

# VivaGuardAI: Intelligent Drug Side-Effect Monitoring Platform for Animal Experiments



# 1. AI Service Description

## Service Definition

VivaGuardAI is an AI-driven multi-modal monitoring platform designed to **predict**, **detect**, and **visualize** drug-induced side effects during animal experiments. The system integrates biological signals, behavioral data, and experimental parameters into one cloud platform, providing **real-time alerts** and **early toxicity prediction**.

It automatically:

- Predicts organ/system side effects
- Aggregates cross-lab experimental data
- Generates visual toxicity trend reports
- Supports ethical reduction of animal usage (p.2)

## Problem It Solves

Fragmented and inconsistent experimental data  
Different labs and batches produce incompatible formats, making analysis difficult.  
(p.3)

Slow manual analysis  
Researchers spend excessive time sorting data and miss subtle toxicity trends. (p.2-3)

Lack of early-warning systems  
Traditional workflows detect toxicity only after experiments finish. (p.2)

Insufficient visualization tools  
Hard to convert complex biological data into intuitive graphs. (p.2-3)

## User Value

- Faster drug-safety evaluation
- Reduction of avoidable animal sacrifice
- Higher data reliability across labs
- Automated, consistent reporting (p.2)

## 2. Motivation



Animal experiments remain essential for biomedical R&D, yet current practice suffers from:

- Fragmented data
- Long manual analysis cycles
- No real-time monitoring
- High labor cost
- Ethical concerns due to unnecessary animal sacrifice (p.3)

VivaGuardAI aims to:

- Centralize all experiment data
- Provide early side-effect prediction
- Improve research speed & reproducibility
- Enhance animal welfare (p.2)

### 3. Chat History

User:

What side effects might occur if my experiment uses a high dosage of Drug X on mice?

VivaGuardAI:

Please upload dosage amount, timepoints, and any available behavior/biomarker data.

User:

Here is the dataset. I suspect liver toxicity might appear.

VivaGuardAI:

Dataset received. Preliminary trends show rising ALT/AST levels. Possible risk: **hepatotoxicity**.

User:

Can you generate a visual report?

VivaGuardAI:

Here is a toxicity trend chart highlighting liver-stress biomarkers and behavioral lethargy patterns.

User:

Is there any early warning?

VivaGuardAI:

Yes. Model predicts a high-probability toxicity event at Hour 18. Recommend reducing dosage or increasing monitoring frequency.

User:

What organ systems might be affected overall?

VivaGuardAI:

Predicted risks:

- Liver (High)
  - Kidney (Medium)
  - Nervous system (Low)
- Suggest validating with additional biomarkers.

## 4. Chatbot Link

**Chatbot URL:** [https://api.openai.com/v1/chat/completions?api\\_key=sk-mockup-KEY-XYZ123](https://api.openai.com/v1/chat/completions?api_key=sk-mockup-KEY-XYZ123)

## 5. Iterative Prompt Development Process

### Idea

Create an AI system that:

- Accepts dosage, timing, behavior, physiological data
- Predicts organ/system toxicity
- Issues early warnings
- Outputs full visual reports
- Reduces repeated animal experiments (p.5)

### Prompt (Initial Version)

"You are VivaGuardAI. Based on uploaded experimental data (dose, time, behavior, biomarkers), predict potential drug-induced side effects, specify affected organs/systems, provide risk scores, and generate a visual summary."

# Experimental Result

AI detected toxicity trends earlier than manual review

Visualization clarified organ-specific effects

Trend analysis reduced repeated experiments

Enabled faster scientific decisions (p.5–6)

# Error Analysis

Issue	Cause	Fix
Overfitting on small datasets	Limited animal-trial data	Data augmentation & transfer learning
Unstable predictions	Complex multi-modal models	Added XAI tools (LIME/SHAP) for interpretability
Data mismatch across labs	Inconsistent schema	Created unified metadata format
Slow processing	High-dimensional data	Used scalable Google Cloud backend
Low model trust	"Black-box" effect	Implemented transparent AI explanations (p.7)

## 6. Limitations



Small datasets limit generalization

Dependent on data accuracy from labs

Species/drug differences affect predictive accuracy

Requires stable cloud connection for real-time monitoring (p.7)

# 7. Future Development



Expand to pre-clinical toxicology and personalized medicine



Disease-model-specific screening modules



API integration with pharmaceutical R&D systems

- Transformer-based multi-organ prediction
- Enterprise analytics packages (p.8)



# 8. Conclusion

VivaGuardAI modernizes animal experiment workflows through **AI-based toxicity prediction, real-time visualization**, and **multi-modal data integration**. It improves:



Drug-safety evaluation speed



Animal welfare



Reproducibility



Research efficiency (p.4, p.9)

As a unified and predictive platform, VivaGuardAI fills a major gap in biomedical research tools.

# 9. References

- Biomedical Toxicology Research
- Explainable AI (LIME, SHAP)
- Google Cloud / PyTorch / PostgreSQL documentation

