

Unregulated Access, Irreversible Outcome: Fatal Hyperkalemia from Online Potassium Supplement

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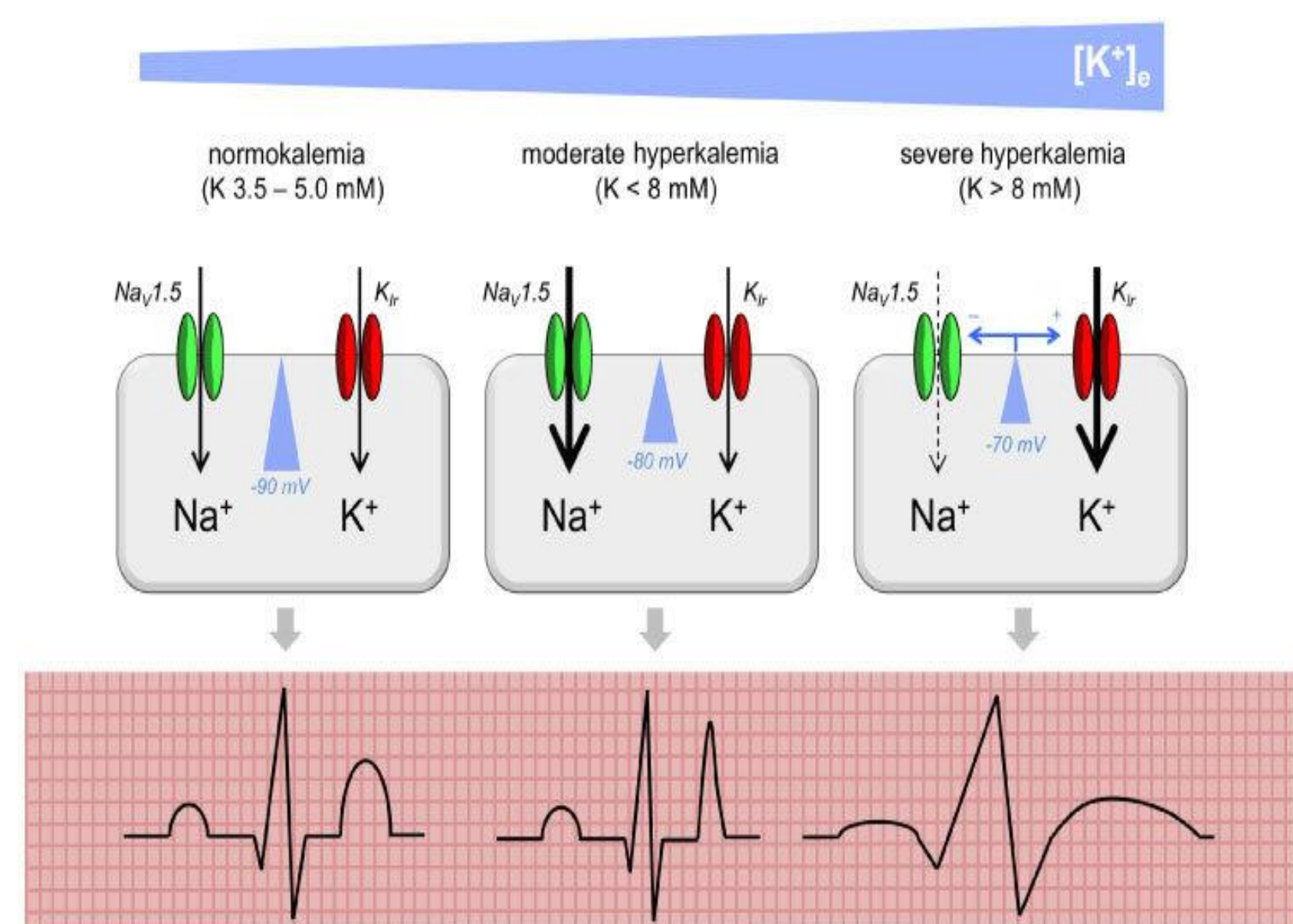
Background

- Potassium chloride (KCl) is widely available as a salt substitute and supplement.
- In overdose, KCl can cause life-threatening hyperkalemia.
- Online platforms increasingly promote KCl for suicide.
- Bulk KCl is sold without warnings, dosage guidance, or purchase restrictions.
- Unregulated access poses serious public health risks.

Potassium Pathophysiology

- Elevated extracellular K^+ lowers the cardiomyocyte **resting membrane potential (RMP)**, making it less negative.
- This brings it closer to threshold, increasing the likelihood of depolarization.
- Mild hyperkalemia can enhance excitability of cardiac cells.
- On the ECG, this first manifests as peaked, narrow-based T waves, especially in precordial leads.
- Moderate hyperkalemia** causes partial depolarization of the RMP, which increases excitability but also begins to impair sodium channel availability.
- As sodium channels begin to inactivate, conduction slows, predisposing one to arrhythmias.
- Severe hyperkalemia → **peaked T waves** on ECG.
- Severe hyperkalemia** further inactivates fast sodium channels ($Na_v1.5$), reducing the rate of rise of phase 0 depolarization.
- Inward-rectifying K^+ channels are activated, shortening repolarization time and disrupting conduction pathways.
- This produces **QRS widening, prolonged PR interval, and conduction delays** on ECG.
- Progression leads to **sine-wave morphology** where P waves disappear and QRS complexes merge with T waves.
- Conduction block may occur, predisposing to ventricular fibrillation or asystole.
- Extreme hyperkalemia** results in loss of coordinated depolarization, leading to lethal arrhythmias and cardiac arrest.

Mechanism of Potassium Toxicity



Mechanism of hyperkalemia-induced cardiac toxicity. Elevated extracellular K^+ reduces the resting membrane potential, initially increasing excitability (peaked T waves), then inactivating Na^+ channels and slowing conduction (widened QRS), which can progress to sine-wave morphology and fatal arrhythmias. Adapted from: Ramlachan S, Modi P, Bolli PC. Hyperkalemia. StatPearls [Internet]. 2024. Hyperkalemia - StatPearls - NCBI Bookshelf

Case Report

Patient: 45-year-old female

Ingestion: ~1 kg KCl powder reportedly mixed with liquid, intentional self-harm attempt (~525 g elemental potassium ≈ 5,000 servings)

Source: Purchased online via a nutraceutical retailer

Presentation to the ED (1-hour post-ingestion):

- Abdominal pain, nausea, vomiting, shortness of breath
- Potassium 9.3 mmol/L
- ECG: ST-elevation myocardial infarction (STEMI)
- Rapid progression to sinus bradycardia → PEA arrest

Interventions:

- Defibrillation → ROSC
- Intubation, ICU admission, hemodialysis preparation
- Sodium zirconium cyclosilicate (OG tube)
- IV calcium chloride, calcium gluconate, insulin, sodium bicarbonate, magnesium sulfate, furosemide
- Severe metabolic acidosis: pH 7.14, lactate 15 mmol/L
- Emergent hemodialysis initiated

Outcome:

- Despite aggressive supportive care measures the patient expired ~10 hours post-ingestion
- Final K^+ level 18 minutes before death was an unmeasurable **>12 mmol/L**
- Cause of death per autopsy report: cardiac arrhythmia from hyperkalemia due to intentional ingestion of potassium chloride powder

Figure 1. Serum potassium levels over time following ingestion. Vertical lines indicate ECG collection times. Note that no later ECGs were available.

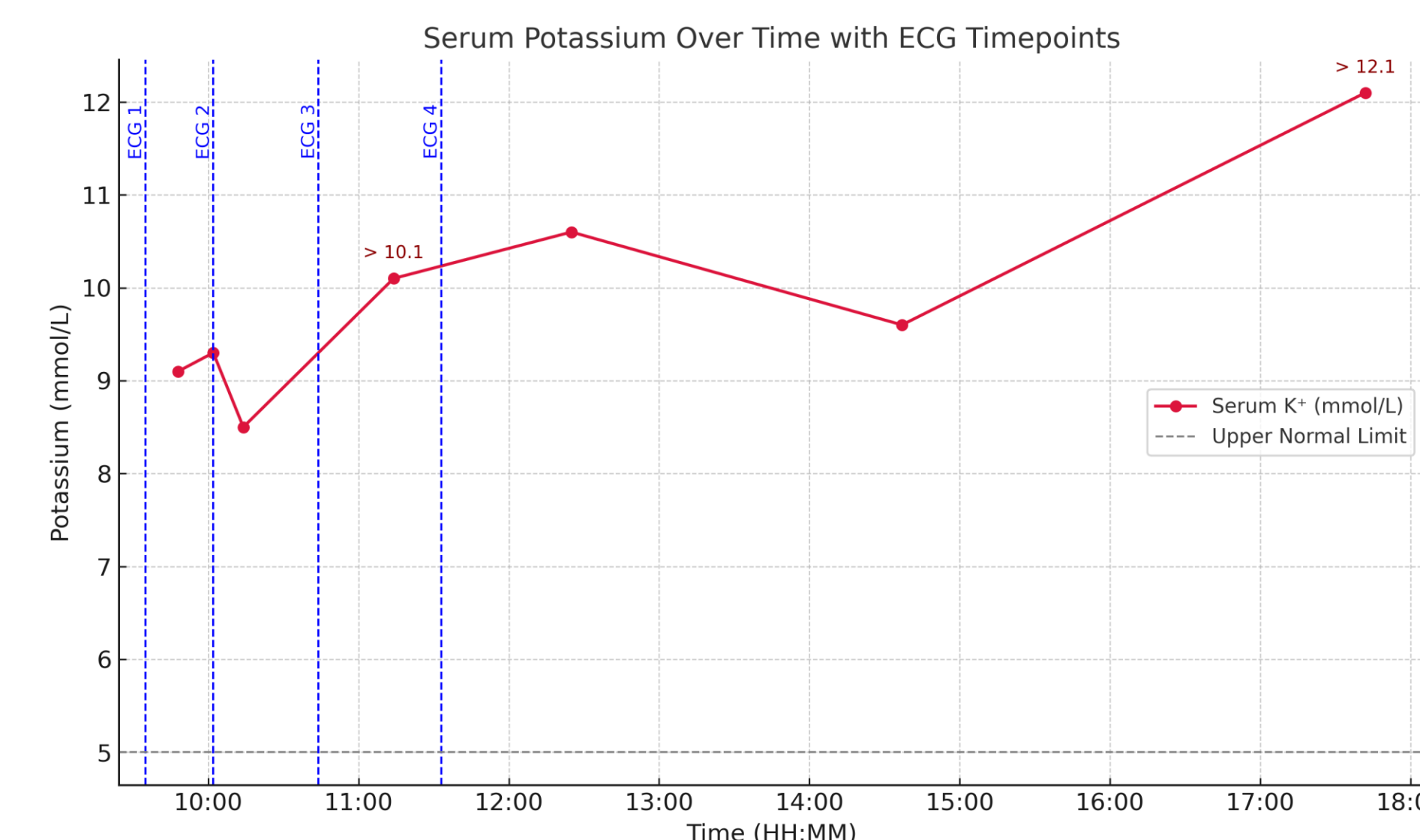
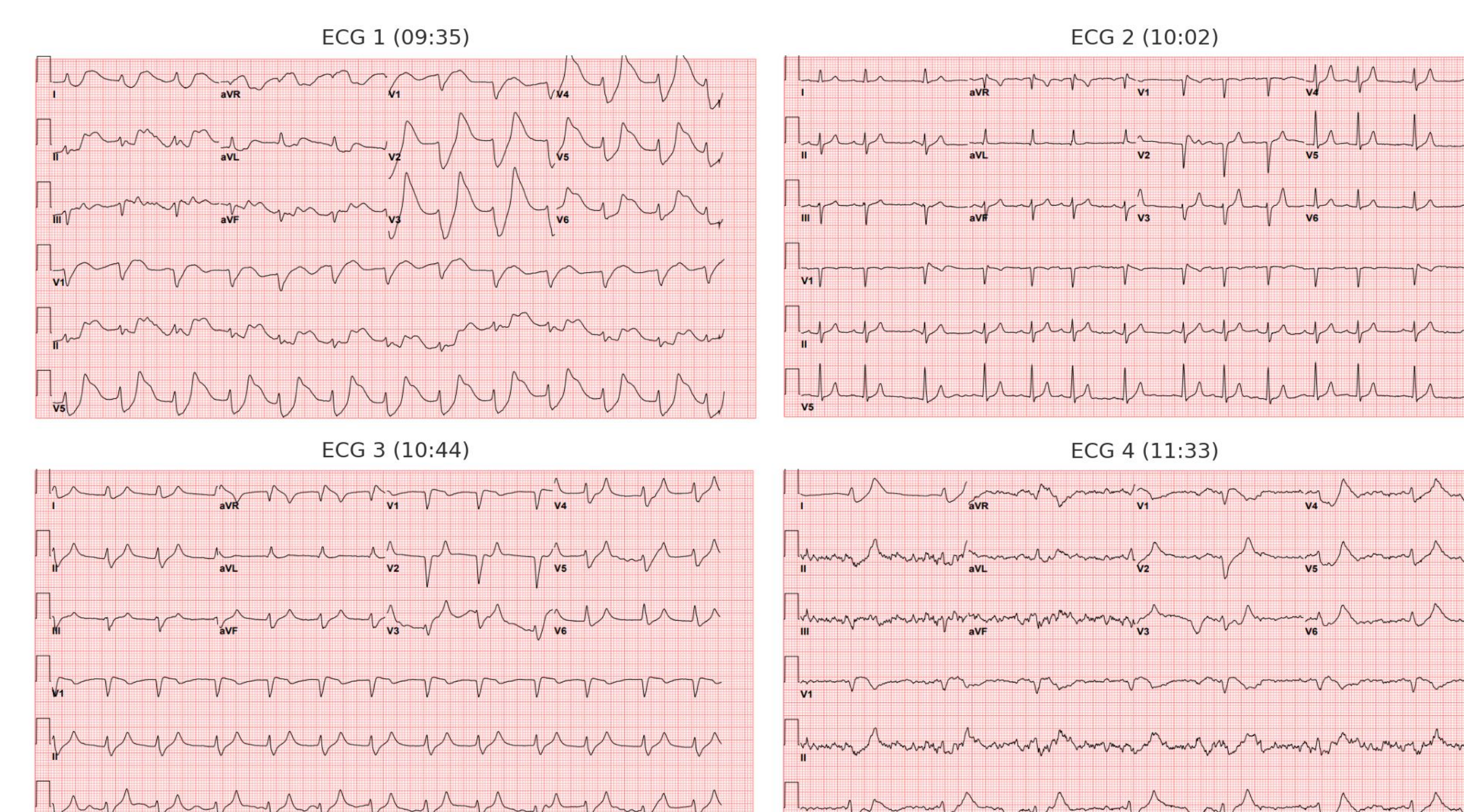


Figure 2. ECG progression demonstrating effects of rising serum potassium.



Discussion

- KCl is marketed with seemingly harmless claims such as “electrolyte balance,” “nerve support,” or “low-sodium salt.”
- Despite this benign marketing, KCl can have serious medical consequences when misused.
- Many consumers view supplements as safe, yet regulatory oversight remains weak.
- New marketing strategies and attractive packaging often hide the true risks of these products.
- Some KCl supplements are sold without any dosage instructions on the packaging.
- Large quantities are available for purchase online; this retailer offers bags of KCl powder as big as 50 lb.
- These products often lack restrictions or warning labels to guide safe use.
- In cases of overdose, even rapid medical intervention may not prevent death.
- Severe hyperkalemia from KCl ingestion can quickly lead to fatal cardiac arrest.
- This case underscores the urgent need for stronger oversight of supplements, particularly high-risk substances like potassium chloride.



BulkSupplements.com. Potassium Chloride Crystallized Powder. Accessed April 23, 2025. Available from: <https://www.bulksupplements.com/products/potassium-chloride-crystallized-powder>

Conclusion

- Bulk quantities of unregulated, high-serving-count KCl pose a fatal risk.
- Standardized labeling, restricted package sizes, and warnings are needed on these products.
- Toxicology professionals should be aware of the availability of bulk amounts of KCl and advocate for public health safeguards.