835 Default Values, Report, and Help). The Parameter File bar shows the file name of the project currently in memory. The main status bar at the bottom of the screen shows the user the status of intake regimes, absorption parameters, particle transport parameters, GI tract model, gut absorption fraction f_1, biokinetic model parameters, deposition model parameters, activity median aerodynamic diameter, and wound model parameters.

Over half of the Main screen is devoted to the Intake Scenario panel, in which the user can enter up to ten intakes, including mixtures of chronic or acute, inhalation, ingestion, or injection, with grayed-out boxes for "wound" and "vapor," hints, perhaps, of future capabilities. The Units subpanel permits the user to specify that times be expressed as dates or times since a particular date (users are cautioned to use 4-digit years); intakes may be specified in Bq, dpm, or pCi; and dose may be specified in Sv, rem, mSv, or mrem (the authors should note that the unit rem, and its unit symbol, rem, are not spelled with an uppercase letter). One must select an indicator radionuclide from a periodic table. At present, choices are limited to isotopes of H, P, S, Co, Sr, I, Cs, Po, ^{234}U, Np, Pu, or Am, which account for the radionuclides of greatest interest to DOE. The omission of ^{235}U and ^{238}U is annoying, despite the fact that these are lumped together with ^{234}U in most tables in ICRP Publication 78. Entire decay chains can be graphically displayed for the available nuclides, as can the ICRP Publication 38 radioactive decay data for each chain member. Users may also select "Associated Radionuclides" that are assumed to occur in a mixture in constant proportion to the indicator radionuclide. This is a particularly useful feature for persons dealing with well-characterized mixtures of radionuclides for which one is used as a tracer for the others. The Model Parameters subpanel of the Main screen permits users to load respiratory tract parameters (deposition, particle transport, and absorption), as well as GI-tract, bioassay and biokinetics parameters. If one clicks on the "Load ICRP Defaults" button after completing the Intake Scenario screen, one must still choose an f_1 value from a menu displaying particle transportability classes F, M, and S, and specifying the ICRP source publication. Note that any ICRP parameter can be overridden by the user.

The Bioassay Calculations screen has two modes, "Bioassay Quantity to Intakes" and "Intakes to Bioassay Quantity," reflecting the complementary needs of an internal dosimetrist to predict excretion rates or compartment activities from postulated intakes and to infer intake values from bioassay data. The two modes are selected by simply clicking on a tab, and a prominent, color-coded arrow clearly shows the user which mode is active. Bioassay quantities include whole body, lungs, urine, feces, blood, thyroid, liver, and user defined. Including skeleton in the list would have been helpful for dosimetrists measuring or tracking retention of bone-seeking radionuclides. The user is cautioned that the calculation progress bar may seem to indicate that nothing is happening, when the calculation is indeed progressing normally. If, during a calculation, an impatient user hits a key, a new calculation begins in parallel with the one already started, further slowing down progress.

There are two useful and reasonably powerful tools, the Graph Tool and the Table Tool, available on the Bioassay Calculations screen. These permit the user to manipulate and display data and predictions. IMBA Expert provides fairly elementary uncertainty

[†] The name derives from "Integrated Modules for Bioassay Analysis."

[‡] Microsoft Corporation, Redmond, WA.

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algorithms, but they are far better than nothing and more sophisticated methods are promised. These tools make IMBA Expert truly interactive, especially when the internal dosimetrist is trying to infer an intake from an unusual set of bioassay data.

The Dose Calculation screen performs dose calculations from intakes with standard parameters and parameters other than those of the ICRP defaults, e.g., with different particle sizes or different transportability classes.

IMBA Expert has the ability to save and print reports of various kinds.

Having worked with several internal dosimetry software packages, in my opinion a tool with this ease of use and power is long overdue. I encountered no significant bugs in the software and was able to perform calculations using the help screens and provided documentation. I look forward to promised additions of more radionuclides, a wound model, and Bayesian statistical inference.

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