

#### 4) Relationship between BP, AP, IQ, TC and Skin Structure

- (1) Where does the Electrical Behavior of BP Take Place in the Skin Structure? - Based on the AMI data before and after epidermis stripping-

When a 3 V DC electrical potential was applied between a right and left

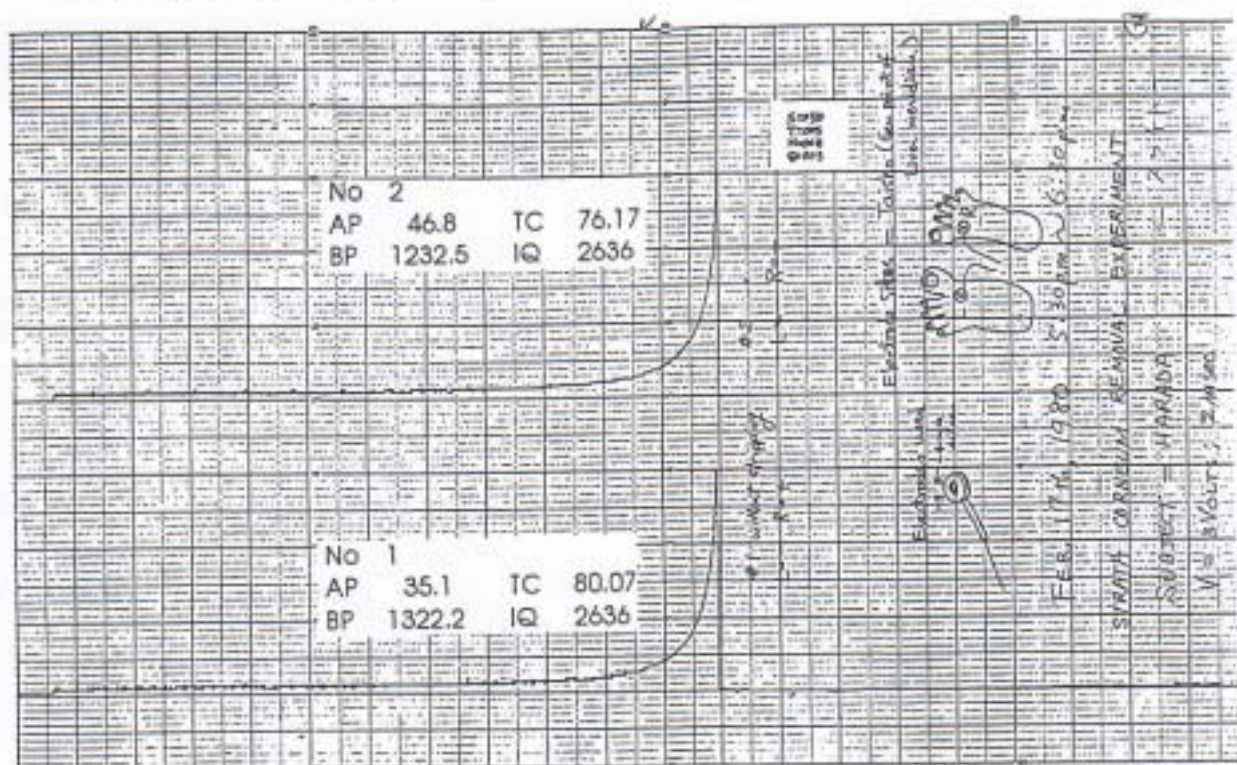


Chart 4: Before Tape Stripping

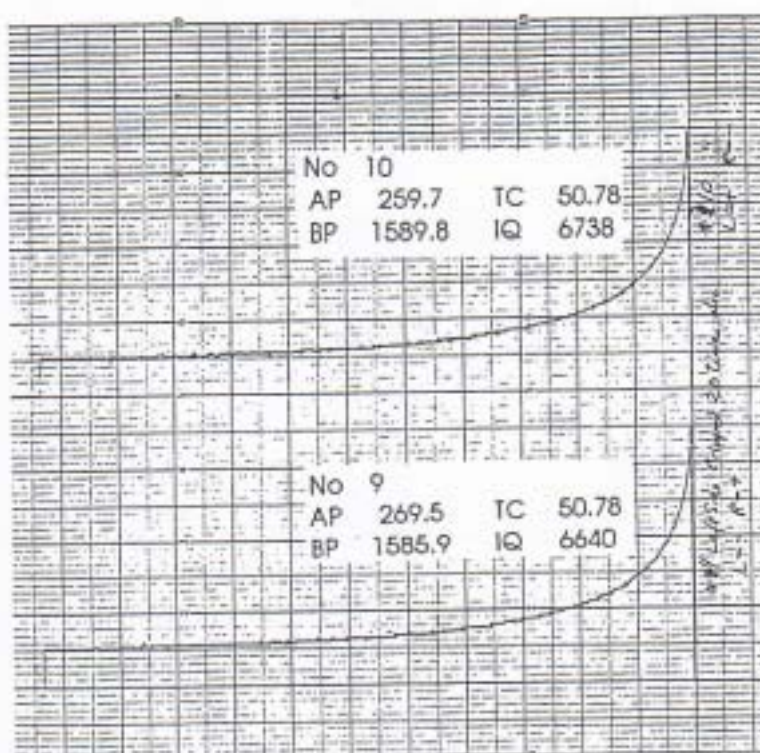


Chart 5: After the First 20 Times Stripping under the Left Electrode

electrode on the top of the foot (Gen point of the liver meridian) with the epidermis intact, a current flow (BP) of approximately  $1330\mu\text{A}$  was recorded (Chart 4). When part of the epidermis under the right electrode was removed by tape stripping (using scotch tape) 20 times, the current value was about  $1350\mu\text{A}$ . When the skin under the left electrode was also peeled 20 times, the current was approximately  $1600\mu\text{A}$  (Chart 5). When the skin on the right side was peeled 20 times more, the current value was around

$1755\mu\text{A}$ . In this process blood began to appear on the surface of the skin, which meant that some basal membrane had been removed (Chart 6). When

the left side was also peeled a further 20 times, the current was approximately  $1750\mu\text{A}$  (Chart 7).

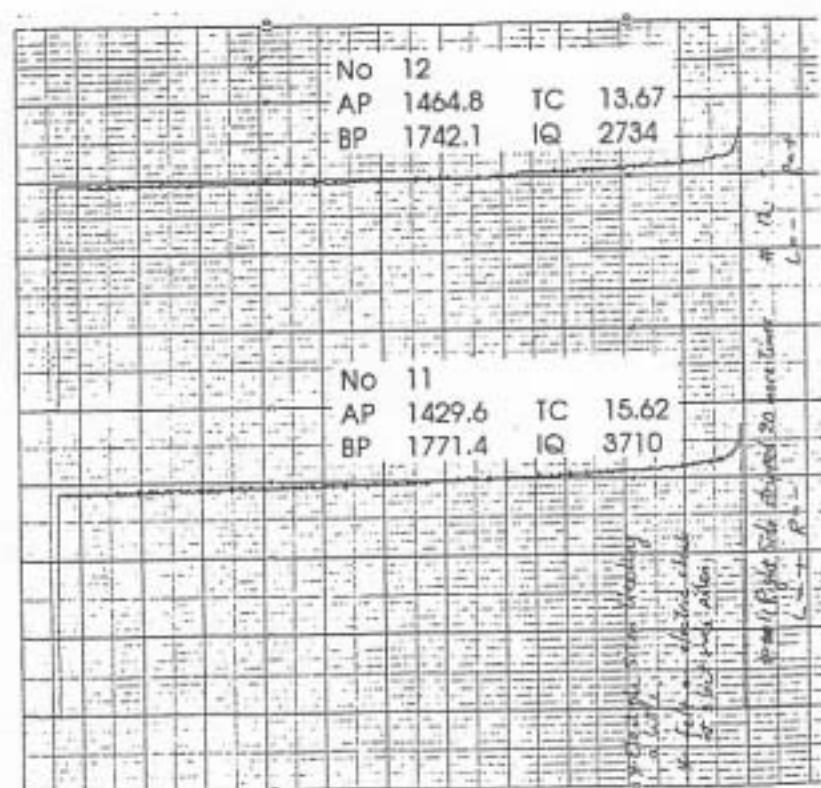


Chart 6: After 40 Times Stripping under the Right Electrode

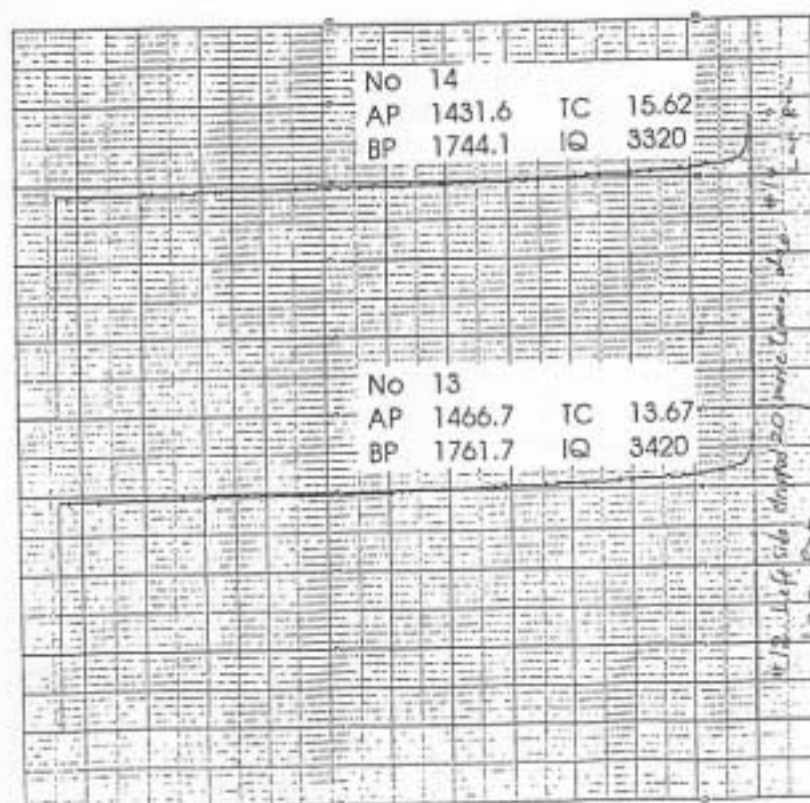


Chart 7: After 40 Times Stripping under the Left Electrode

From the above experiment, when the basal membrane is removed (whether the basal membrane was removed completely is unclear) about  $1750\mu\text{A}$  is recorded. When it is not removed, as much as  $1330\mu\text{A}$  is recorded (Chart 8). So the existence of the epidermal layer has only about a 30% influence on the value of the BP. Most of the remaining 70% of the BP value is then determined by the dermal layers. Therefore it can be surmised that the BP current travels primarily in the dermal layers, regardless of the existence of the epidermis.

It is easy to understand that the current flows in the dermis when the epidermal layers are removed. On the other hand, even though current decreases some 30% due to the resistance of the intact epidermal layer, the larger part of the current still penetrates this layer. As for the routes by which this current passes into the dermis there are a number of possibilities. These include a route via the skin appendages such as the sweat glands; a route which penetrates the cells; and a route which runs through the inter-

STRATA CORNEUM REMOVAL EXPERIMENT-II

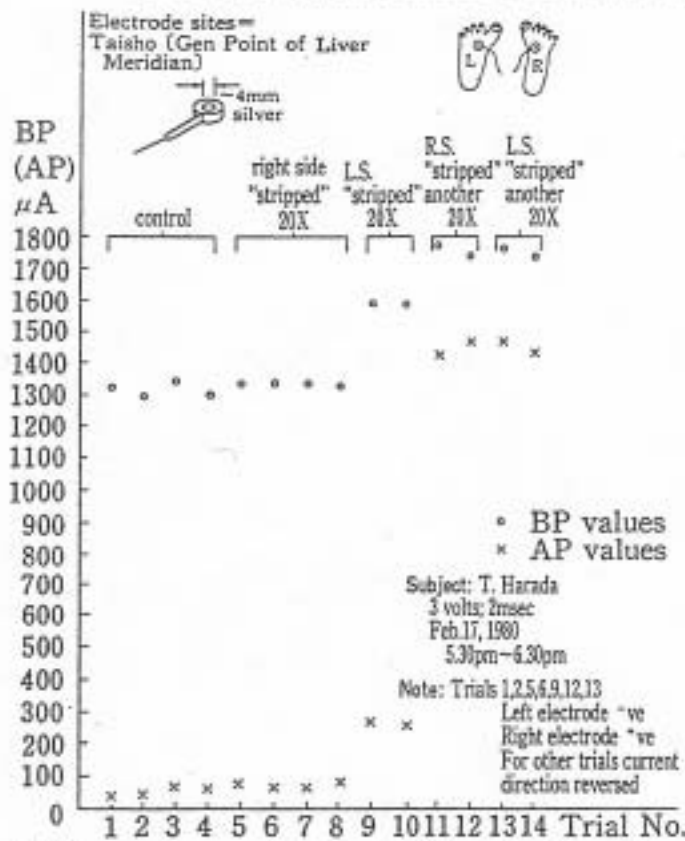
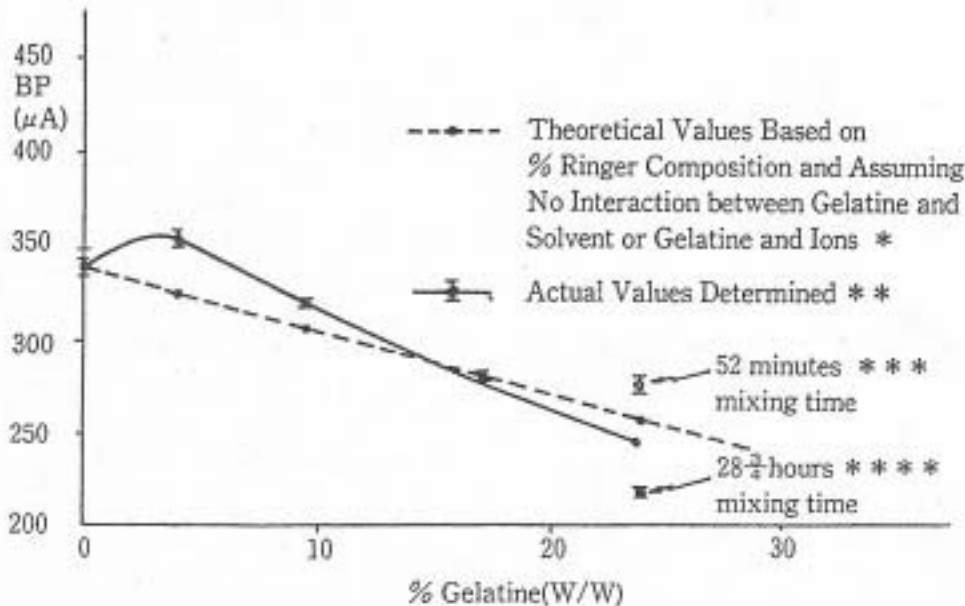


Chart 8: Dependence of BP and AP on the Number of Stripping



**Experimental Procedure:**

Each of the experimental solutions (4 cm<sup>3</sup>) was poured in U-form test tubes of 6.5mm-caliber at room temperature, and the change of BP value in proportion to the ratio of gelatine solution was observed, applying 1.0V, 100msec-rectangular wave pulses (The ratio of gelatine solution is the weight ratio of gelatine in the Ringer composition). A shielded needle with 1mm tip exposure was used as an electrode. The experimental solution kept more than 30 minutes after the gelatine mixture, was used.

Chart 9: Gelatine % Composition Experiment

cellular spaces (Figures 7 & 8). From studies such as those of Nyboer (1970),<sup>(6)</sup> the current pathway which passes directly through the cells is thought to be the most prominent.

In any case, BP measures electrical behavior which takes place mainly in the dermis. The factors that determine the actual current are the load resistance of the external circuitry ( $100\Omega$ ), the resistance between the electrode and the electrode paste (less than  $600\Omega$ ), and the intrinsic resistance of the epidermal and dermal structures ( $700\Omega$  or more). The intrinsic resistance depends on the organic conditions. This is one important factor for diagnoses.

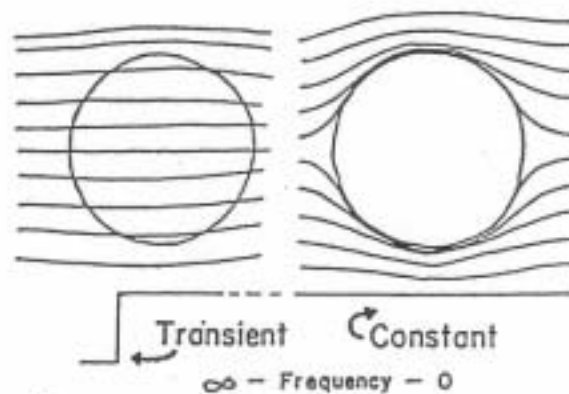


Figure 7: Schematic of Instantaneous and Constant Direct Current<sup>(6)</sup>

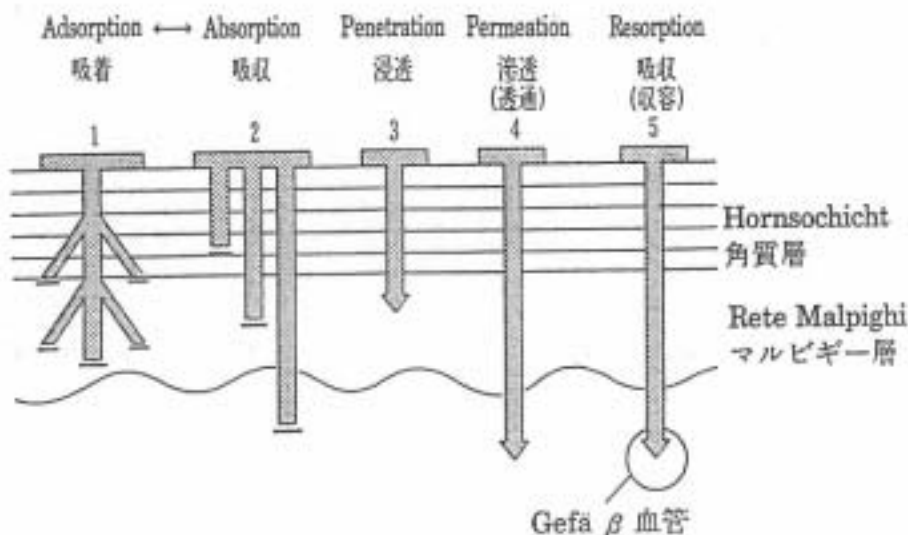


Figure 8: Pathways into the Skin<sup>(7)</sup>

The biological constituents which determine the intrinsic resistance of the skin structure are the sodium, potassium, calcium, chloride, collagen, and hyaluronic acid contained within the dermal connective tissue structures.

The concentration of gelatine (soluble denatured collagen) in vitro and the corresponding BP values from the AMI measurement data are in Chart 9.

The higher the concentration of gelatine, the more the BP value decreases.