Skunk Adenovirus-1 (SkAdV-1) in Porcupines

Summary
Skunk adenovirus-1 (SkAdV-1) is an emerging adenovirus first identified in skunks and since detected in several North American wildlife species, including striped skunks, raccoons, gray foxes, African pygmy hedgehogs, and North American porcupines. In porcupines it has been associated with upper respiratory signs and pneumonia but outcomes vary — some animals recover with supportive care while others die. Because SkAdV-1 appears able to infect multiple wild mammal species and can cause severe respiratory disease, wildlife rehab centres should adopt strict intake screening, isolation, PPE, diagnostic, treatment, and bio security protocols.

1. Brief overview:
•Skunk adenovirus-1 (SkAdV-1), an adenovirus related to others in the Adenoviridae family. It has a broadening host range beyond skunks and has been found in wild porcupines with respiratory disease.
• Distribution & emergence: First characterized from a captive skunk in Ontario; since reported in eastern North America in multiple wildlife species. Surveillance is ongoing and taxa affected continue to expand.

2. Clinical signs in porcupine - Commonly reported presentations (range and severity vary):
• Nasal and ocular discharge, sneezing.
• Increased respiratory effort, higher than normal respiratory rate, open-mouth breathing.
• Lethargy, anorexia, dehydration.
• Pneumonia or consolidation on necropsy in fatal cases; some porcupines recovered with treatment and were released.
• It damages the cilia in the nasal passage (cilia filter out bacteria) but can recover over time.

3. Differential diagnoses - When porcupines present with respiratory disease consider:
• Bacterial pneumonia (e.g., secondary bacterial infection).
• Fungal disease (e.g., aspergillosis — rare but reported).
• Other viral pathogens (less commonly described).
• Trauma, aspiration, or environmental toxicosis.

Laboratory testing is required to confirm SkAdV-1.

4. Intake triage & immediate actions
1. Triage outdoors: At intake, screen and triage outside or in a dedicated entry area. Wear gloves and a surgical mask at minimum. If respiratory signs are present, escalate PPE. (Volunteers follow this triage checklist.)
2. Isolate immediately: Place any porcupine with respiratory signs in a dedicated isolation enclosure (separate building/room if possible). Minimize movement.
3. Limit handlers: Assign one experienced handler per shift; maintain an isolation log (who handled the animal, when, procedures performed).
4. Stabilize**:** Provide oxygen if in respiratory distress (portable oxygen and monitoring), warm fluids, and supportive care while diagnostics are planned.

5. Diagnostic testing & sample submission
• Samples to collect (veterinarian): deep nasal swabs, bronchoalveolar lavage or tracheal wash if safe and indicated, blood for CBC/Chemistry, and, if fatal, fresh tissue (lung, trachea, turbinates) for PCR / histopathology. Follow biosafety for sample collection.

• Tests: PCR specific for SkAdV-1 (submit to a diagnostic lab with wildlife/virus capability — e.g., veterinary diagnostic laboratories or university labs). If more complex characterization needed, labs performed in publications did sequencing and in-situ hybridization.
• Record keeping: Record date/time of sample, animal ID, clinical signs, treatments given. Maintain chain of custody for diagnostic samples.

6. Infection control, PPE & facility biosecurity
Given cross-species detection, assume high transmissibility between susceptible wildlife and implement conservative measures:

Minimum PPE for handlers of suspected cases
• Disposable nitrile gloves (change between animals/procedures).
• Surgical mask at minimum; N95 (or equivalent) respirator when doing aerosol-generating procedures (oxygen therapy, nebulization, tracheal wash).
• Disposable gown or dedicated coveralls; eye protection (goggles/face shield).
• Dedicated footwear or disposable boot covers in isolation areas.

Facility biosecurity
• Strict isolation rooms for respiratory cases with separate ventilation if feasible. Do not house other animals in the same room.
• Dedicated equipment (stethoscopes, thermometers) for isolation; disinfect between uses.
• Footbath or changed footwear policy entering and leaving isolation. Use EPA-registered disinfectants effective against non-enveloped viruses (adenoviruses are non-enveloped and relatively resistant to some disinfectants). Bleach (sodium hypochlorite) at appropriate concentration (e.g., 1:32 household bleach or other disinfectants noted effective against adenoviruses should be used. Allow recommended contact time.

7. Treatment recommendations - There is no specific antiviral licensed for SkAdV-1 in wildlife. Treatment is supportive and addresses secondary complications:
• Supportive care: fluids (SC or IV as indicated), nutritional support, warmth, oxygen therapy for dyspnea.
• Antibiotics: judicious use to treat or prevent secondary bacterial pneumonia — based on local antibiogram or culture results when possible. Empiric broad-spectrum antibiotics can be considered under veterinary direction.
• Nebulization / bronchodilators: may be helpful for some animals but use cautiously (aerosolization risk; use in isolation with N95 for staff).
• Monitor closely: daily weight, appetite, respiratory rate/effort, hydration. Adjust care accordingly.

8. Quarantine duration & release criteria
• Minimum isolation: Keep animals in isolation until clinical recovery and until diagnostic guidance from submitting lab/veterinarian. For viral respiratory diseases, a conservative quarantine of at least *14–21 days* after clinical recovery is reasonable, but adjust based on testing and clinical judgment.
• Must remain inside during the entire winter months
• Release criteria: fully ambulatory, eating normally, no respiratory signs for a minimum period (e.g., 7–10 days), stable body weight, and—if available—negative PCR from nasal swabs at two time points separated by several days. Work with your supervising veterinarian

9. Environmental cleaning & waste handling
• Disinfection: Surfaces, enclosures, and equipment used in isolation must be cleaned of organic matter and then disinfected with agents proven effective against non-enveloped viruses (bleach solutions, accelerated hydrogen peroxide products labelled for adenovirus, etc.). Observe contact times.
• Laundry: Washables from isolation (towels, bedding) should be handled with gloves, placed in sealed bags, and laundered on hot cycle with detergent and dryer heat.
• Waste: Dispose of biological waste per provincial regulations. Sharps and clinical waste must go into appropriate containers.

10. Staff training, exposure management & volunteer safety

• Train all staff and volunteers on PPE donning/doffing, hand hygiene, and reporting.

• Potential human risk: Adenoviruses that infect animals are usually species specific; there is no current evidence SkAdV-1 infects humans. However, standard occupational health precautions apply. If an exposure occurs (significant splash to mucous membranes, bite, or needlestick), follow health & safety protocols — wash, report, consult staff, fill out accident report form, staff to report to and public health.

11. Reporting & collaboration

• Report confirmed or suspected cases to provincial wildlife health authorities and to your regular diagnostic lab contacts. Sharing data helps surveillance and identification of emerging patterns. Many published reports resulted from collaboration between wildlife centres and university labs.

• Consider collaborating with nearby university veterinary diagnostic labs (e.g., Ontario veterinary labs, Cornell where research has been funded on SkAdV-1) for confirmatory testing or sequencing if needed.

12. Recommended checklist LP

• Triage indoors; mask + gloves for intake.

• Isolate immediately any porcupine with respiratory signs.

• Assign one handler; keep an isolation log.

• Vet exam and collect nasal swabs / diagnostics (PCR for SkAdV-1).

• Supportive care (fluids, oxygen if needed), targeted antibiotics for secondary infection.

• PPE: N95 for aerosol procedures; gowns, gloves, eye protection always.

• Clean/disinfect with adenovirus-effective disinfectant; launder bedding on hot.

• Hold for minimum 14–21 days post-recovery; consider negative PCRs before release when possible. Recommend overwintering.

• Report confirmed/strongly suspected cases to provincial wildlife health authority and your diagnostic lab contact.

13. Limitations & recommended further actions

• SkAdV-1 is emerging and the host range is still being defined; protocols should be updated as new data appear. Continued collaboration with diagnostic labs and wildlife health networks is essential.

• Consider providing staff with a training session on respiratory isolation procedures and PPE, and ensure the clinic has a written sample submission pathway to a diagnostic lab familiar with SkAdV-1 testing.