LCMV Infection Models (WE, Clone 13, Docile, Armstrong)

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Purpose

This protocol describes standardized mouse infection procedures using lymphocytic choriomeningitis virus (LCMV), with primary emphasis on **LCMV-WE** and **LCMV-Clone 13**, and additional reference to **LCMV-Docile** and **LCMV-Armstrong**.

The protocol defines virus handling, dilution, injection parameters, infection doses, and sampling windows, with specific annotation of **liver NLC (NK-like cell) dynamics** to guide optimal experimental design.

Critical notes (read before starting)

- All LCMV work must be performed under **approved animal and biosafety protocols**.
- Virus stocks must be **titered, aliquoted, and freeze–thaw limited**.
- Infection dose and route strongly influence antigen load and immune kinetics.
- **NLC dynamics differ markedly between WE and Clone 13**, requiring strain-specific sampling strategies.
- Late timepoints (> day 7) in Clone 13 infection are **suboptimal for NLC-focused analyses**.

Approximate timing

- Virus thawing and dilution: **5–10 min**
- Intravenous injection: ~**1–2 min per mouse**
- Acute infection window: **days 0–15**
- Chronic infection window: **days 0–30+**

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Procedure

Virus stock handling and preparation

LCMV-WE, LCMV-Clone 13, LCMV-Docile, and LCMV-Armstrong virus stocks are propagated and titrated as previously described in the literature and the LCMV production protocol in this library.

- Virus stocks are stored at **−80 °C** in single-use aliquots.
- Repeated freeze–thaw cycles must be avoided.

Thawing

- Virus aliquots are **rapidly thawed immediately before use**.
- Thawing is performed in a **37 °C water bath** until the aliquot is just thawed.
- Aliquots are removed promptly from the water bath and placed **immediately on ice**.
- Virus is kept on ice during dilution and injection.
- Repeated freeze–thaw cycles must be avoided.

Dilution buffer

- Virus stocks are diluted in **sterile, endotoxin-free PBS**.
- No serum or supplements are added unless explicitly required by internal SOP.
- Dilutions are prepared **fresh on the day of infection**.

Infection doses and routes

Mice are infected **intravenously (i.v.)** via the lateral tail vein using the following standard doses:

- **LCMV-Clone 13: 2 × 10 plaque-forming units (PFU)**
- **LCMV-WE: 2 × 10 plaque-forming units (PFU)**
- **LCMV-Armstrong: 2 × 10 plaque-forming units (PFU)**
- **LCMV-Docile: 2 × 10^6 plaque-forming units (PFU)**

> **Note**
>
> **LCMV-Armstrong — route note:** The dose used here for Armstrong is **2 × 10 PFU i.v.**. The broader literature typically uses **1 × 10 − 2 × 10 PFU administered intraperitoneally (i.p.)** for acute infection and memory studies. The i.p. route is the most common in published Armstrong protocols. The i.v. route used here differs from the literature standard — this should be noted when comparing outcomes across studies.

Injection parameters

- **Injection volume: 200 µL per mouse**
- **Syringe:** insulin syringe
- **Needle gauge: 27G–30G**
- Injections are performed slowly to ensure proper intravenous delivery.
- Successful i.v. injection is confirmed by lack of resistance and absence of subcutaneous bleb formation.

Post-infection monitoring

- Body weight and general health are monitored daily during the first week post infection.
- Monitoring frequency is adjusted according to infection severity and institutional guidelines.
- Humane endpoints are applied as defined in approved protocols.

Buffers Required

Full composition, preparation, storage, and safety information for each buffer lives in its own linked buffer document — only a concise per-buffer summary is reproduced here, generated automatically from that document.

None

Infection dose ranges, rationale, and expected outcomes

Virus strain	Dose range (PFU, literature)	Route (literature)	Rationale for low vs high dose	Expected outcome	Standard used here
Armstrong	~1×10 – 2×10	**i.p.** (literature standard)	Low–moderate dose to induce acute infection with rapid immune control	Acute infection; strong effector CD8 response; viral clearance and memory formation	**2×10 PFU i.v.**
	2×10	i.v.			**Yes**
WE	~1×10^2 – 1×10^3	i.v.	Minimal acute infection	Rapid clearance; limited systemic and hepatic involvement	–
	2×10	i.v.	Intermediate dose to ensure robust systemic infection without chronic persistence	Strong liver immune response; sustained NLC accumulation	**Yes**
	~1×10	i.v.	High-dose systemic challenge used in comparative studies	Severe acute disease; heightened inflammation	No
Clone 13	**2×10**	i.v.	High antigen load to enforce chronic infection and exhaustion	Persistent infection; CD8 exhaustion program	**Yes**
Docile	~1×10	i.v./i.p.	Moderate dose allowing partial control	Semi-chronic infection; intermediate exhaustion	–
	2×10	i.v.	High-dose infection to drive persistent antigen exposure	Chronic infection; exhaustion-prone immune response	**Yes**

Expected NLC dynamics in the liver

LCMV-WE (2×10 PFU i.v.)

- NLCs accumulate prominently in the liver.
- Peak frequency occurs at approximately **day 7 post infection**.
- Elevated NLC levels are **maintained through at least day 30 post infection**.
- This model supports **both early and long-term NLC analyses**.

LCMV-Clone 13 (2×10 PFU i.v.)

- NLCs peak **early**, around **day 5 post infection**.
- A **sharp contraction occurs by ~day 7**, followed by gradual decline through day 30.
- The effective experimental window for NLC analysis is **day 4–7 post infection**.
- Sampling outside this window will substantially underestimate NLC abundance.

Experimental design guidance

- For studies requiring **broad or late NLC sampling**, LCMV-WE is preferred.
- For studies focused on **early inflammatory or antigen-rich environments**, Clone 13 is appropriate but requires tight temporal control.
- Direct comparisons between WE and Clone 13 must account for **non-overlapping NLC kinetics**.

Safety (brief)

- All animal procedures must comply with approved animal licences and institutional regulations.
- Wear appropriate PPE (lab coat, gloves, eye protection) when handling animals, tissues, and reagents.
- Handle sharps (needles, scalpels) with care and dispose of immediately in approved sharps containers.
- Perform virus handling, injections, and tissue processing in accordance with institutional biosafety guidelines.
- Dispose of viral waste and contaminated materials according to local biosafety regulations.

Version history

Version	Date	Author	Change summary
v1.0	2026-01-09	Dillon Corvino	Initial LCMV infection protocol (WE, Clone 13, Docile, Armstrong)

Version	Date	Author	Change summary
v1.1	2026-04-13	Dillon Corvino	Added Armstrong as the standard (2×10 PFU i.v.); added route note clarifying i.p. vs i.v. difference from literature; added Route column to dose table
v1.2	2026-09-18	Dillon Corvino	Replaced `# Buffers used` with an auto-generated `# Buffers Required` section (one heading + one small table per buffer, sourced from each buffer's own `summary:` data), moved to the correct position after Procedure, and fixed leaked R package-startup warnings.