The IMBA concept originated in 1997 to provide the UK Approved Dosimetry Services with a new-generation software required to interpret monitoring data and calculate doses with the new biokinetic models recommended by ICRP.

At its core, are 6 IMBA modules each of which is an independent executable program performing a unique task in the stages of internal dose calculations.

Each module has been extensively quality assured. The key point is that by running these modules in a certain order, it is possible to:

- estimate intakes from bioassay measurements
- predict bioassay quantities at specified times after a known intake, and
- calculate doses from known intakes.

### Development from 1997 - 2005

- After the IMBA modules, work began on the development of IMBA Expert™ software to use the modules in a user friendly way.
- In 2001, IMBA Expert™ USDOE-Edition was completed for the United States Department of Energy and there are now 25 fully licenced US DOE sites using the software.
- A contract with the CANU Owners Users Group, Canada to extend the software to deal with radionuclides and vapours arising in CANU-type reactors followed.
- A third version was developed for OCAS (Office of Compensation, Analysis and Support), USA to aid the calculation of causation probabilities for the US compensation scheme (EEICPA 2000).
- A UK version IMBA Expert™ UK-Edition was also developed and is now used routinely by the Approved Dosimetry Services in the UK.
- In order to make the software more accessible to smaller organisations, an off-the-shelf version, IMBA Professional, was developed and made available in January 2004.
- Special versions of IMBA Professional have been developed for universities, and also for the IDEAS international intercomparison exercise.

### IMBA Professional Plus Central Concepts

IMBA Professional Plus is the successor of the IMBA Professional and IMBA Expert™ series. It is more flexible, more powerful and 6 - 10 times faster. The central concept behind the software is that the nucleus of the program (called the Base Unit) can be installed and run as a separate entity, enabling basic internal dosimetry calculations to be performed. More powerful capabilities (called Add-ons) can be added to the Base Unit as required. Each Add-On can be installed independently, and increases the functionality of the software. The users can thus build up the software to meet their precise requirements.

<table>
<thead>
<tr>
<th>Add-On</th>
<th>Description of Add-On</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enables up to 10 independent intake regimes to be specified and used together in calculations</td>
</tr>
<tr>
<td>2</td>
<td>Allows different types of measurement data to be used simultaneously in the assessment of intake(s)</td>
</tr>
<tr>
<td>3</td>
<td>Enables up to 30 associated radionuclides to be specified and used in dose calculations</td>
</tr>
<tr>
<td>4</td>
<td>Used to enable different isotopic mixtures of uranium (eg, enriched, natural) to be specified and used in calculations</td>
</tr>
<tr>
<td>5</td>
<td>Implements a generic wound model, enabling intakes via wound to be dealt with in cases where the data is normally distributed, and there is only 1 intake, this Add-On will automatically calculate the error on the estimate of intake</td>
</tr>
<tr>
<td>6</td>
<td>Incorporates a Bayesian fitting methodology allowing the user to investigate the effects of different ‘prior’ knowledge on intake estimates, combine bioassay data with PAS data, and obtain uncertainties in estimates of intakes</td>
</tr>
<tr>
<td>7</td>
<td>A tool used to analyse measurements of tritium in urine from a routine tritium monitoring procedure</td>
</tr>
<tr>
<td>8</td>
<td>A tool specifically designed for calculating doses to a specified organ in each calendar year. Used for input into compensation type calculations</td>
</tr>
<tr>
<td>9</td>
<td>Enables the ingrowth of 239Am from 241Pu to be automatically allowed for in calculations (Chronic intakes cannot be used with this Add-On)</td>
</tr>
<tr>
<td>10</td>
<td>Incorporates a tool used to analyse measurements of tritium in urine from a routine tritium monitoring procedure</td>
</tr>
<tr>
<td>11</td>
<td>A statistics package giving a quantitative judgement as to the goodness of fit of the assumed models to the measurement data</td>
</tr>
</tbody>
</table>

### IMBA Modules

- IMBA_Dep deposition
- IMBA_Bio biokinetics
- IMBA_Fit fitting
- IMBA_Eff effective dose
- IMBA_Dos organ dose
- IMBA_Dis disintegrations

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