

Realization of a society where child abuse and suicide are zero

Project manager

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leader's institution

Kobe University

R&D institutions

Kobe University

Yokohama City University

Summary of the project

By using our proprietary epigenome data resource for juvenile suicidal individuals and novel AMPA receptor recognition technology for human brain, we aim to 1) develop of biomarkers that accurately predict the presence or absence of child abuse and suicide risk, and 2) clarify abnormalities in epigenome status, gene expression, and AMPA receptors related to child abuse and suicidal tendency. Through these efforts, we aim to visualize child abuse and suicide risks, which are difficult for children to express themselves, elucidate the biological basis relevant to child abuse and related emotional instability even leading to suicide risk, and identify novel therapeutic targets, and finally realize a society where child abuse and suicide are zero.

Milestone by the end of project (year 2024)

R&D Item 1: We aim to identify abnormalities in epigenomic aging, telomeres, immune cells, and DNA methylation of specific gene regions in children with a history of abuse (particularly those with suicidality among them), and to develop algorithm to detect abuse and suicide risk in children with high accuracy by using machine learning method. Furthermore, we will perform single-cell RNA sequencing analysis of blood of children facing severe suicide risk and identify abnormalities in specific cell type gene expression and high-resolution cell proportion counts.

R&D Item 2: By using the world's first AMPA receptor recognition technology for human brain, we aim to identify the biological basis relevant to child abuse and suicide risk. Furthermore, we aim to clarify whether "we can accurately predict the amount of region-specific AMPA receptors based on comprehensive DNA methylation data on peripheral blood" and to gain new insights for novel non-invasive biomarkers that can evaluate the dynamics of AMPA receptors among youth.

R&D theme structure of the project

R&D Item 1: Comprehensive epigenome data and single-cell gene expression data for child abuse and suicidality

Teenage cohort

Abuse history	+	+	-
Suicidality	+	-	-

- Comprehensive epigenome data**
- Aberrant epigenome profile of CpGs
 - Abnormalities in epigenomic aging, telomeres and immune cell proportion
- Single-cell gene expression data**
- Cell type-specific gene expression
 - High-resolution cell proportion counts

R&D Item 2: Brain AMPA receptor data and epigenome data for abuse and suicidality

Twenties cohort

Abuse history	+	+	-
Suicidality	+	-	-

- The world's first AMPA receptor recognition for human brain related to abuse and suicidality**
- Amount of region-specific AMPA receptors
 - Association with DNA methylation data on peripheral blood from same individuals

Visualization and detection of abuse/suicide risks (difficult for children to express themselves)



Early intervention Novel care/therapeutics



Abnormalities in epigenome, gene expression, AMPA receptors for child abuse/suicidality

- Abnormalities in epigenomic aging, telomeres, specific cell proportions
- Aberrant epigenome status and single-cell gene expression levels in specific genes
- Abnormalities in region-specific AMPA receptor amounts

Principal investigators (PIs)

R&D Item 1:
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 Tomoyuki Furuyashiki (Kobe University)

R&D Item 2:
 Tomoyuki Miyazaki (Yokohama City University)
 Ikuo Otsuka (Kobe University)