

THE ROLE OF COMBINED CRITICAL AND NEPHROLOGY CARE IN ACUTE ALUMINIUM PHOSPHIDE INTOXICATION

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BACKGROUND

As a dialysis nurse, I rarely encounter clinically challenging toxicological cases. This case was especially interesting for us because the poisoning occurred with such a toxic material, about which we couldn't find any relevant data neither in our domestic nor in international medical literature.

THE CASE STUDY

A young adult male ingested by accident a single tablet of aluminium phosphide (Quickphos) stored in a bottle over the counter magnesium preparation. With a few hours he developed profound metabolic abnormalities and severe circulatory collapse, unresponsive to multiple vasoactive pressor infusions and requiring further circulatory support with intra-aortic balloon pump. He quickly developed full-blown multi-organ failure including kidney, liver and lung functions and need for mechanical ventilation (MV). Due to persisting metabolic acidosis with profound lactate accumulation, a temporary jugular hemodialysis (HD) catheter was placed and Renal replacement therapy (RRT) was initiated, at first with conventional HD, later on converted to slow-efficiency extended HD up to 8 hour session to optimize hemodynamic stability. Altogether, he received three sessions of RRT with subsequent stabilization of hemodynamics, with good recovery from metabolic acidosis and oligo-anuria. MV support was ceased on the 11th hospital day; at the time of Rehabilitation transfer (20th hospital day) he had only mild dysarthria and mild left-sided facial and upper limb weakness.

ABOUT THE ALUMINIUM PHOSPHIDE (QUICKPHOS)

Aluminum phosphide (AIP) is a solid fumigant which has been extensively used since the 1940s. AIP is a solid pesticide that rapidly became one of the most commonly used grain fumigants because of its properties which are considered to be near ideal; it is toxic to all stages of insects, highly potent, does not affect seed viability.

This highly toxic chemical is cheap and usually formulated in tablets or pellets, granules and as a dust. It emerges as a poison of suicidal deaths as this pesticide has no effective antidote and is freely available in the market.



Dialysis treatment prescriptions

Days	Treatment modality	Dialysis machine	Acidic concentrate	Na conductivity mS/cm	Bicarbonate conductivity mS/cm	Dialyzer surface m ²	Treatment time hour	UF volume ml	QB ml/min	Blood volume (L)	QD ml/min	Blood pressure Hgmm Before HD	Blood pressure Hgmm After HD
1	intermittent HD	Dialog Plus	K2 standard	14,4	4	Low flux 15	3:00	500	200	34,5	500	70/48	76/55
2	SLED	Dialog Plus	K2 standard	14	3,6	Low flux 15	8:00	1500	150	71,5	500	140/90	106/45
3	SLED	Dialog Plus	K2 standard	14,2	2,8	Low flux 17	6:00	500	200	71,9	500	128/61	113/60

Clinical finding

Time (days)	1.	2	3	4	5
HD	yes	yes	yes	not	not
Respiration	O2 therapy	Mech. ventilation	Mech. ventilation	Mech. ventilation	Mech. ventilation
Consciousness	awake, cooperable	unconscious	unconscious	unconscious	unconscious
RR (Hgmm)	78/41	100/46	119/40	114/71	106/78
Pulse (/min)	104	116	109	103	109
Temperature (C°)	34,5	36,4	37,9	38,1	38
Urine vol (ml/24 hour)	300	1350	3160	2780	2650
Volumen input (ml/24 hour)	4840	4310	4260	3440	3150

Laboratory data

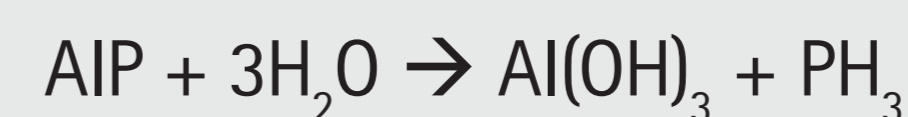
Time (days)	1.	2	3	4	5
Se carbamid (mmol/L)	5,6	4,6	11,7	13,8	13,9
Se kreatinin (μmol/L)	169	138	244	149	108
EGFR-EPI (ml/min)	47	60	30	55	81
Se CPK (U/L)	244	1497	3207	4159	2041
Se LDH (U/L)	433	953	1242	1396	1353
Lactate (mmol/L)	24,2	10,66	8,7	2	1,1

CONCLUSION

Our case documents successful recovery from severe multi-organ failure and metabolic acidosis due to aluminum phosphide with RRT and the value of close co-ordination of care between Nephrology and Critical Care. RRT should be strongly considered in suspected cases of phosphide toxicity.

THE CHEMISTRY OF AIP

The toxic effects of the AIP are due to deadly phosphine gas liberated when it reacts with water or hydrochloric acid in the stomach. Phosphine gas (PH₃) is the active pesticide component of AIP.



Phosphine inhibits cellular oxygen utilization and can induce lipid peroxidation.

TOXICITY

In case of oral intake, the phosphine gas released is absorbed by the gastrointestinal tract with simple diffusion and is mainly excreted by the kidneys and lungs. Some common complications of AIP poisoning include hemorrhage, acute renal failure, disseminated intravascular coagulation and arrhythmias. Other rare effects include hepatitis, disseminated intravascular coagulation, and acute tubular necrosis.

