We want to provide the quickest possible treatment for pets and animals, who cannot speak for themselves, for alleviating their pain or burden. This is the desire of not only the pet owner, but of everyone who takes care of animals.

The test data that supplies objective information for making a decision is required as soon as possible to provide appropriate medical care. We never know when sickness or injuries may happen. Therefore, it would be ideal to provide medical care any time, immediately 24 hours a day. The goal aspired to and obtained by DRI-CHEM is the very immediacy of test results.
If there are physiological changes or symptoms experienced by the pet, a large number of specific components that exist in the blood increase or decrease. By examining which component has increased or decreased and to what extent, it is possible to presume a disease or condition and its severity. This is what biochemical tests do. Biochemical tests are used to analyze the components of blood, which are like a mirror reflecting the physiological state of the patient, and biochemical tests form the basis of clinical tests that play a key role in addition to the physical examination.

[Clinical Tests]
Clinical tests are a scientific approach to diagnosing a disease based on objective information (ie, test data), which is in contrast to the information obtained by interviewing the patient or a medical examination involving taking the patient’s body temperature or palpation. In addition to providing confirmation to support a diagnosis obtained by test data, clinical tests are also used to determine the therapeutic effect as well as the prognosis of a patient.

**Clinical tests and biochemical tests**

Blood
- Hematology tests, immunological tests, bacteriological tests

Urine
- Urinalysis
  - (also called general tests, to determine sugar and protein levels in urine)

Feces
- Fecal tests
  - (to examine for hemorrhaging, parasite eggs, etc.)

Body fluids
- Cerebrospinal fluid tests, seminal fluid test

Tissues and cells
- Pathological tests
  - (To identify cancer or viral infections)

In Biochemical tests, urine and spinal fluid are sometimes used aside from blood. Test using blood as a sample is called blood chemistry test.
Whole blood drawn from a patient coagulates when it leaves the body and the components change their form, so it is unstable and therefore not appropriate as a specimen for most of the tests. Stable samples for biochemical tests can be plasma obtained by centrifuging whole blood, or serum obtained after centrifuging coagulated whole blood. Also, because glucose in blood is consumed after blood sampling, a glycolysis inhibitor is used in conjunction with anticoagulants in blood used for glucose tests.

**[Types of Blood Sampling]**

- **Venous blood samples**
  The conventional blood sampling method. Blood is withdrawn by syringe or vacuum into a tube or syringe.

- **Arterial blood samples**
  Used primarily for the measurement of blood gases.

- **Capillary blood samples**
  Ear lobe blood sampling (capillary)

**Vacuum blood sampling tubes**
Vacuum blood sampling tubes, which are used most often, may already contain, depending on the usage, an anticoagulant, coagulation accelerator, or blood separating agent.

**[Blood processing and types of samples]**

- **Blood sampling**
- **Blood cell separating agent**
- **Anticoagulant** (+ glycolysis inhibitor)

**Whole blood**
- **Heparin whole blood (EDTA whole blood)**

**Centrifugation**
- **Serum**
- **Plasma**
- **Fibrin matrix** (fibers)
- **Fibrinogen** (cellulose, solution)

**[Laboratory Tests]**

- **Blood tests**
  [Hematological tests]
  Number, shape, color, and type of RBC, WBC, and platelets, hemorrhaging, coagulation

- **Bacteriological tests**
  [microbiologic tests]
  Bacteria tests

- **Immunological tests**
  [Serum tests, serum immunological tests]
  Testing for infectious diseases, etc. using antigen-antibody reaction

- **Biochemical tests**
  [Blood chemistry tests]
  Measurement of amounts and activities of chemical components contained within this liquid portion of blood
Clinical Chemistry Analyzer

Test items

[Enzymes]
Various enzymes are present in the blood at fixed concentrations when the physiological state of a pet is normal. However, when there is an abnormality in a specific organ or tissue, the enzymes in those organs or tissues are released into the blood resulting in an increase in their concentration (activity). Also, the concentrations of enzymes decrease when there is a decrease in the function of a particular organ.

[General chemistry]
Like for enzymes, the blood concentrations of various metabolites, which are normally present at certain levels, increase or decrease when an abnormality occurs.

[Immunological test]
Specific proteins, endocrine hormones, drugs, etc, are present in the blood in very small amounts in healthy animals. However the blood concentrations increase due to acute inflammation, tissue destruction, medication, and therapy. These trace components, called immunological parameters, can be analyzed and measured using antigen-antibody reactions (immunological reaction specific for each component).

[Electrolytes]
The concentration of salt in plasma is approximately 0.9%. The molecular formula of salt (crystalline state) is NaCl, however, in aqueous solutions the NaCl exists as Na+ ions and Cl- ions. These ions are called electrolytes.

[Blood Gas]
The changes of CO2 in blood may suggest the patient is retaining or losing fluid. This can cause imbalance in the body's electrolytes. This test is usually conducted with the electrolytes.

Inflammatory disease
CRP C-reactive protein

Electrolytes
Na, K, and Cl

Bone and hormonal abnormalities
Ca Calcium
IP Inorganic phosphorus
Mg Magnesium

Physical status
TP Total protein
ALB Albumin
Na Sodium
K Potassium
Cl Chloride

Heart diseases
CPK/CK
GOT/AST
LDH/LD
Hepatobiliary diseases
GOT/AST
GPT/ALT
GGT(yGTP)
ALP
LDH/LD
LAP
Pancreatic diseases
AMYL
LIP
Malignant tumors
LDH/LD
Bone diseases
ALP

Hepatic diseases
NH3 Ammonia nitrogen
Jaundice
TBIL Total bilirubin
Diabetes mellitus
GLU Glycerina (glucose)

Renal diseases
BUN Urine nitrogen
CRE Creatinine
IP Inorganic phosphorus
Mg Magnesium

Obesity
TCHO Total cholesterol
TG Triglyceride

Bone and hormonal abnormalities
Ca Calcium
IP Inorganic phosphorus

Physical status
TP Total protein
ALB Albumin
Na Sodium
K Potassium
Cl Chloride

TCO2 Total Carbon

Only one drop...
**Clinical Chemistry Analyzer**

**Special characteristics of FUJI DRI-CHEM**

FUJI DRI-CHEM is a very simple biochemical test system that can measure substances by merely placing a drop of specimen on a small slide containing dry reagents. Standard biochemical test methods that use liquids are suitable if large sample volumes are processed all at once. However, the measuring equipment tends to be bulky and there are various time-consuming and laborious steps involved, such as rinsing with water, management of liquid reagents, preparations before and clean-up after the measurements. Practice and skill is required for precision control and other aspects of the liquid method. On the other hand, the FUJI DRI-CHEM method, which maximizes the advantages of dry chemistry, does not require any rinsing with water, the measuring equipment is compact, and the procedure is simple and straightforward. This means it is ideal for obtaining immediate measurements in emergency situations.

**Comparison of handling procedure**

<table>
<thead>
<tr>
<th>Liquid method</th>
<th>FUJI DRI-CHEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Turn power button to ON</td>
<td>(i) Turn power button to ON</td>
</tr>
<tr>
<td>(ii) Preparation and replacement of Fuji Auto Tips and reference solution RE (for electrolytes)</td>
<td>(ii) Preparation of slide of items to be measured</td>
</tr>
<tr>
<td>(iii) Calibration</td>
<td>(iii) Preparation of slide of items to be measured</td>
</tr>
<tr>
<td>(iv) Data check and confirmation of normal state</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement</strong></td>
<td><strong>Measurement</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preparations until start of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Emptying of waste box</td>
</tr>
<tr>
<td>(ii) Turn power button to OFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid measurement method</th>
<th>FUJI DRI-CHEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighing and injecting of reagent</td>
<td>Only sample weighed and analyzed</td>
</tr>
<tr>
<td>Incubation 37 C (98.6F)</td>
<td></td>
</tr>
<tr>
<td>Transmission colorimetric measurement method</td>
<td>Reflex colorimetric measurement method</td>
</tr>
<tr>
<td>Measurement cell</td>
<td>Measurement cell</td>
</tr>
</tbody>
</table>

**Comparison of measurement procedure**

**No water needed**
- There is no need to prepare purified water that is used to rinse the cell, or other parts inside the equipment, etc. in liquid-based measurement methods.

**Ancillary equipment not needed**
- Equipment for supplying and draining water and water purifiers not needed.
- Regular power source can be used so renovations to or upgrading of electrical power supply not required.

**No need for preparations or clean-up**
- Pre-measurement preparations and post-measurement cleaning and rinsing needed by standard methods that use liquids are not required.
- There are no substances or chemicals to dispose of.

**Minute amounts of samples**
- As only a minute amount of sample is required for a single measurement (colorimetry: 10μL, electrolytes: 50μL [Na, K, Cl]), the impact of blood sampling on newborns, the elderly, or a severely injured person can be greatly decreased.

**Automatic Dilution Function**
- The troublesome dilution procedure can be done automatically. Just by setting a dilution fluid with the sample, dilution will be performed with the assigned dilution factor.

<table>
<thead>
<tr>
<th>Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>The liquid measurement method has built-in reagent tanks inside the apparatus for each test item. The calibration must be checked everyday, calibrator (liquid) must be measured regularly, and the reagent and equipment are corrected.</td>
</tr>
</tbody>
</table>

**Simple procedure**
- The basic procedure involves only 3 simple steps: “Setting of the slide and pipette tip”, “Setting the sample”, and “Pressing the start button”.

**Slide reagents**
- Ready made slide reagents are individually packaged for each single use. They are very stable when stored and there is no wastage.

**Calibration not necessary**
- If the lot number of the slides change, one merely has to insert the QC card supplied with the slides to correct for any differences from the new lot. Correction using a QC card is not needed for electrolytes.

**Display of measurement results**

---

**GUIDE**
There are 2 types of FUJI DRI-CHEM slides with a different measurement principle, neither type requires the preparation of any reagents.

**[Colorimetric method slides]**
The enzymes, general chemical components, and immunological components in the samples are measured by colorimetry. Application of the sample to the slide results in a reaction between the component and the reagent, the formation of a pigment, and measurement of the concentration of chromophore that corresponds to the amount of component. The multilayered film slide begins with dry reagent needed for one measurement and has successive layers of functional materials. In the colorimetry slides, there is the end-point method (general chemistry) and rate method (enzymes, Mg, CRP).

**[Potentiometric method slide]**
Assays the electrolytes in the specimen. The specimen and an electrolyte reference solution with a fixed concentration of electrolytes are applied to the slide. The concentrations of the electrolytes are measured by the change in potential between two electrodes. One slide contains 3 types of film electrodes (Na, K, and Cl) and all three can be measured at once simultaneously in only 1 minute.
Stable manufacturing of FUJI DRI-CHEM slides

We apply advanced technologies we have cultivated for photo film.

We apply manufacturing technologies of photo film cultivated for over 80 years in manufacturing FUJI DRI-CHEM slides. Technologies include the machining accuracy of the transparent support media (film base) comprising of a multilayer structure and the technology to apply a reagent layer that reacts to the object substance in a sample and a reflection layer that blocks off blood pigments. The world’s top level fine chemistry, processing technology and quality control have built a new possibility called dry chemistry in biochemical tests.

Film-forming process

- **Prepared liquid process**
  - This is the prepared liquid of the reagent applied on the film base. The type, the mixing ratio, the mixing order, the temperature and the time are strictly programmed by item and layer for gelatin, enzyme, pH buffering agent, color fixing agent and additives and prepared to always show a constant reaction against the object substance in the specimen. As the reagent layer and the reflection layer vary depending on the item and consist of a single layer or multiple layers, the liquid is prepared per layer.

- **Application process**
  - The reagent prepared on the film base running and accurately controlled in a constant speed is applied to 0.1 micron accuracy. This application process and the subsequent drying process are carried out under an indoor condition where light is always kept constant and minute dust particles are kept out.

- **Drying process**
  - The film applied with the reagent is continuously fed to the drying process. In addition to stabilizing the indoor condition, dry air is finely set to the temperature and humidity per item and layer considering the deactivation of enzymes and then blown. The time to finish drying is accurately controlled by improving the accuracy of the drying process in addition to the prepared liquid and application.

- **Cutting process**
  - After the spreading layer is bonded, the rolled dry film is set on the slitter (cutting machine). The wide roll is cut in round slices of about 1.2 cm in width and cut again to about 1.3 cm in length direction to form chips as small as approximately 2 cm or less. These film chips are stored on the plastic mount to protect them and finish a FUJI DRI-CHEM slide.
Features of FUJI DRI-CHEM system

FUJI DRI-CHEM QC card system
About calibration
While test reagents should be manufactured with the same degree of quality, in fact, when judged from the point of view of biochemical tests, which require a high degree of precision, there are slight differences between the lots for each reagent. This is why it is necessary to calibrate the measuring equipment when using different lots, or in other words, correct or compensate for the differences between lots.

FUJI DRI-CHEM does not need calibration
Each individual package of FUJI DRI-CHEM comes with a magnetic memory card (QC card) that contains the correction coefficients so that each lot will be corrected to the measured values of a standardized lot. When slides from different lots are used, calibration is performed automatically merely by inserting the QC card into the analyzer beforehand.

Automated Measurement for Faster, More Accurate, and Safer Testing
FUJI DRI-CHEM uses automated measurement at the device side to provide the key features needed in testing, “simplicity and speed”. Once the START key is pressed, the entire process is automated until the results are displayed. This automated process is faster and more accurate than manual processes, and it minimizes potential contact with samples for reducing the risk of infection by pathogens. This system also enables the operator to leave the test site to perform other operations.

- Faster and more accurate
- Reduced risk of infection
- Enables walk-away operation

Slide cartridge
Barcode scan
Parameter identification
Sample application
Light source
Calculation
Measurement
Display
Printout
Waste box

About calibration
The test parameter and slide lot are identified by the barcode or 2D dot code printed on the back of the slide. (The sample application amount, measurement wavelength, reaction time, and other information are also loaded at the same time.)

Sample application
A predetermined amount of sample is applied to the slide quickly and accurately.

Incubation and measurement
The sample is incubated for a certain reaction time at 37°C (98.6°F), which is nearly the temperature of the human body, and measured at a specific wavelength, and the calculated measurement results are displayed and printed out.

Waste box
After use, slides and tips are automatically dropped into a waste box. This eliminates time-consuming cleanup and minimizes contact with the sample.
Immunological parameters for hormone related diseases

The concentration of special proteins, secreted hormones, medications, and other special substances in the blood can increase due to acute inflammations and tissue breakdowns in the body, taking of medications, treatments, and other causes. Immunological tests are used to detect these types of substances using antigen-antibody reactions (immunological reactions specific for each substance) for finding the presence of substances and their concentration for identifying the illness and its severity.

[Immunological Parameters]
Hormones secreted within the body remain at constant levels, but in certain cases, they may fluctuate due to hormone related diseases. These hormones are called immunological parameters because antigen-antibody reactions (immunological reactions specific for each component) are used to quantitatively analyze them.
**Measurement principles of immunological analyzer**

**Principle of Immunological Test System**

The equipment performs fluorometry using Surface Plasmon enhanced Fluorescence (SPF) method, a technology based on Surface Plasmon Resonance (SPR), within a small cartridge. The SPF technology has two major advantages which made the realization of a compact sized immunodiagnostic analyzer possible. First advantage is it does not require a washing process for surplus fluorescent beads, making the mechanical process of the equipment simple. Second, since the fluorescence is enhanced by SPR, a low power beam is sufficient enough to generate substantial fluorescence intensity for detection.

**Competitive method**

For low molecular substances like T4 (thyroxine) and COR (cortisol)

Measurement principles of T4

![Diagram of Competitive method]

When a specimen is applied to a cartridge, the specimen and the dried fluorescence particle-labeled anti T4 mouse monoclonal antibody enclosed in the cartridge are mixed. T4 in the specimen reacts with a fluorescence particle-labeled antibody. The mixture then reacts with T4-BSA, the solid phase antigen. Here, the T4 non-binding fluorescence particle-labeled antibody binds to the solid phase antigen. These fluorescence particles are activated by excitation light through the gold coating film. The fluorescence is inversely proportional to the T4 concentration of the specimen.

**Sandwich method**

For high molecular substances like TSH (Thyroid-stimulating hormone)

![Diagram of Sandwich method]

When a specimen is applied to a cartridge, the specimen and the dried fluorescence particle-labeled anti TSH mouse monoclonal antibody enclosed in the cartridge are mixed. TSH in the specimen reacts with a fluorescence particle-labeled antibody. The mixture then reacts with Anti-TSH mouse monoclonal antibody, the solid phase antibody. The fluorescence particle-labeled antibody-TSH complex in the specimen binds to the solid phase antibody. These fluorescence particles are activated by excitation light through the gold coating film. The fluorescence is directly proportional to the TSH concentration of the specimen.
### FUJI DRI-CHEM Clinical Chemistry Analyzer

**Test parameters and slides ①**

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter name</th>
<th>Slide name by sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enzyme</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Gamma-glutamyl transpeptidase</td>
<td>GGT-P</td>
</tr>
<tr>
<td>2</td>
<td>Glutamate dehydrogenase</td>
<td>GOT/AST-P</td>
</tr>
<tr>
<td>3</td>
<td>Glutamate pyruvate transaminase</td>
<td>GPT-P</td>
</tr>
<tr>
<td>4</td>
<td>Creatine phosphokinase</td>
<td>CPK-P</td>
</tr>
<tr>
<td>5</td>
<td>Lactate dehydrogenase</td>
<td>LDH-P</td>
</tr>
<tr>
<td>6</td>
<td>Alkaline phosphatase</td>
<td>ALP-P</td>
</tr>
<tr>
<td>7</td>
<td>Leucine aminopeptidase</td>
<td>LAP-P</td>
</tr>
<tr>
<td><strong>Biochemical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Glucose</td>
<td>GLU-P</td>
</tr>
<tr>
<td>2</td>
<td>Blood urea nitrogen</td>
<td>BUN-P</td>
</tr>
<tr>
<td>3</td>
<td>Creatinine</td>
<td>CRE-P</td>
</tr>
<tr>
<td>4</td>
<td>Uric acid</td>
<td>UA-P</td>
</tr>
<tr>
<td>5</td>
<td>Total cholesterol</td>
<td>TC-CHO-P</td>
</tr>
<tr>
<td>6</td>
<td>Triglycerides</td>
<td>TG-P</td>
</tr>
<tr>
<td>7</td>
<td>Total protein</td>
<td>TP-P</td>
</tr>
<tr>
<td>8</td>
<td>Calcium</td>
<td>Ca-P</td>
</tr>
<tr>
<td>9</td>
<td>Inorganic phosphorus</td>
<td>IP-P</td>
</tr>
<tr>
<td>10</td>
<td>Total protein</td>
<td>TP-P</td>
</tr>
<tr>
<td>11</td>
<td>Albumin</td>
<td>ALB-P</td>
</tr>
<tr>
<td>12</td>
<td>Ammonia</td>
<td>NH3-P</td>
</tr>
<tr>
<td>13</td>
<td>Magnesium</td>
<td>Mg-P</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>chemistry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrolyte</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sodium</td>
<td>Na-K-P</td>
</tr>
<tr>
<td>2</td>
<td>Potassium</td>
<td>K-P</td>
</tr>
<tr>
<td>3</td>
<td>Chloride</td>
<td>Cl-P</td>
</tr>
<tr>
<td><strong>Blood gas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Total carbon</td>
<td>TC-O2-P</td>
</tr>
</tbody>
</table>

**Important**

FUJI DRI-CHEM slides were developed for use with human subjects, and so the measurement results may vary depending on the animal type. For more information contact your Fujifilm sales representative.

### FUJI DRI-CHEM Immunological Analyzer

**Test parameters**

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Cartridge name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroxine</td>
<td>v-4</td>
</tr>
<tr>
<td>Thyroid Stimulating Hormone</td>
<td>v-TSH (for canine)</td>
</tr>
<tr>
<td>Cortisol</td>
<td>v-COR</td>
</tr>
</tbody>
</table>