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Analysis of Tumor Growth and Distribution of Human Leukemia Cells (K562-Luc) in an Orthotopic Mouse Model Using IVIS Imaging

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Introduction and Purpose

Chronic myelogenous leukemia (CML) is a myeloid neoplasm characterized by the abnormal proliferation of myeloid cells, particularly granulocytic lineage cells, caused by abnormalities originating in hematopoietic stem cells. To elucidate the pathogenesis and develop treatments, it is necessary to establish an appropriate animal model. However, there are few reports on orthotopic transplantation models using the CML cell line K562.

In this study, we transplanted a human CML cell line transduced with the luciferase gene (K562-Luc) intravenously into NOG mice and evaluated the tumor growth kinetics and distribution.

Materials and Methods

● Animals

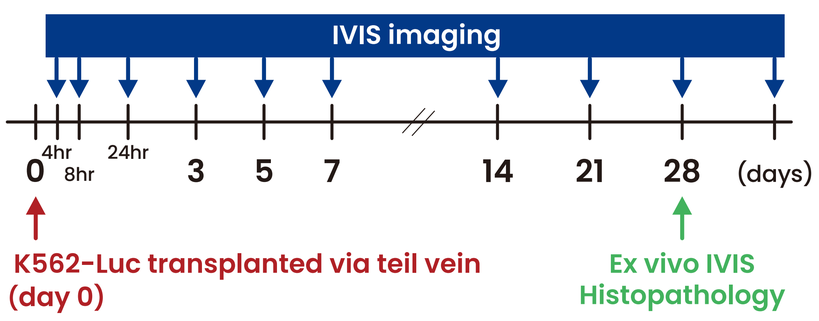
NOG.Cg-*Prkdc*^{scid}*Il2rg*^{tm1Sug}/ShiJic (NOG), male, 8 weeks old, n=6

● Tumor Cell Transplantation

K562-Luc (JCRB Cell Bank)
1×10^7 cells/animal

● Bioluminescence Imaging

Examined using an In Vivo Imaging System (IVIS) Lumina III (Revvity, Inc.)
Bioluminescence imaging (in vivo) was performed about 15 minites after luciferin injection (150 mg/kg, i.p.)



● Histopathology

Hematoxylin-eosin (HE) staining and anti-human lamin immunohistochemistry (IHC).
Liver, lungs, brain, pituitary gland, stomach, spleen, pancreas, femur, mandibular tissue (as mandibular lymph nodes), and mesenteric tissue (as mesenteric lymph nodes) were examined.

Conclusion

Results:

- ✓ IVIS monitoring showed increased signals from 14 days after transplantation, with a pronounced rise by 28 days after transplantation.
- ✓ Ex vivo IVIS detected signals in the liver, lungs, brain, and pituitary gland (and stomach in an animal).
- ✓ Histopathological analysis confirmed tumor cell infiltration mainly in the liver, lungs, brain, and pituitary gland.

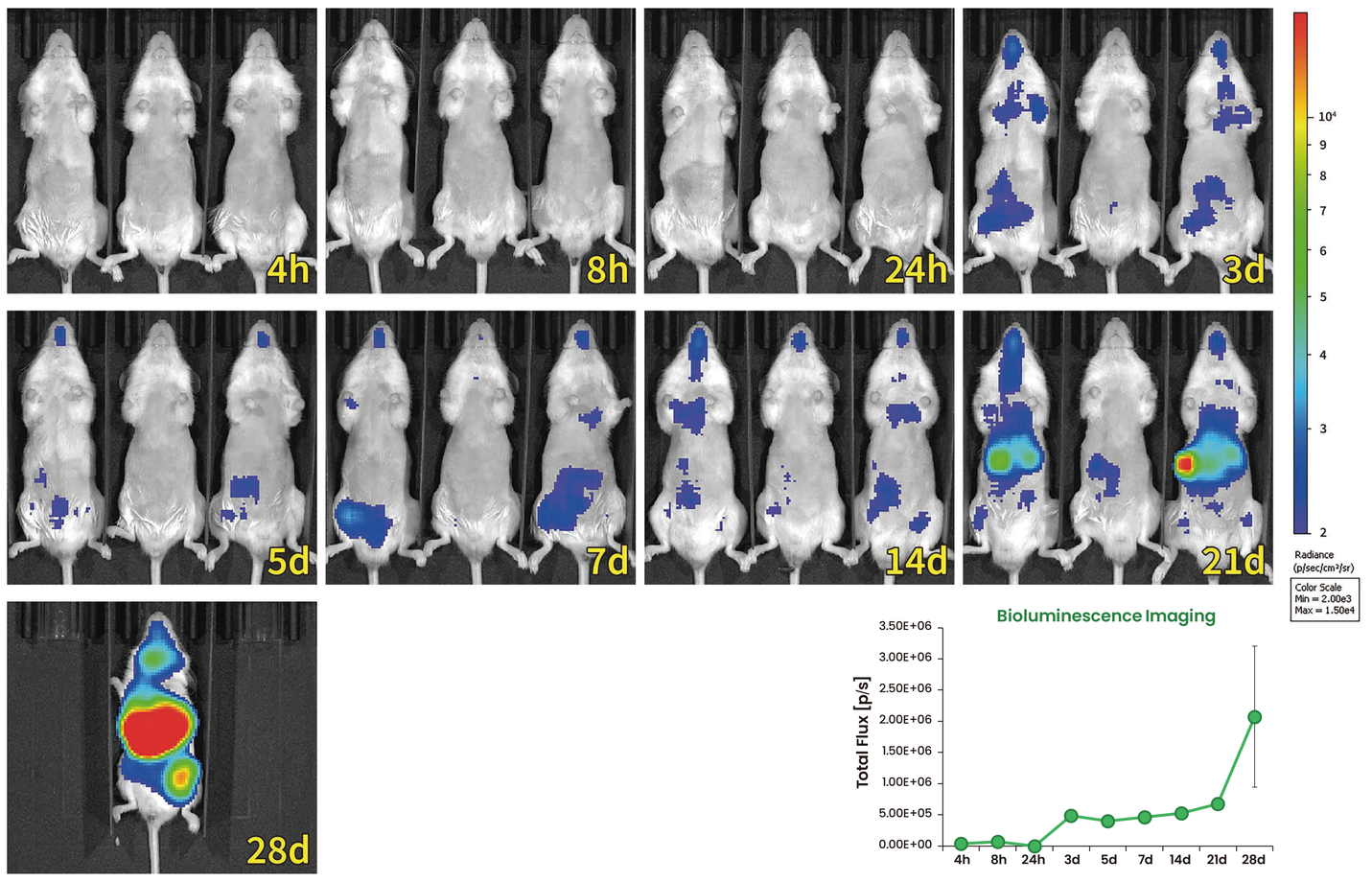
Conclusion:

This study elucidated the characteristics of tumor growth kinetics and distribution in an orthotopic transplant model of human CML using K562-Luc cells. This model could serve as a platform for studying CML pathophysiology and preclinical drug evaluation.

Further detailed analyses are planned to enhance the utility of this model.

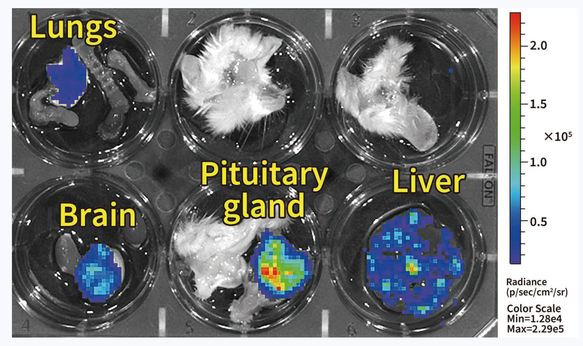
Results

IVIS imaging (in vivo)

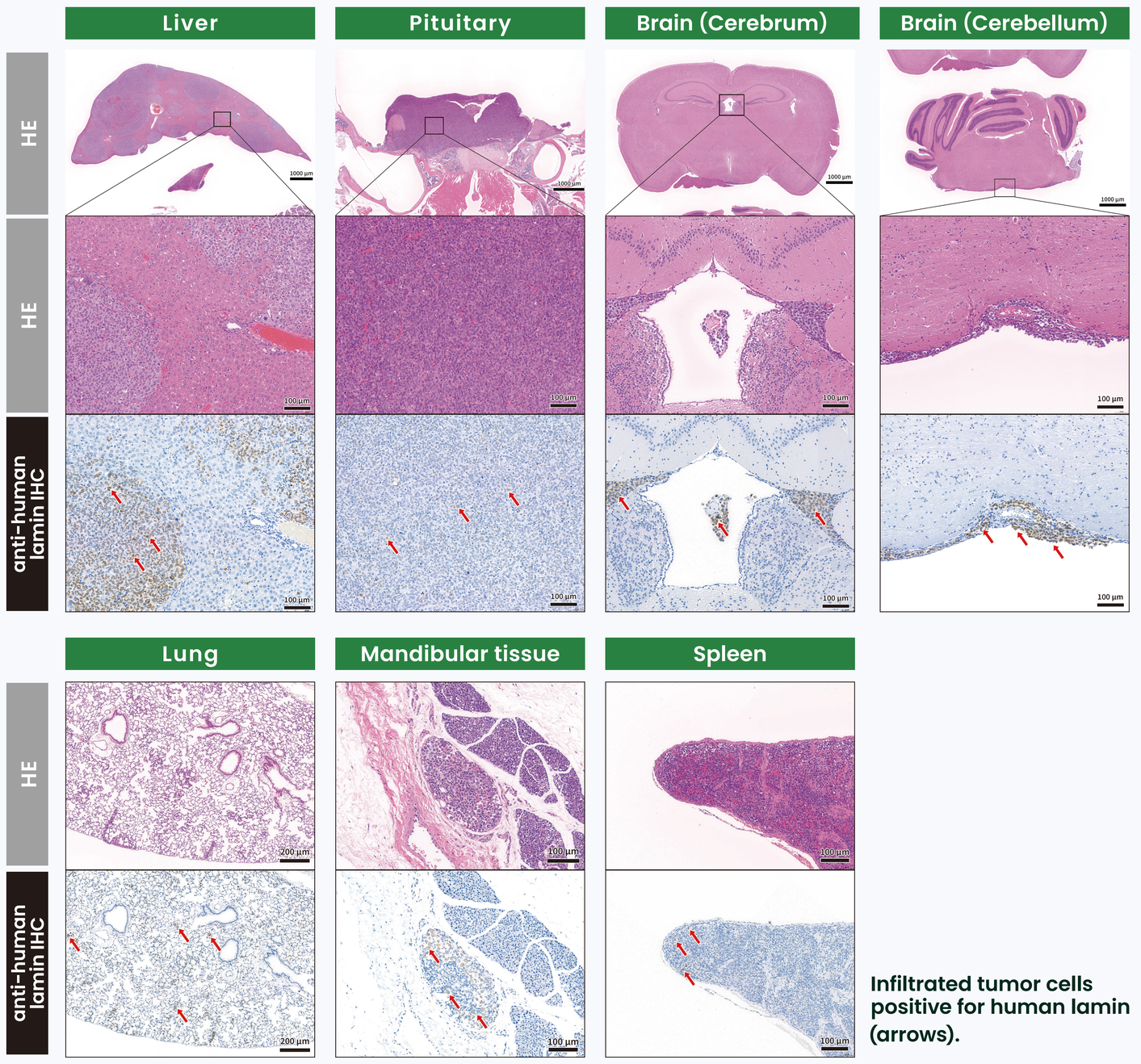


Macroscopic photographs

IVIS imaging (ex vivo)



Histopathology



Infiltrated tumor cells positive for human lamin (arrows).

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