



Colorado Molybdenum Standards Update October 2015

Climax Molybdenum Company (Climax) is providing this update to our stakeholders to summarize the progress of ongoing scientific research on molybdenum to address two principal areas: human toxicological studies, sponsored by the International Molybdenum Association (IMOA) and agricultural studies, in progress by the Animal Science Department at Colorado State University. In addition, we wish to update our stakeholders on changes to the schedule for the Colorado Water Quality Control Commission's formal hearing on molybdenum standards in light of these new studies, and the timing we expect to follow to present results of the studies, once they are completed, to a subgroup established within the Colorado Basic Standards Workgroup and to the Colorado Water Quality Control Commission (WQCC or Commission).

Status of the human toxicological research

The International Molybdenum Association continues its work to develop reliable scientific studies on the toxicity of molybdenum by sponsoring the development of new human health studies by qualified expert scientists. As noted in prior communications, two studies were completed and published under stringent international Organisation for Economic Cooperation and Development (OECD) protocols using prescribed Good Laboratory Practices (GLP). These studies included a dose-response and a reproductive toxicological assessment. A third OECD GLP compliant two-generation reproductive toxicity study that started in July 2015 is being conducted by Charles Rivers Laboratories in Pennsylvania.

The two-generation study focuses on potential effects of molybdenum exposure prior to mating, during mating, throughout gestation and during postnatal development over two generations. Regarding the study protocol that was developed by Charles Rivers Laboratories, IMOA engaged USEPA Headquarters in Washington D.C. to discuss laboratory selection and key aspects of the protocol, at which time positive support for Charles Rivers Laboratories and the study design was received. Study completion is expected in early 2016 and the study draft report is currently projected to be finalized by mid-2016. A final report is expected to be available by late 2016, at which time the results will be submitted for peer-review and publication.

Status of the agricultural study at Colorado State University

The agricultural study investigating the effects of molybdenum in cattle is well underway at the Agricultural Research, Development and Education Center at Colorado State University. Fifteen steers served as the first replicate in the study, each receiving one of five doses of molybdenum in their water supply. This first replicate was slaughtered in mid-July and a second replicate of fifteen steers is currently under the same feeding and watering regimen. Preliminary results from the first set of cows showed no observation of symptoms of molybdenosis for any of the five treatments up to approximately 1000 µg/l. The second replicate will run through November and results will be shared as soon as they can be summarized.



Dr. Terry Engle, Professor of Animal Science at Colorado State University, speaks to interested parties about ongoing molybdenum research on cattle during a May 4, 2015 tour of university facilities

Climax sponsored two visits to the research facilities, with an open invitation that included participants in the basic standards work group and other interested parties, in the first six months of 2015 and appreciates the attendance by

representatives of the Water Quality Control Division, the Colorado Department of Agriculture Office of the State Veterinarian and Grand County, as well as other stakeholders. Along with his investigatory team, Dr. Terry Engle has both graduate and undergraduate students working with him to manage the day-to-day requirements of this research. Dr. Engle has a standing invitation to all stakeholders and interested parties to arrange to visit the research facilities to understand this research.

Changes to the schedule for the WQCC to consider molybdenum standards

CDPHE established a molybdenum subgroup of the Basic Standards Workgroup preparing for the Regulation 31 Colorado Basic Standards hearing in June 2016. This subgroup has been regularly updated on progress of the scientific studies for both the human health and the agricultural studies and their timing in relation to the Basic Standards hearing. In June, the subgroup recommended postponing consideration of molybdenum standards as part of the current Regulation 31 schedule to the Basic Standards Workgroup, in favor of a separate molybdenum-specific hearing to be held before the WQCC following completion of the studies. The Workgroup accepted the recommendation and discussed having the Division and Climax update the Commission at the Regulation 31 Issues Formulation hearing in November, and again during the Temporary Modification hearing in December. This latter hearing is timely since there is a Temporary Modification for molybdenum on Segment 13 of Tenmile Creek that expires on December 31, 2016. Climax has requested this Temporary Modification to be extended to December 31, 2017, which will allow the Commission to hold a special hearing on molybdenum standards.

Climax will continue to update the molybdenum subgroup and any other interested participants once the studies are complete. We expect some research findings will be available for review before the end of the second quarter in 2016.

With whom is Climax communicating?

In addition to Climax's participation in regulatory proceedings before the WQCC, including the Basic Standards Workgroup process, Climax continues to coordinate with the Water Quality Control Division, the Colorado Department of Agriculture and Colorado State University. We have also provided updates to the Summit Water Quality Committee and to the Clinton Ditch and Reservoir Company in recent months. Climax is more than willing to meet informally with any stakeholders who may have interest in the science, the standards process, or the specifics of water management at our facilities.

Who can I contact to get more information?

If you have specific questions or you would like additional information, including copies of the published articles, please contact:

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