Author’s response to reviews

Title: Assessment of the potential respiratory hazard of volcanic ash from future Icelandic eruptions: a study of archived basaltic to rhyolitic ash samples

Authors:
David Damby (ddamby@usgs.gov)
Claire Horwell (claire.horwell@durham.ac.uk)
Gudrun Larsen (glare@hi.is)
Thorvaldur Thordarson (torvth@hi.is)
Maura Tomatis (m.tomatis@unito.it)
Bice Fubini (bice.fubini@unito.it)
Ken Donaldson (kdctox@hotmail.co.uk)

Version: 1 Date: 08 Aug 2017

Author’s response to reviews:
Reviewer #1:
We would like to thank the reviewer for his positive assessment and kind comments towards the study and manuscript overall.

>> Lacks section on limitations of study (and strengths)<<

We fully recognize the importance of a strengths/weaknesses assessment but ultimately decided not to include a dedicated section in this manuscript. Instead, we have highlighted strengths/weaknesses at appropriate points throughout the manuscript. This includes, for example, the limitations of using archived samples (lines 195-199, lines 446-449), the limited insight provided by the employed toxicity tests (lines 446-449, lines 473-474), the benefits imparted by assessing the entire range of compositions expected for Icelandic ash (lines 135-137), amongst others.
The primary rationale for this decision is that we did not think it most appropriate for this paper. This work builds on 10+ years of considering ash as a hazard and the most rapid and effective method to communicate this hazard to local governments, emergency responders and populations. We aim to publish a full review of the approach which will include an in-depth assessment of limitations and strengths, drawing from the years of experience. In light of that, we believe that this paper has study-specific limitations (e.g., the use of archived samples, as mentioned above) that negate a full evaluation of the approach but are not sufficiently extensive to warrant an independent section, and we have organized the manuscript accordingly.

All samples were dried in an oven at 80 °C for 12 hours and then sieved (Endecotts woven wire 183 stainless steel sieves) first through a 2 mm and then subsequently a 1 mm sieve. Please explain what effects could have on measurements

We expect this sample preparation to have no effect on the measurements conducted, as no changes in the particle composition/surface chemistry are expected at this temperature, and contamination from the sieves (which are washed thoroughly between samples) would be minimal. It is, however, a concern if soluble species are of interest and we have amended the text to include this (lines 183-186).

Other biological tests than hemolysis assay and free radical production. Please describe what other tests could be done and why they were not done

We thank the reviewer for this observation and certainly appreciate that an abundance of other biological tests are available. However, many biological tests come with a high associated cost and require long-duration experiments (days to weeks). This is particularly true with cell-based assays. The two tests that we used are low-cost and rapid (minutes to hours), making them ideal for a screening approach, and are also tailored to what is currently known about potential ash hazards: reactive surface iron (iron-based free radical generation) and reactive crystalline silica (haemolysis). We believe that we explain this in the manuscript and support the chosen analyses in the context of intensive studies of ash toxicity as well as reviews of experimental work. Further, we state that the toxicity work conducted for this manuscript was limited because the
samples are not fresh (line 443), which can impact ash toxicity (Horwell et al., 2015), so any results would not be directly applicable. Accordingly, we have only made minor amendments to the text to emphasize the above (see first paragraph of section 4.3) rather than introducing a new section.