ROOT CAUSE ANALYSIS REPORT EXAMPLE:
Explosion at Acme Chemical Company

smartsheet

AGENCY	Acme Chemical Co.	**REFERENCE NO.**	ACH#200-1
PROGRAM	Lab	**DATE RCA COMPLETED**	12/11/16
FACILITY	Seattle West	**DATE OF EVENT**	11/27/16
ADDRESS	123 Pine St., Seattle, WA		
RCA TEAM MEMBERS	Mark Berry, Laboratory Manager; Bob Graphy, Company Safety Officer; Team Leader: Rick James, R&D Officer		

1. THE EVENT *Describe what happened and any harm that resulted. Identify the proximate cause, if known.*

During synthesis of a large batch of nickle hydrazine perchlorate (NHP) derivative, a laboratory explosion occurred. The compound detonated, injuing one laboratory analyst.

2. BACKGROUND & FACTORS SUMMARY *Answer the following questions briefly, attach supporting documents if necessary*

2.1. Describe the sequence of events that was expected to take place. Attach flowchart if necessary.

As single batch of less than 100 milligrams of NHP was to be synthesized, with any deviation from the protocol being checked through the Prinicipal Investigator (PI).

2.2. Was there a deviation for the expected sequence of events? If yes, describe. Attach flowchart if necessary.

Yes, a batch of 10 grams was planned for synthesis. The PI was not consulted in the scaling up of the production.

2.3. Was any deviation from the expected sequence likely to have led to or did contribute to the adverse event? If yes, describe.

Yes, a batch of over a 300 milligram quantity becomes unstable and explosive.

2.4. Was the expected sequence described in written policy, procedure, guidelines, or expressed in staff training? If yes, cite the source.

Yes, the Laboratory Analyst was trained in Lab Safety procedures and further trained in additional lab satefy techniques (all training is current). It was reiterated in the morning meeting that any deviations to lab protocol must be assessed by the PI.

2.5. Does the expected sequence or process meet any regulatory requirements and/or practice standards? Cite any references reviewed by the team. If no, describe the the deviation from the requirements.

Yes. The team reviewed the American Chemical Society manual, MSDS sheets, and official laboratory safety policies.

2.6. Did human action or inaction appear to contribute to the adverse event? If yes, describe the actions and how they contributed.

Yes, the laboratory analyst should have checked the scaling up of the chemical compound manufacture with the PI prior to mixing the chemicals.

2.7. Did a defect, malfunction, misuse of, or absence of equipment appear to contribute to the event? If yes, describe what equipment and how it appeared to contribute.

No.

2.8. Was the procedure or activity involved in the event being carried out in the usual location? If no, describe where and why a different location was utilized.

Yes.

2.9. Was the procedure or activity being carried out by regular staff familiar with the consumer and activity? If no, describe who was carrying out the activity and why regular staff were not involved.

Yes. However, this staff member has only performed the synthesis on four occasions.

2.10. Were involved staff credentialed/skilled to carry out the tasks expected of them? If no, describe the perceived inadequacy.

Yes.
2.11. Were staff trained to carry out their respective responsibilities? If no, describe the perceived inadequacy.
Yes.
2.12. Were staffing levels considered to have been adequate at the time of the incident? If no, describe why.
No. The PI, nor any other PI's were present in the laboratory that day.
2.13. Were there other staffing factors identified as responsible for or contributing to the adverse event? If yes, describe those factors.
Yes. The responsible Analyst was the most senior in the lab that day, with only two years experience, while the other analysts present all had less than one year experience.
2.14. Did inaccurate or ambiguous information contribute to or cause the adverse event? If yes, describe what information and how it contributed.
Yes. Analysts regularly scale up when making compounds in order to make enough for multiple tests. The MSDSs did not specify risk associated with making this compound above a threshold.
2.15. Did a lack of communication or incomplete communication contribute to or cause the adverse event? If yes, describe who and what and how it contributed.
Yes. The PI responsible should have reviewed all potential risks associated with this project prior to the project commencing.
2.16. Did any environmental factors contribute to or cause the adverse event? If yes, describe what factors and how they contributed.
No.
2.17. Did any organizational or leadership factors contribute to or cause the adverse event. If yes, describe what factors and how they contributed.
Yes. The PI is ultimately responsible for this accident due to inadequately preparing the team.
2.18. Did any assessment or planning factors contribute to or cause the adverse event? If yes, describe what factors and how they contributed.
Yes. Proper assessment of the chemical synthesis risk should have been reviewed.
2.19. What other factors are considered relevant to the adverse event? Describe.
N/A
2.20. Rank order the factors considered responsible for the adverse event, beginning with the proximate cause, followed by the most important to less important contributory factors. Attach Contributory Factors Diagram, if available.
1. Lack of PI oversight, project safety review
2. Lack of chemical safety information on MSDS sheet
3. Lack of analyst experience
2.21. Was a root cause identified? If yes, describe.
Yes. The PI should have performed a comprehensive safety review of the chemicals being synthesized in the experiment and any potential safety indications prior to starting the project work. Since scaling up is done regularly in the lab, this should have been anticipated.

3. RISK REDUCTION ACTIONS TAKEN *List the actions that have already been taken to reduce the risk of a future occurrence of the event under consideration. Note the date of implementation.*

A safety semainar was conducted with all project PIs on staff. Reviewed were the protocols for reviewing each project with their team prior to work being performed, looking for potential hazards. HR has assigned each PI a cellular phone to be carried at all times so that their team may reach team (especially night shift). All lab analysts were retrained on lab safety policies. Each shift will also have a senior analyst scheduled. The MSDS sheet for NHP was updated with batch size notes.

4. PREVENTION STRATEGIES *List from highest priority to lowest priority the recommended actions designed to prevent a future occurrence of the adverse event. Begin with a rank of 1 (highest). For each strategy or action provide an estimated cost, if known, and any additional considerations or recommendations for implementing the strategy (e.g., phase-in, immediate need, triage by risk.*

RANK	STRATEGY	ESTIMATED COST	SPECIAL CONSIDERATIONS
1	All lab-staff safety training	$1500-$2000	Batch size considerations, personal protective equipment
2	Communication equipment	$7,000	See current cell contract in HR

5. INCIDENTAL FINDINGS *List and describe any incidental findings that should be carefully reviewed for corrective action.*

Consider discipline of PI. HR recommendations under consideration.

6. APPROVAL *After review of this summary report, all team members should notify the team leader of either their approval or recommendations for revision. Following all revisions the report should be signed by the team leader prior to submission.*

Signature of Team Leader	Date of Signature
/s/ Rick James	12/11/16

The information contained in this report is confidential and intended solely to promote safety and reduce consumer risk.

Forward this report to all RCA

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