



**Clean Health Safety**  
**NEWS**

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〈KOACH INFORMATION〉  
独立行政法人理化学研究所 情報基盤センター  
バイオインフォマティクス研究ユニット  
再生医療の品質管理には、  
KOACHがつくる清浄環境が必要

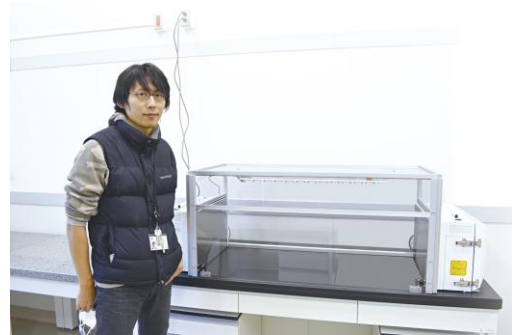
〈N95/DS2マスクに関する研究〉  
第29回日本環境感染学会の研究発表紹介  
医療機関における空気感染予防効果を高める  
N95/DS2マスクの構造、フィットの指導

 **興研株式会社**  
<http://www.koken-ltd.co.jp/>

**The quality control in regenerative medicine needs a clean environment that Koken provides.**

**Bioinformatics Research Unit (BiT), RIKEN Advanced Center for Computing and Communication (ACCC)**

**Riken, an independent Administrative Institution, is Japan's only multidiscipline laboratory that conducts in many areas of science, including physics, chemistry, engineering, biology and medical science, and ranging from basic research to practical applications. Koken's Table KOACH T500-F is used for their research and development of basic technologies for regenerative medicine at Riken.**



Mr Yohei Sasagawa, Senior Scientist

● **We interviewed with Mr. Yohei Sasagawa, Senior Scientist.**

➤ **What research is conducted at BiT?**

It has recently become possible to quantitatively understand various biological phenomena by obtaining DNA sequences on a large scale using the massively-parallel DNA sequencer.

In our research unit, we are challenging to research and develop a novel analytical method and software to analyze and integrate various sequencing data. Furthermore, we are undertaking the task to develop a new experimental technology in order to quantify biological phenomena with the DNA sequencer. Through the development of both analysis technology and experimental technology, we are aiming at quantifying those biological phenomena that have not been measured by any one until now.

We are now concentrating on the development of a highly sensitive single-cell RNA-Seq method called Quartz-Seq that can accurately detect the tiny amount of RNA in a single cell. We want to use this technology to evaluate its efficacy and safety of the cell preparation in regenerative medicine.

**By utilizing the KOACH, we are developing a new technology that can enhance its efficacy and safety of regenerative medicine.**

➤ **We have heard that Quartz-Seq is a revolutionary technology.**

Almost every cell in the human body contains the same DNA sequence of the genome. However, not every gene is expressed in the same fashion in every cell. Because understanding patterns of gene expression provides clue to deeper understanding of life phenomena, we need to analyze the mRNA information in each cell.

Unfortunately, as each cell contains only small amounts of mRNA, it has been difficult to quantitatively detect differences in gene-expression patterns of each cell using the existing methods. The “Quartz-Seq” method, that we have developed, has not only a better quantitative performance but also a simple protocol. Consequently, this method has been successfully introduced in a large number of users and used for various researches.

➤ **What area of research is the Quartz-Seq method used for?**

Quartz-Seq is expected to contribute to a discovery of a new molecular marker and the clarification of the mechanism of human cell's generation and differentiation. With a high degree of accuracy it can detect characteristics of each cell population, and we think that it can evaluate its efficacy and safety of the differentiated cells derived from iPS cells. Last July, the work using Quartz-Seq was supported by the Program for Innovative Cell Biology by Innovative Technology from the Ministry of Education, Culture, Sports, Science and Technology of Japan, the Leading Project for the Realization of Regenerative Medicine.

The objective of the Program is to assemble from research institutes across the country those leading researchers who are engaged in and close to practical use of the regeneration of heart, nerve, retina etc. using the iPS cells at the center and facilitate the medical application of iPS cells.

➤ **We understand that Quartz-Seq is expected to be used for research on cell preparations using iPS cells.**

When the differentiated cell derived from iPS cells is used to make cytomedicine for regenerative medicine, the "Quartz-Seq" method or a new experimental method that we are going to develop will be used in the process. Just like quality check such as component analysis is performed on an ordinary medicine, there must be a quality control on cytomedicine: How many effective cells are there in a cell population? Are not harmful cells included?

We think that evaluation on the cell ratio/cell population will be dramatically improved if we can observe them at a single-cell level. We are hoping to obtain the more detailed information on a marker gene for an effective cell or a harmful cell by detecting the cells at a single-cell level. By supplying such information to the manufacturers of cytomedicine, we can contribute to the establishment of more effective and safer regenerative medicine.

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**“An environment where everything always goes well” is indispensable in our research.**



The Table KOACH can easily maintain ISO Class 1 environment even if the workspace is shared with other workspace as far as proper operation procedure and workplace layout are followed.

➤ **Could you tell us how important a clean space is for your research?**

RNAs that we are handling in a laboratory can be easily decomposed by the common RNA degradation enzyme which is abundant in our daily life.

A typical single cell has approximately 10 pg of total RNAs but contains only 0.1 pg of mRNAs, about 100,000 molecules. This is a very small amount despite its apparently large number, since we are dealing with numbers of

more than ten thousand times larger than this for our ordinary analysis.

There are no two identical cells in the Universe. They are so precious that we do not want to waste the effort and time spent for analysis due to contamination. We pay meticulous attention to contamination control. We should implement the best possible measures against contamination.

➤ **How do you appreciate the performance of “KOACH” in the actual workplace?**

Although Table KOACH can create a clean environment of ISO Class 1 easily, contaminants can be generated if you are working in the clean environment, no difference from a clean bench. Thus, we requested an on-site demonstration from the Koken staff and verified the performance before deciding to purchase one.

**Rough handling of the device did not affect the performance. ISO Class 1 cleanliness was maintained if a proper layout in the workplace and operation procedure was observed.**

As the Table KOACH can create a high level of cleanliness in a clean space, rough handling of the device did not deteriorate the level of cleanliness so much. Because the Table KOACH has much stronger power to expel contaminants than the ordinary clean bench, research samples were not affected by contaminants as far as work layout and operation procedure were properly observed. It was found that ISO Class 1 cleanliness was maintained to our satisfaction.

**“Absolute space” was realized within the same laboratory.**

Contamination control is a really difficult task. Since dividing work between processes per room in the laboratory was not easy, we positioned two work areas: one that requires a high level of cleanliness and one that handles dirty things, as far away from each other as possible. However, it was difficult to separate the two areas completely within the same laboratory workspace due to the low level of cleanliness offered by the existing cleaning device. On the contrary, due to the powerful exhaustion capacity of the Table KOACH, it was found that “absolute space”, meaning a complete clean space, can be created.

**No more worry about contamination**

Contamination control plays a very important role in our research and development where we are handling very small amounts of samples such as a single cell. We are paying a meticulous attention to that. In our development of new experimental technology, if our work is affected by unintended factors in a random manner, we may carry the development plan forward based on the wrong interpretation, or we may end up with a failure of the experiment itself.

Contamination is rated number one among unintended factors. We are not neat freaks, but we have a strong passion for cleanliness.

With the use of the Table KOACH, a clean environment where almost no particulates of more than 0.1µm in diameter are floating in the air can be created. As a result, we can carry out experiments with the peace of mind that comes from knowing that all possible measures have been taken. In particular, the dispensing of liquid from the masker stock, a critical process of experiments, is performed in such “absolute space.”

**Damage from static electricity can be prevented.**

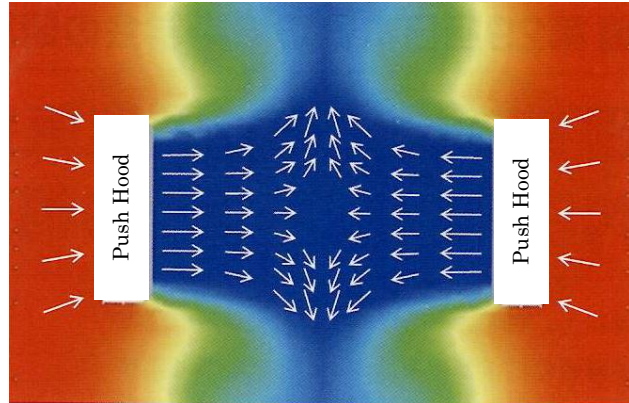
When performing the work involving the dispensing of a tiny amount of liquid, there has been a problem that the liquid is pulled and jumps upward by the force of static electricity. An air ionizer, installed in the Table KOACH

(option), can resolve this static electricity problem in a clean environment.

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**The area created by the KOACH can maintain ISO Class 1 cleanliness even if it is shared with the other work area under the same roof.**

Two coherent filter-purified airflows generated by the two opposing hoods collide with each other at the middle point and be pushed out to vertical and horizontal directions. This exhaust power of the airflows expels contaminants quickly and can maintain a high level of cleanliness in the area enclosed by the hoods and recovers cleanliness quickly if it is contaminated.



**Realizing a high level of cleanliness will help prevent future troubles and lead to increase in “yield rate” of research achievements**

Even if you don't see a problem now, we don't know what will happen in the future as the study proceeds. We have to admit that it is very difficult to create a completely trouble free environment, but we want to prevent future troubles from occurring by introducing the facility that can provide the highest level of cleanliness.

As a matter of fact, when performing experiments, things go well sometimes or things go wrong sometimes. However, we should not give up our efforts to improve such an unpredictable environment if such problems can be brought under control. Producing stable performance is as important as increasing manufacturing yield on the production site. KOACH can give us a solution.

➤ **What is your future research direction?**

Up to now we have been concentrating on the development of a single-cell RNA sequencing method including Quartz-Seq. We will continue our efforts to develop an experimental technology to enhance this single-cell analysis method. We need a simplified method while maintaining a high level of accuracy in order to analyze a large number of single-cells.

We are aiming at finding a method to detect more than 10,000 single-cells at the same time. Besides, we are advancing development involving single-cell related experimental technology. We think that both of these experiments will require a clean environment that the KOACH can provide.

➤ **A high level of cleanliness seems to give a big advantage.**

We think that the KOACH can be utilized as immediate asset whether in development phase or in operation phase.

Assuming that a clean environment is guaranteed by the KOACH, we can focus only on technology development and can challenge difficult research tasks. Other clean devises do not have characteristics that the KOACH has, such as being compact and space-saving and being able to create a super clean environment anywhere. We believe that the KOACH will increase its presence in the market, considering that there is a growing need to handle small quantities of materials in life science research.