

Letter to the Editor

Universal Decay Factor Table

Decay factors can be calculated by using the exponential decay equation and a calculator with an exponential function key (*I*). In practice, however, especially in a busy radiopharmacy where up to several hundred doses are precalibrated before shipment, use of the exponential decay equation becomes a bit too cumbersome.

To facilitate the decay calculations of such longer lived radionuclides as Tl-201, Ga-67, Xe-133, and I-131, manufacturers provide pages and pages of decay charts with a limited number of time points for their radionuclides. Why have all these decay charts when one universal decay chart will suffice?

The universal decay chart (Table 1) was generated by a simple computer program. This program (Table 2), written in BASIC computer language, can be easily varied to provide as many or as few decay factors as desired and up to as long a time period as is practical. Table 1 is but a sampling and is not very useful in its present form. A more practical table should be generated using smaller increments and extended to include time to half-life ($T/T_{1/2}$) ratios up to 2 or 3.

Once the desired universal decay chart is generated it can

TABLE 1. Universal Decay Factors

$T/T_{1/2}$	Decay Factor	Predecay Factor
0.000	1.0000	1.0000
0.100	0.9330	1.0718
0.200	0.8706	1.1487
0.300	0.8123	1.2311
0.400	0.7579	1.3195
0.500	0.7071	1.4142
0.600	0.6598	1.5157
0.700	0.6156	1.6245
0.800	0.5743	1.7411
0.900	0.5359	1.8661
1.000	0.5000	2.0000

TABLE 2. Computer Program to Calculate Decay Factors

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10 PRINT "    TIME/HALF-LIFE", "DECAY FACTOR", "PREDECAY FACTOR"
20 PRINT "    ....."
30 FOR J=0 TO 1.01 STEP .1
40 X=EXP(-.693147*J)
50 PRINT TAB(7);
60 PRINT USING "#,###";J,
70 PRINT " ";
80 PRINT USING "#,###";X,
90 PRINT " ";
100 PRINT USING "#,###";1/X
110 NEXT J
120 END

```

be used to find the decay factor for any radionuclide. To use the chart one simply must know the elapsed time for the radionuclide to decay and the half-life of that radionuclide. Divide the elapsed time by the half-life (same time units), then locate that quotient in the left-hand column of the universal decay chart; the corresponding decay factor is found in the adjacent column.

For example: A 24-hr decay factor for Ga-67 is desired.

$$T = 24 \text{ hr;}$$

$$T_{1/2} = 78 \text{ hr;}$$

$$T/T_{1/2} = 0.3.$$

The decay factor from Table 1 = 0.81.

Technologists presently using various decay charts will find this universal decay chart a very handy tool. It will facilitate decay factor calculations, and cut down on the amount of nuclear "grafitti" found strewn all over the dose calibrators and walls of most radiopharmacies.

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References

1. Chandra R. *Introductory physics of nuclear medicine*. Philadelphia: Lea & Febiger, 1976:28-31.