

Pesticides

Dr. Pezeshgi

Nephrologist

Associated professor of zanzan ums



نفراتوکسین‌ها و کلیه

Kidney and Nephrotoxins

۱۳-۱۵ مهر ۱۴۰۱-تهران

Pesticides - Health issues

- ✓ ↑ volumes in **developed** countries; but ...
- ❖ ↑ hazard in **developing** countries
- ✓ Acute Poisoning: WHO Estimates
 - 2 million suicides
 - 700 000 occupational pois
 - 300 000 non-occup
 - 220 000 fatalities
- ✓ Long-term health and enviro impacts



The most commonly used poisons:

- ✓ **Organophosphorates & Carbamates**
- ✓ **Paraquats**
- ✓ **Aluminium phosphide**

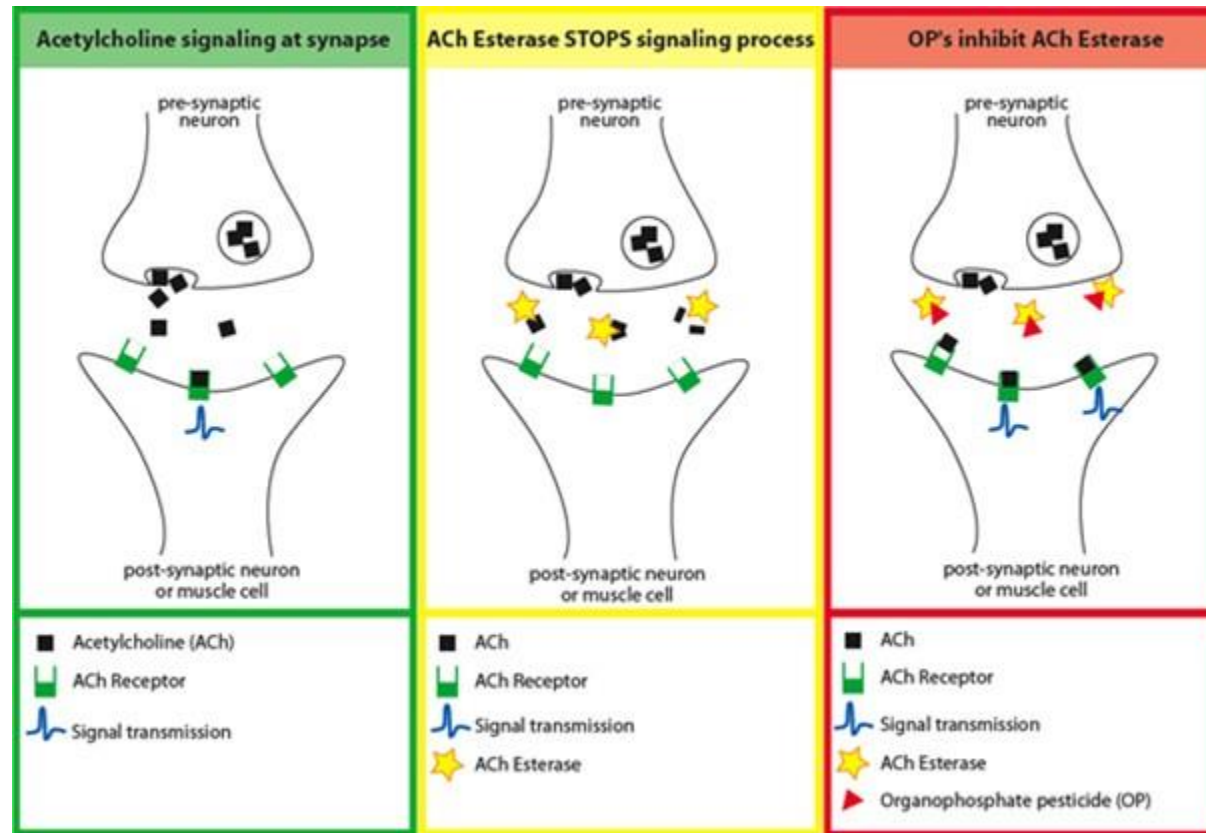


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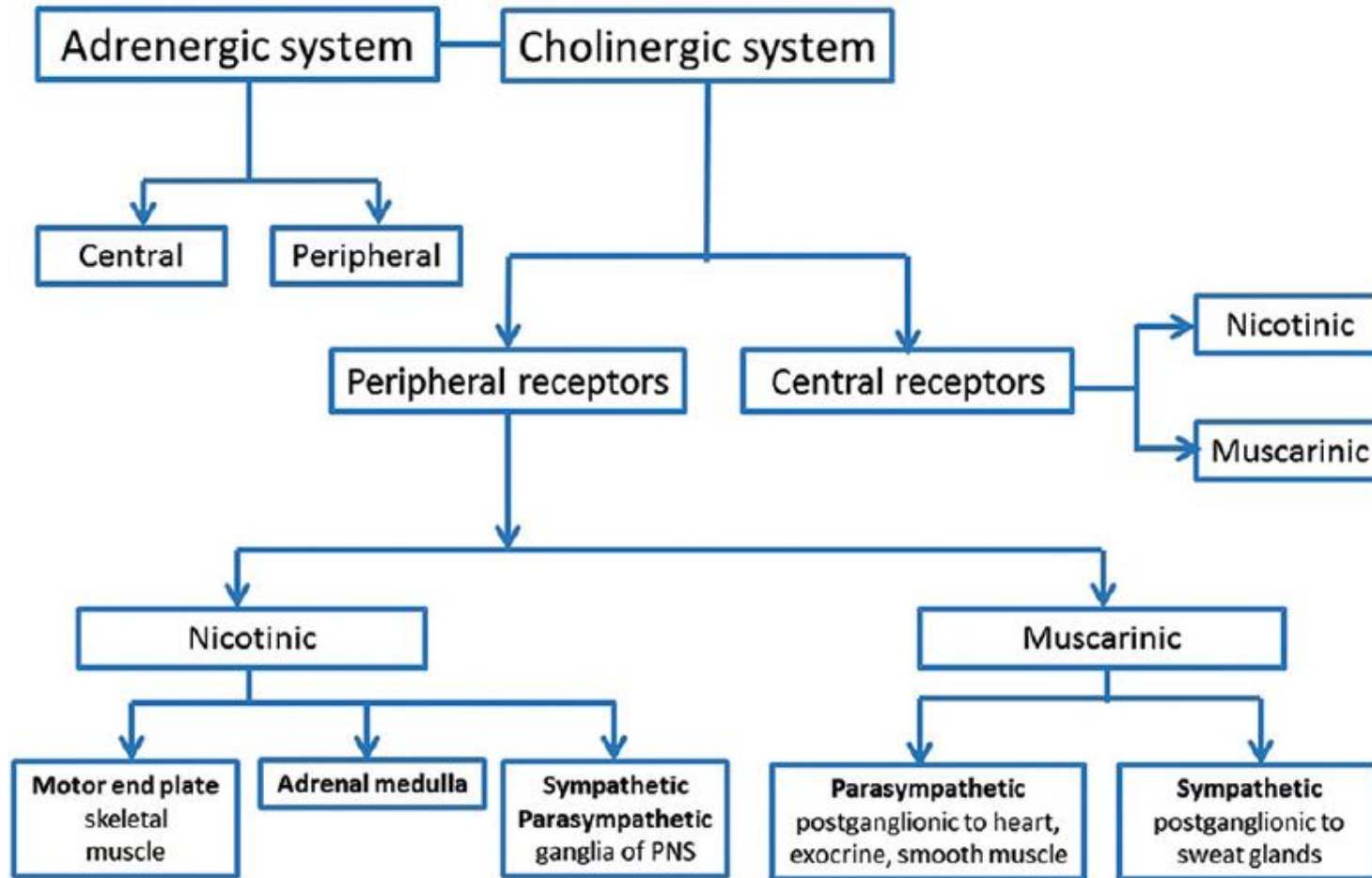
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Mechanism Of Action



Autonomic nervous system



Carbamates

Organophosphorates

rarely can cause acute renal failure

higher risk of AKI(6.17-fold)

mechanisms

- ✓ oxidative stress
- ✓ direct damage to the renal tubules
- ✓ Rhabdomyolysis
- ✓ Hypovolemia due to dehydration

Reference:Cureus. 2017 Jul; 9(7): e1523.Published online 2017 Jul 27. doi: [10.7759/cureus.1523](https://doi.org/10.7759/cureus.1523)



paraquats

- ✓ Colorless, odorless
- ✓ poisoning cases are most often related to:

1. intentional oral ingestion
2. occupational exposure:

- dermal(not intact)
- inhalational



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paraquats

- Paraquat causes direct damage when it comes into contact with the lining of the: **mouth, stomach, or intestines.**
- enters the body & distributed to all areas of the body.
- Paraquat causes toxic chemical reactions to occur throughout many parts of the body, primarily: **the lungs, liver, and kidneys.**
- Cells in the lung selectively accumulate paraquat likely by active transport.



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Symptomes & signs

following ingestion are gastrointestinal

- ✓ pain and swelling of the mouth and throat
- ✓ nausea, vomiting, abdominal pain, and diarrhea (which may become bloody)

result in:

- dehydration (not enough fluids in the body)
- electrolyte abnormalities (not enough sodium and potassium in the body)
- and low blood pressure.



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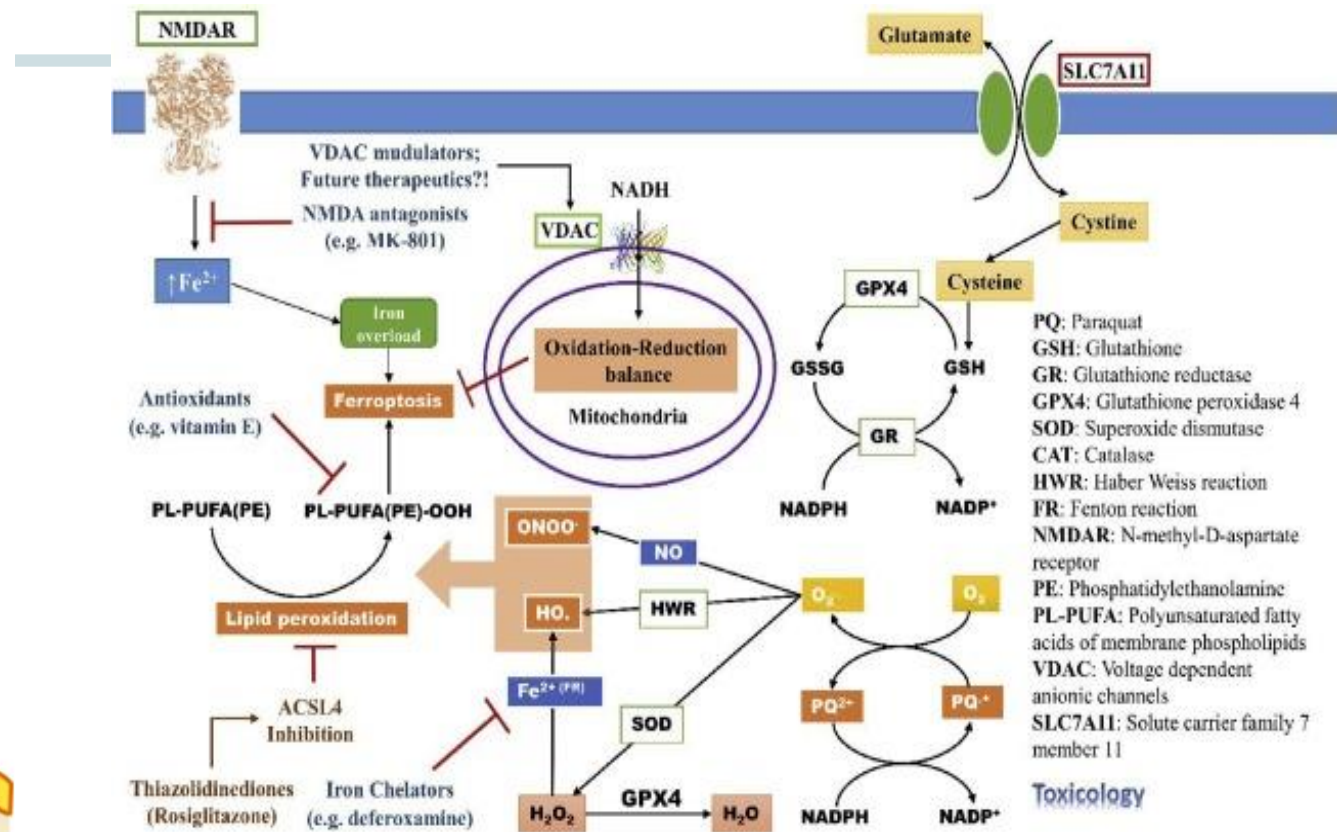
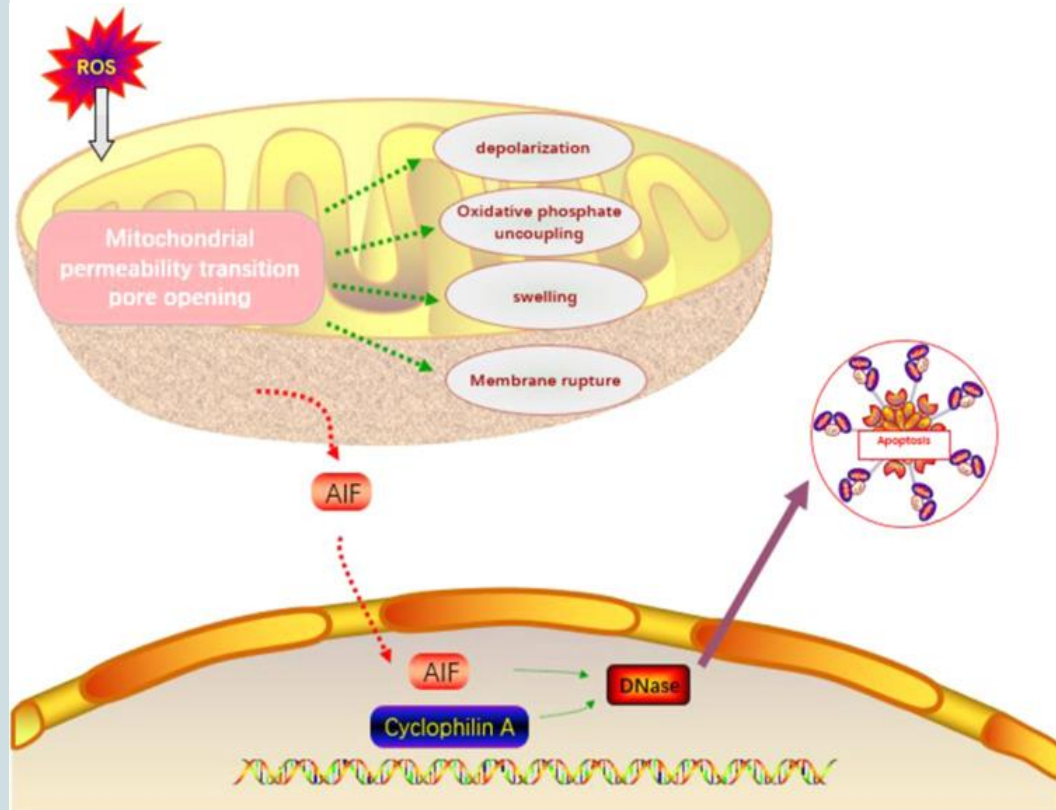
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- Ingestion of **small to medium amounts** of paraquat may lead to development of the following adverse health effects within **several days to several weeks**:
 - Heart failure
 - Kidney failure
 - Liver failure
 - Lung scarring
- In general, ingestion of **large amounts** of paraquat leads to the following signs/symptoms within **a few hours** to a few days:
 - Acute Kidney failure
 - Confusion
 - Coma
 - Fast heart rate
 - Injury to the heart
 - Liver failure
 - Lung scarring (evolves more quickly than when small to medium amounts have been ingested)
 - Muscle weakness
 - Pulmonary edema (fluid in the lungs)
 - Respiratory (breathing) failure, possibly leading to death
 - Seizures



Paraquate poisoning Mechanism



Paraquat generates superoxide radicals leading to [lipid peroxidation](#) and depletion of reduced nicotinamide adenine dinucleotide phosphate (NADPH), and redox cycling is its



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- ✓ the incidence of AKI with PQ intoxication was 51.4%
- ✓ the incidence of failure was 34.7%
- ✓ The amount of PQ ingested is the most important factor influencing the development of AKI after PQ intoxication
- ✓ The clinical feature was characterized by fully developed AKI at the **fifth day after PQ** ingestion and normalized within **3 weeks without exception**



Renal function studies were performed in three cases of paraquat poisoning

- ✓ Acute renal failure was observed in all three cases.
- ✓ Glomerular filtration rate improved for two patients who survived three weeks(reversible)

first and second weeks
- ✓ A mild to moderate transient proteinuria
- ✓ Glucosuria
- ✓ marked amino aciduria
- ✓ and increased fractional excretion of phosphorus, sodium, and uric acid
- ✓ These findings are indicative of proximal tubular dysfunction and parallel observations previously made in experimental animals.

(Arch Intern Med 139:172-174, 1979)



✓ **Renal biomarkers predict nephrotoxicity after paraquat**

✓ Author links open overlay panel [Klinton Wunnapuk^{ab}](#) [Xin Liu^a](#) [Philip Peake^c](#) [Glenda Gobe^d](#) [Zoltan Endre^c](#) [Jeffrey E. Grice^a](#) [Michael S. Roberts^{ae}](#) [Nicholas A. Buckley^{fg}](#)

✓ Highlights

- ✓ Urinary KIM-1, urinary Alb and urinary Cys-C changes were strongly correlated with [kidney injury](#) development.
- ✓ At 8 and 24 h, urinary KIM-1 outperformed other biomarkers for prediction of histopathological renal injury.
- ✓ Plasma Cys-C was as good as pCr in indicating [renal function](#).



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✓ Administration of :

excessive oxygen should be avoided
because it may worsen paraquat toxicity.

No proven antidote



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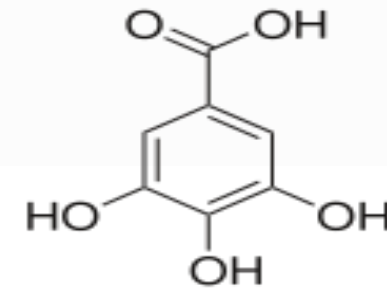
Treatment



- Original Article
- [Published: 30 July 2020](#)

Gallic acid exerts anti-inflammatory, anti-oxidative stress, and nephroprotective effects against paraquat-induced renal injury in male rats

- [Ali Nouri](#),
 - [Fatemeh Heibati](#) &
 - [Esfandiar Heidarian](#)
- [Naunyn-Schmiedeberg's Archives of Pharmacology](#) **volume 394**, pages1–9 (2021)



3,4,5-trihydroxybenzoic acid

administration of gallic acid could alleviate the noxious effects of PRQ on the antioxidant defense system and renal tissue. (Oxidation and oxidative coupling)



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early hemoperfusion (less than 4 to 5 hours after ingestion of paraquat)
is associated with decreased mortality.

According to the paper by Ghannoum *et al.*,

planned review by EXTRIP (EXtracorporeal TReatment In Poisoning)



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نماد امانتداری



Thanks for your attention



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