

Adjuvant-Induced Rheumatoid Arthritis Model in Rats: Standardized Model Establishment and Evaluation Workflow

Comprehensive in-vivo tool for rheumatoid-arthritis mechanistic research and anti-inflammatory drug screening

HUSTON, TX, UNITED STATES, August 25, 2026 /EINPresswire.com/ -- [Rheumatoid arthritis](#) (RA) represents a prevalent chronic autoimmune joint disorder worldwide. Human clinical investigations face substantial constraints stemming from ethical concerns and inter-individual variability. Adjuvant-induced arthritis rat models recapitulate key pathological hallmarks of human RA, featuring straightforward surgical induction and high experimental reproducibility. [Cloud-Clone](#) shares a complete technical overview covering model construction, multi-dimensional evaluation endpoints and sample-testing workflows, supporting global researchers working on autoimmune-disease mechanisms and pre-clinical drug candidate assessment.

Background & Rationale for This Animal Model

Rheumatoid arthritis (RA) is a chronic autoimmune joint disease characterised by joint erythema, pain, synovial hyperplasia, as well as cartilage and bone destruction. Progressive disease severely impairs patients' quality of life. Large-scale mechanistic studies and drug screening cannot be readily performed in human subjects due to ethical restrictions and biological inter-subject variation.

The adjuvant-induced arthritis rat model closely mirrors core pathological features observed in human rheumatoid arthritis. Thanks to simple induction procedures and reliable reproducibility, this classic in-vivo model is widely adopted for dissecting RA pathogenesis and evaluating anti-inflammatory drug candidates within immunology research and new-drug development pipelines. Full construction, assessment and biomarker-testing workflows are described below.

Core Model Specifications

- Model type: Adjuvant-induced arthritis
- Animal strain: SPF-grade male SD rats, body weight 180g-220g
- Study groups (random allocation): Control group, model group, positive-drug control group, test-compound treatment group
- Experimental duration: 4-6 weeks

Model-Induction Procedure

Rats are anaesthetised, and 0.1 mL complete Freund's adjuvant (CFA) is injected intradermally into the right hind paw to establish the adjuvant-induced arthritis model. For the control group, 0.1 mL of 0.01 mol/L glacial acetic acid is injected subcutaneously into the right hind paw to

exclude sensitisation effects triggered by solvents contained within CFA.

Primary Research Applications

This animal model is utilised to investigate the pathological mechanisms underlying rheumatoid arthritis and perform screening of candidate therapeutic agents.

Multi-Dimensional Model Evaluation

1. Body-weight monitoring

Rat body weight is recorded on day 0, day 7, day 14, day 21 and day 28. Body-weight shifts are compared between the model group and control group.

2. Immune-organ assessment

Rats are weighed prior to euthanasia. Spleens and thymuses are harvested, rinsed with saline solution and blotted dry. Wet organ weights are measured using an electronic balance.

Organ index = wet organ weight (mg) / rat body weight (g)

3. Paw-swelling measurement

Paw swelling constitutes a critical readout for adjuvant-induced arthritis. Markers are placed at consistent positions on rat paws at day 0. An electronic vernier caliper measures paw thickness at the marked site. Repeated measurements are performed every 7 days (day 7, 14, 21, 28). Comparisons are conducted between left- and right-side paws of individual animals, as well as across experimental groups.

4. Arthritis Index (AI) scoring

Arthritis index scoring quantifies inflammatory severity. Apart from the injected right hind paw, the remaining three non-injected limbs are each scored from 0 to 4 according to visible pathological changes and inter-phalangeal inflammation. Cumulative scores yield the final arthritis index for each animal. - Score 0: No observable erythema or swelling - Score 1: Erythema plus mild swelling confined to mid-paw or ankle joint - Score 2: Erythema and mild swelling extending from ankle across mid-paw - Score 3: Erythema and mild swelling spreading from ankle to digital joints - Score 4: Erythema plus severe swelling covering ankles, paws and digits

Histopathological Analysis

Following euthanasia, hind-limb ankle joints are dissected with soft tissues removed. Specimens undergo fixation, decalcification, embedding and paraffin sectioning, followed by H-E staining for histological examination. Normal rat ankle joints exhibit intact anatomical architecture without inflammatory-cell infiltration; synoviocytes are neatly arranged, cartilage surfaces remain smooth, and no intra-articular exudate is observed. In model-group animals, prominent joint destruction occurs, accompanied by massive neutrophil infiltration, hypertrophic synovial hyperplasia, fibrous-tissue proliferation, and cartilage-bone damage.

Circulating Biomarker Detection

Rats are anaesthetised with 3% pentobarbital sodium. Approximately 1 mL blood is collected from the vena cava. Samples stand for 30 min, then centrifuged at 4000 rpm for 30 min at 4°C. Isolated serum supernatants are stored at -80°C for downstream analysis. Target analytes such as TNF-α and IL-1β are quantified using ELISA assay kits.

Summary

The CFA-induced rat adjuvant-arthritis model delivers well-established performance and comprehensive evaluation endpoints. Researchers can assess model status and drug efficacy from multiple layers including gross phenotypic signs, immune-organ parameters, joint histopathology and circulating inflammatory-factor profiles. It serves as a preferred in-vivo system for basic RA research and therapeutic-agent screening.

Cloud-Clone operates a standardised SPF-grade animal-experiment platform and provides one-stop contract-research services covering inflammatory- and autoimmune-disease animal-model generation, drug-administration intervention, multi-parameter biomarker detection and pathological analysis. Leveraging robust modelling protocols, strict end-to-end quality control, and matched ELISA detection reagents, Cloud-Clone guarantees stable model performance and reproducible datasets, supporting global immunology research and innovative drug-discovery programmes.

About Cloud-Clone Corp.

Cloud-Clone Corp. is dedicated to the development and production of high-quality immunoassay reagents and detection solutions. With a focus on antibody engineering, multiplex assay development, and cross-platform compatibility, the company provides research tools designed to support precision medicine and advanced biomedical investigation globally. Our core products and services include the research and development of proteins, antibodies, ELISA kits, primary cells, and multiplex cytokine assay kits, as well as professional CRO services to fully meet the diverse needs of biomedical research and related fields.

For more information about Cloud-Clone Corp, visit www.cloud-clone.com.

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