

Molecular imaging: A convergence of technologies

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Abstract

While novel diagnostic techniques are undoubtedly required for improved healthcare, it is unlikely that a single diagnostic tool will meet current demands for diagnostic sensitivity and specificity for a broad range of diseases. Integration of complementary tools will afford significant improvements, but it is likely that instrumental limitations will still hamper diagnostic accuracy. A combination of advanced imaging strategies and novel, disease specific molecular beacons may offer a way forward.

Molecular imaging (imaging the distribution of molecular species within cells, tissues, organs and whole organisms) promises significant improvements in diagnostic sensitivity and specificity. This increased sensitivity and specificity may be obtained in three ways:

1. Specific accumulation of a species of interest at a site of interest
2. Specific activation of a species of interest at a site of interest
3. Specific accumulation and activation of a species of interest at a site of interest.

A number of imaging techniques can be used to track an appropriate probe: the problem is to find the appropriate probe for the disease being studied and the technique used. A survey of the approaches used to date will be presented, and some opportunities for nanotechnology in this evolving field will be outlined for discussion.