ABSTRACT:
Multi-Isotope Imaging Mass Spectrometry (MIMS) is a quantitative imaging methodology which combines SIMS analysis (using the Nanosims50 instrument) with the use of stable-isotope-tagged tracers to study metabolic pathways in a variety of biochemical pathways using molecules tagged with different stable isotopes. We commonly use for biological studies are D, 13C, 15N, and 18O. Deuterium was administered deuterated (D)-water and N-thymidine by I.P. injection concurrently [6]. We have obtained quasi-simultaneous images of 14O, 12C, 13C, 15N, 12CH3, 12CH2, 12CH, 14N, and 18O with a setup for simulaneous acquisition which is time consuming and not fully effective. The usual approach is to use the deflection plate located in front of the detector slit (ExSLD) by mean of magnetic peak switching. We derive D/H from C/H ions is to reduce instrumental mass fractionation which is most likely attributable to the light mass of H and D. We use the deflection plate located in front of the detector to allow us the acquisition of two masses with one detector at a fixed magnetic field. For example, the signal for 12CH4N and 12CD4, at the isobaric mass 26 are recorded on the same detector. A switch is also made on the detector at mass 27 to record 13CH4N and 12CH5N from which we derive the ratios 12C/12C and 12CH2N/12CH4N. We have applied this method to the analysis of sections of mouse small intestine embedded in LR white. A mouse was administered deuterated (D)-water and 32P-thymidine concurrently [6]. We have obtained quasi-simultaneous images of 14O, 12C, 12CH3, 12CH2, 12CH, 14N, 13C, 14N, 31P and 32S ions with a setup for the electrostatic peak switching at mass 26 and 27. This generic method will be applied in the future to biological studies involving the simultaneous use of the 4 stable isotopes D, 13C, 15N and 18O.

CONCLUSION
This method allows for the measurement of H, D, 13C, 12C, 15N, 14N in extending MIMS capabilities to the exploration of up to 4 biochemical pathways in a single biological study.

AKNOWLEDGEMENTS:
C.I. is funded by the NIH (1P41EB01974-13, AI034941, RO1 AG058019, R21AG058019-03, AG-SS-2105-08, RGP0948, RS AG042090, Human Frontier Science Program and the Ellison Medical Foundation). M.S. is funded by Watkins Cardiovascular Leadership Award, Kibber 500147-02 and Harvard Stem Cell Institute Seed Grant.

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METHODOLOGY
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