## Anoxia-based Methods

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<th>Mechanism of Killing</th>
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<td>Nitrogen gas delivered via high-expansion (&gt;300:1) foam</td>
<td>Provided expansion ratio and bubble size are appropriate for the species, foam is a vehicle for delivering N2 gas and displacing oxygen. Death occurs by anoxia without airway occlusion or drowning.</td>
<td>Agricultural Emergency Services Newark, Delaware Dan Hougentogler <a href="mailto:dan@agemergency.comagemergency.com">dan@agemergency.comagemergency.com</a>/</td>
<td>Foam delivery system for use in whole barns or in dump trailers. Simple design and operation requiring minimal maintenance. For pigs and floor-reared poultry.</td>
<td>Research on-going re: use in chickens in battery cages and multi-tiered aviaries and in other species.</td>
<td>Multiple species: 1, 2 Poultry: 3–13 Pigs: 14–20 See also Nitrogen Gassing Trailer References below</td>
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<tr>
<td>Nitrogen (N₂) Gassing</td>
<td>Rapid exposure to &gt;97% nitrogen gas, death occurs by anoxia.</td>
<td>Prairrie Agricultural Machinery Institute Humboldt, Saskatchewan, Canada <a href="mailto:parmi@parmi.ca">parmi@parmi.ca</a> 1-800-567-7264</td>
<td>Fully-automated trailer includes nitrogen generator, so external nitrogen source unnecessary. Prototype made for piglets but can be custom built to accommodate various sizes/species of animals.</td>
<td>Operation may be problematic at temperatures &lt;14°F (-10°C). 200 to 700 pigs per hour depending on animal size.</td>
<td>Multiple species: 21, 22 Pigs: 19, 23–26 Poultry: 8, 27–29</td>
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<td>Low Atmospheric Pressure Systems</td>
<td>Gradual decompression to produce oxygen level to &lt;5%; death occurs by anoxia.</td>
<td>TechnoCatch, LLC Kosciusko, MS Randolph Cheek <a href="mailto:hrcheek@technocatch.com">hrcheek@technocatch.com</a> technocatch.com/laps 662-289-1117</td>
<td>Trailers with mounted generator, vacuum pump, hydraulic power pack, and compressed air tanks. Chamber types and size are specific to operational needs. For birds only.</td>
<td>Correct rates of decompression must be used. Careful bird handling required.</td>
<td>3, 30–36</td>
</tr>
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### Containerized Gassing Unit

Units can be used with up to 100% nitrogen or with 80% argon/20% carbon dioxide mixture; death occurs by anoxia.

**Livetec Systems**
Leighton Buzzard, United Kingdom
info@livetecsystems.co.uk
livetecsystems.co.uk/our-solutions/on-farm-products/containerised-gassing-units/

Birds in transport modules or crates are placed in the unit’s chamber, which is then filled with compressed gas. Manual, automated, and bespoke options available.

3 sizes of containers available, with max throughput up to 10,000 kg per hour. Careful bird handling required.

### Electrocution-based Methods

#### Electrocution Trailer

1-step head-to-heart electrocution (pigs).

**University of Nebraska–Lincoln**
Lincoln, Nebraska
Ruth Woiwode, PhD
ruth.woiwode@unl.edu
402-472-3247
970-690-9337

V-belt restrainer mounted onto 30-ft flatbed gooseneck trailer onto which electric components and drive units are mounted.

Only suitable for pigs weighing 125–600 lbs. Careful animal handling required.

#### H2H Chicken Euthanizer

1-step head-to-heart electrocution (chickens).

**Top Equipment**
Tiel, The Netherlands
info@top-equipment.nl
+31 6 537 760 43
top-equipment.nl/

Chicken (0.5–4 kg; 1.1–8.8 lbs.) is supported head down in a flexible cone for head-to-heart electrocution resulting in immediate loss of consciousness.

Because birds are killed individually, primary use is for smaller flocks. Careful bird handling required.

### Carbon Dioxide-Based Methods

#### Whole House or Partial House Gassing of Poultry

Carbon dioxide (CO₂) causes hypercapnia, leading to central nervous system depression; hypoxia may also play a role.

**USDA National Veterinary Stockpile**
contains 18 units

**Linde (formerly Praxair, Inc.)**
Danbury, CT
Joe Shine
281-203-3235
203-482-0227
praxair.com/frac

System includes distribution box, dosing manifolds, hoses, and monitoring devices to distribute carbon dioxide throughout the poultry house, raising CO₂ levels to 45% and reducing oxygen concentration.

Establishing reliable sources of liquid CO₂ gas can improve accessibility of this method. Longer hold times and higher CO₂ levels required for waterfowl. “Homemade” WHG units are not recommended due to safety, efficacy, and animal welfare concerns.

**Air Liquide**
Canada
Toni Mancini
tony.mancini@airliquide.com
1-780-438-5602
airliquide.ca/

**Carbox Cryogénique**
Longueuil, Québec, Canada
Gaétan Bélanger
1-514-953-6901
carboxcryo.com/

**Livetec Systems**
Leighton Buzzard, United Kingdom
info@livetecsystems.co.uk
livetecsystems.co.uk/our-solutions/on-farm-products/whole-house-gassing/
Containerized Gassing Units for Poultry with Controlled Gas Flow

Carbon dioxide (CO₂) causes hyperventilation, leading to central nervous system depression; hypoxia may also play a role.

E-Z Systems
Palmer, PA
Brett Field
info@ezsystemsinc.com
1-877-559-0159
ezsystemsinc.com

Euthanex AgPro PC Modified Atmospheric Chamber Cart can be moved down the aisle of laying house. Euthanex MAK Trailer is placed outside the building. Gas flow and temperature are controlled in both systems.

Systems built to order. Careful bird handling required.

REFERENCES


